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DENTAL FEAR AND ORAL HEALTH BEHAVIOR
Studies on psychological and psychosocial factors

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Sweden
2003
DENTAL FEAR AND ORAL HEALTH BEHAVIOR: Studies on psychological and psychosocial factors.

AKADEMISK AVHANDLING

som för avläggande av odontologie doktorsexamen kommer att offentligt försvaras i föreläsningssal 3, Odontologiska fakulteten, Göteborg, fredagen den 16 maj 2003, kl. 9.00.

av

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Avhandlingen är av sammanläggningstyp och baseras på följande delarbeten


Abstract

Dental fear and oral health behavior:
Studies on psychological and psychosocial factors.

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The general aim of this thesis was to study psychological and psychosocial factors in relation to the development, maintenance and expression of dental fear, how individuals cope with their fear, and how dental fear may impact on health and daily life. The study samples consisted of adult dental fear patients seeking treatment at a specialized dental fear clinic. Both quantitative and qualitative research methods were used. The qualitative interview protocols were analyzed using the constant comparative method of grounded theory.

It was found that dental fear patients with concomitant high general fear differ in several ways from patients with less frequent and wide-spread fear. These differences concern dental fear reactions and related emotions, as well as general psychological dimensions. The results indicated an overall more negative and complex situation for patients with high dental and general fear. Comparisons between severe dental fear patients reporting different attendance patterns showed a higher education level and more filled teeth among patients with a history of regular dental care, while patients with phobic dental avoidance behavior had more anticipatory dental anxiety, more missing teeth, and reported a stronger negative impact from dental fear/poor oral status on daily life. General fearfulness was not related to phobic dental avoidance. According to the qualitative interviews the onset of dental fear was commonly related to an individual vulnerability and to traumatic dental care experiences, where perceived negative dentist behavior played a significant role. The patient was caught in a “vicious circle” that was difficult to break, and fear and anxiety were maintained by negative expectations about treatment and about the patient’s own ability to cope in dental care situations. The interviews brought out the patients’ ambivalence in coping with dental fear. The ambivalence was between, on the one hand the tendency to avoid dental care, and on the other hand the need for dental care and their attempt to find active problem-solving strategies. This left patients in a state of conflict with negative consequences for self-respect and well-being. It was obvious that dental fear and deteriorated oral health status resulted for many patients in wide-spread negative life consequences. It was also obvious that several psychological and social factors interact in determining how individuals cope with their dental fear, and demonstrate how dental fear affects their daily lives. Finally, the importance of dental beliefs in dental fear treatment was investigated. The interpretation of the results suggests that the assessment of dental beliefs provides valuable information and that patients’ subjective perceptions about how dentists communicate are important for treatment outcome. However, initial dental beliefs were not found to predict clinical treatment outcome, and dental beliefs are one of several factors interacting in dental fear treatment.

The results emphasize the complexity of dental fear and oral health behavior, where personality characteristics and environmental factors interact. This further elucidates the need for a broad-spectrum approach in dentistry.

Key words: Behavioral sciences, coping, dental anxiety, dental beliefs, grounded theory, oral health, phobia, psychological distress, quality of life, treatment outcome.

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PREFACE

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


ABBREVIATIONS

ANOVA  Analysis of Variance
BDI    Beck Depression Inventory
BT     Behavioral Therapy
CI     Confidence Interval
DAS    Dental Anxiety Scale
DBS    Dental Beliefs Survey
DFRTC  Dental Fear Research and Treatment Clinic
DFS    Dental Fear Survey
DMFT   Decayed, Missing and Filled Teeth
DSM-IV Diagnostic and Statistical Manual of Mental Disorders 4th edn.
GFS    Geer Fear Scale
GLM    General Linear Model analysis
GSI    General Symptomatic Index
GT     General anesthesia Treatment
KHA    Kajsa Henning Abrahamsson
LH     Lillemor R-M Hallberg
MACL   Mood Adjective CleckList
OR     Odds Ratio
SCL-90 Symptom CleckList
SPSS   Statistical Package for Social Sciences
STAI   State-Trait Anxiety Inventory
INTRODUCTION

Dental fear is one of the most frequent of common fears among people in the industrialized world [1, 2] and has been shown to be an important determinant of dental care habits [3-5]. In addition, the risk for deteriorated oral health status [6] and concomitant negative life-consequences [7] has been revealed. Thus, dental fear should be considered in a wide biopsychosocial perspective as a matter of public health concern. Research in the field of dental fear is important for several reasons. Improved knowledge and a deeper understanding of this problem can contribute to better education programs for dental personnel and thus to the prevention of dental fear. Moreover, it can contribute to the development of effective treatment methods for dental fear. Patients with dental fear are not a homogenous group. The character and expression of dental fear differs between subgroups of dental fear patients, as well as between individuals, and interacts with personality traits and other psychological and social components. This thesis concerns psychological and psychosocial factors associated with dental fear and oral health behavior.

Oral health and oral health behavior

Oral health has been defined as “a standard of health of the oral and related tissues which enables an individual to speak and socialize without active disease, discomfort or embarrassment and which contributes to general well-being” (p.8) [8]. This broad definition of oral health comprises many aspects and qualities, and is also a part of general health and well-being. However, defining oral health is a difficult task, especially on an individual level. In dentistry the predominant interest in oral health has been biomedical and it has been defined in terms of absence of oral disease. The broader definition of oral health also includes the social context and personal goals of the individual i.e. a “holistic approach”. Further, subjective or self-perceived oral health or “ill-health” may not be related to a professional view of oral health. Thus, the individual perspective is of great importance in oral health research and further knowledge, as well as methods for measuring dental attitudes and beliefs are needed [8, 9]. In this context the term “oral health behavior” refers to a wide array of behaviors related to oral health or “ill-health” among dental fear patients i.e. dental attendance pattern, oral care performance, avoidance, information seeking etc.

Fear, anxiety and phobia

Even though the terms fear, anxiety and phobia are often used interchangeably in the literature of dental fear, they differ in strict definition. These definitions need to be clarified.
Fear and Anxiety

Fear and anxiety are in many ways similar with regard to experience and physiological reactions. However, there are differences between the terms. Fear could be described as a normal response to a perceived threat. When the threat is gone, the fear reactions abate. Fear is also central in anxiety, but here the fear response is more extensive, with anticipated negative emotional reactions to a hypothetical threat. In this sense anxiety is non-adaptive [10]. In anxiety cognitive responses are characterized by negative emotions and catastrophic thoughts. However, in daily life it is difficult to distinguish between fear and anxiety since the phenomena are closely related. Both terms will therefore be used interchangeably in the present work, with regard to dental fear reactions.

Phobia

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) [11], a specific phobia is a circumscribed, persistent and unreasonable fear of a particular object or situation (Criterion A). Exposure to the phobic stimulus almost invariably provokes an immediate anxiety response (Criterion B), although most individuals recognize their fear as excessive and unreasonable (Criterion C). The phobic situation is in most cases avoided, but could also be endured with intense fear and anxiety (Criterion D), and/or significantly interferes with the persons normal routine, occupational functioning, social activities or relationships (Criterion E). In young individuals (<18), the duration has to be at least 6 months (Criterion F) and finally, the phobic fear is not better accounted for by other mental disorders (Criterion G).

The heterogeneous group of specific phobias is divided into four different subgroups (animal type, natural-environment type, blood-injection-injury type and situational type) [11].

Specific phobia and dental fear

According to the DSM-IV [11], severe dental fear could be considered a specific phobia. In the research on dental phobia some of these criteria have been better investigated (Criterion A, B and D), than others [12]. With regard to the subgroups of specific phobias, dental fear has been clustered with blood-injection-injury phobia [13]. Others [14, 15] suggest that dental phobia should be considered a specific phobia independent of the blood-injection-injury subgroup, although co-occurrence is frequent. However, the dental care situation is complex
and includes several components that can be perceived as frightening i.e. fear of pain, injections, feelings of being shut-in, out of own control etc. The dental care situation also includes social interaction with the dental staff, and for some patients dental phobia may be related to a fear of social situations [16]. Thus, it is plausible to assume that dental phobia often co-occurs with several other types of strong fears. This complexity may explain the difficulty in defining dental phobia and also in finding a uniform diagnostic classification system. So far formal diagnostic systems are rarely used in studies of dental anxiety, and highly fearful patients seeking treatment at specialized dental fear clinics have by tradition been regarded as “phobic” in dental fear research literature.

One of the few studies that has described a dental “phobic” population according to formal diagnostic criteria (DSM-III-R) found that 60% fulfilled the criteria for dental phobia only, while 40% met criteria for other diagnoses (mostly anxiety or mood disorders) [17]. More recently, Kvale et al. [18] found that 47% of a dental fear clinic sample fulfilled the criteria for specific dental phobia, 33% had severe dental anxiety without fulfilling the criteria for phobia, and 19% had multiple DSM-IV diagnoses.

**Classification of dental fear types**

Weiner and Sheehan [19] proposed dividing anxiety and phobic disorder into two major groups: an endogenous and a non-endogenous group. Endogenous dental anxiety is likely to be genetically determined and organic in nature. Non-endogenous anxiety is more likely to develop through learning processes resulting from aversive experiences.

In order to find a clinically applicable classification system for dental fear Milgrom et al. [20] presented a diagnostic system, referred to as “the Seattle diagnostic system”, with four diagnostic categories: (i) conditioned fear of specific stimuli (drills, needles etc), (ii) anxiety about somatic reactions during treatment/fear of catastrophe (panic attacks, fainting etc.), (iii) generalized anxiety or multiphobic symptoms and, (iv) distrust of dental personnel. The idea behind this classification was that as each category had as its root a specific kind of fear, it should be handled accordingly [20, 21]. The “Seattle model” has been tested and some data have been presented to indicate that the system is psychologically valid and identifies subtypes of dental anxiety [16, 17, 22].

In addition, the Seattle system has been compared to the formal DSM-diagnostic system for psychiatric disorders among dental phobic populations [16, 17]. Moore et al. [16] found that “the Seattle type-iv symptoms” were present for the largest group of patients, which may indicate social phobic disorders according to DSM-criteria. They proposed a
modification of “the Seattle model type-iv” to include new social phobic subgroups. However, even though Roy-Byrne et al. [17] reported similar results when phobic dental patients were classified according to the Seattle model, they found no evidence that this classification corresponded to DSM-diagnoses as proposed by Moore et al. [16]. Thus, these authors [17] argued that although it is of interest to combine formal psychiatric diagnostic systems with dental fear classifications in the hope of finding a uniform diagnostic system, no data supporting this is presently available.

Prevalence of dental fear and anxiety
The reported prevalence of dental fear and anxiety varies greatly, with prevalence estimates between 2.5 and 20%, depending on the population, method and measurement involved [4, 23-27] (for a review 1987-1992 see [28]). In Scandinavia, epidemiological surveys have shown a prevalence of severe dental fear of about 4-5% in adult populations [25, 27, 29]. Cross-sectional studies have shown that the prevalence of severe dental anxiety has been relatively stable in Sweden, during the last decades [23, 25, 30-33] despite technological advances and improved education in modern dentistry.

Age, gender and socio-economic status
Age, gender and dental fear
It has been shown that dental anxiety correlates with background factors such as age and gender. Dental fear is usually viewed as a fear originating in childhood [3, 34] peaking in early adulthood [35] and declining with age [36, 37]. Most studies have shown that women are more likely to report high dental fear [4, 25, 29, 30, 38, 39]. Women also show higher prevalence figures than men for other specific fears and general anxiety disorders [2, 40-42]. The gender difference has been accounted for by the greater social acceptance of reporting fear for women [43], but also by the possibility of other predisposing factors e.g. sex hormones, which may contribute to the development of fear and anxiety [43, 44].

Socio-economic status and dental fear
Contradictory results have been reported with regard to socio-economic and educational factors and level of dental anxiety. Thus, a significant correlation between socio-economic status and dental fear has been reported in some studies [23, 45]. However, most studies do not confirm this relationship, or do so only weakly [4, 25, 27, 38, 39, 46, 47]. In some studies an association between marital status and dental fear has been found suggesting that divorced/
separate or single men and women report higher levels of dental fear [45-47]. However, the association between marital status and dental fear appeared to be weak. In addition, some studies report that lower education is associated with higher dental fear [23, 45], while other studies do not confirm this relationship [4, 25, 27, 38, 46, 47].

Why do some people respond to dental care with fear and anxiety, while others do not?  
*The etiology of dental fear*

The etiology of dental fear is discussed in terms of individual vulnerability and predisposition to anxiety and fear in general and/or as a response to a specific stimulus. A relationship between age of onset and etiology has also been found [35, 48], suggesting that invasive procedures and modeling are most important for child onset, while general psychological status may play a more prominent role in adult onset of dental anxiety.

*Dental fear: a classic conditioned response versus an indirect (cognitive) learned reaction*

Two different basic patterns behind the development of fear and anxiety have been described: classical conditioning, and a process of indirect learning referred to as cognitive learning [49]. Conditioned dental fear arising after one or more traumatic experiences in dentistry (commonly pain or negative dentist behaviors) has been identified in several studies [4, 50-52]. Cognitive aspects of dental fear acquisition have been described as the individual’s tendency to think negatively about treatment and expected pain due to vicarious or indirect learning [53]. Thus, an indirect or cognitively learned fear may be acquired through threatening information about dental care or by observation of other people in fearful dental situations [50, 51, 54]. However, the origin of dental fear is most often regarded as multifactorial where both conditioned stimuli and cognitive processes interact with personality and other concomitant factors. Thus, fear evoked by classical conditioning may be progressively built up not only by a series of related events, but also by negative expectations about such events or about dentistry [50]. This means that it may be difficult for the patient to identify the origin of his/her dental fear in favour of an actual traumatic experience.

The “learning” process of fear and anxiety may also be moderated by several factors. According to the latent inhibition theory [55] an association between a conditioned stimulus (a visit to the dentist) and an unconditioned stimulus (a painful or traumatic experience in dental care) is less likely formed if the conditioned stimulus is presented alone on several occasions before it is paired with the unconditioned stimulus. Thus, a history of previous positive (or at least not negative) dental experiences may serve as a defence against
the development of dental anxiety. Evidence for this theory has been supported in several studies [55-58] suggesting that dental fear might be prevented by exposure to dental care and by having children visiting the dentist regularly from a very young age. However, most research on dental fear relies on retrospective data, and it should be pointed out that prospective longitudinal data is required in order to further confirm such relationships [12].

**Predisposing and concomitant factors for development of dental fear**

A genetic vulnerability and personality traits such as higher levels of general fearfulness and anxiety, neuroticism, and temperament have been discussed as factors correlating with and predisposing to dental fear.

**Genetic vulnerability**

In a population-based study on female twins, Kendler et al. [59] investigated the genetic epidemiology of phobias and suggested that simple phobias appear to arise from the combined effect of a genetic vulnerability and a specific traumatic event in childhood. More recently, Kendler et al. [60] investigated the etiology of phobias in more than 7,500 twins of both genders from a population-based register. They assessed the personality trait of neuroticism as an index of phobia proneness, and the lifetime history of five phobia subtypes (agoraphobia, social, animal, situational and blood-injury) and their associated irrational fears. The modes of acquisition of fear in phobic twins were classified into five possible categories: trauma to self, observed trauma to others, observed fear in others, taught by others to be afraid, and no memory of how or why fear developed. They concluded that their findings were inconsistent with the traditional etiologic theories for phobias, which assume conditioning or social transmission. They suggested instead that the vulnerability to phobias is largely innate and does not require environmental experiences manifest itself [60].

**Temperamental aspects**

Some studies have found temperamental aspects to be associated with childhood dental fear [61-63]. Liddell [61] found that early behavioral signs of distress in relation to dental or medical care (according to mothers' observations) predicted the later onset of dental anxiety, and that “dentally anxious boys appeared to have been influenced by external factors, while dentally anxious girls' influences appeared to be internal ones”. However, although temperamental factors may contribute, negative dental experiences were suggested to be crucial for the development of dental fear [61]. Klingberg and Broberg [62] found that
children with dental fear showed significantly more shyness and negative emotionality compared to non-fearful children. Further, cluster analysis among uncooperative child dental patients has shown different fear and personality subgroups, suggesting that there is an association between temperament factors such as higher level of shyness and internalizing behaviors and dental fear [63]. The authors [63] concluded that for most (but not all) children referred because of behavioral management problems in dentistry dental fear is a part of the problem, but also that impulsivity and negative emotionality discriminate these children from ordinary dental child patients.

**General fear and anxiety, neuroticism, and general emotional distress**

Several studies have shown that there is an association between dental fear and general fear and anxiety, neuroticism and general emotional distress [17, 18, 26, 64-68]. Thus, Berggren [66] found that a great majority of adult dental fear patients at a specialist dental fear clinic reported at least one extreme fear besides their dental fear, and that about 50% reported five or more of extreme fears. In addition, Klingberg et al. [26] found in a representative study sample of more than 4000 children (4-11 years) that dental fear was closely related to age (dental fear decreasing with age) and dental fear in the family (maternal fear), as well as being intimately related to general fears. Klingberg [52] suggested, that children predisposed with general fears should be regarded as potential risk patients for developing dental fear and handled with special care. Frazer and Hampson [64] found among a selected sample of adult dental patients that fear and anxiety was significantly and positively related to neuroticism, while there was a non-significant and negative correlation to extraversion. They [64] argued that patients high in both introversion and neuroticism might not be very robust and thus warrant special attention from the dentist. In addition, Schuurs et al. [65] found that dental phobic patients were more neurotic (i.e. unstable), have lower self-esteem, are less decisive, and generally more anxious than a random sampled control group.

It has also been shown that adult dental fear patients who could be assigned additional psychiatric diagnoses, tended to have more dental fear, more widespread phobic avoidance, and were generally more distressed than those who suffered from dental phobia only [17]. In addition, patients who fulfilled the DSM-IV diagnostic criteria for specific dental phobia and in particular those with multiple psychiatric diagnoses, were significantly more anxious both before and after dental fear treatment, as well as at follow-up, compared to patients with high dental fear who did not fulfill the criteria for a phobia [18]. In a recently published population study among young adults the relation between severe dental fear and
psychological disorders was again confirmed [67]. Thus, Locker et al. [67] found that highly anxious dental patients had the highest rates of agoraphobia, social phobia and simple phobia and argued that these individuals are more likely to manifest a constitutional vulnerability to anxiety disorders. Highly fearful dental individuals with one or more psychological disorder were also more likely to maintain their anxiety over time [67]. However, most of those with anxiety and mood disorders were not dentally anxious and the authors stated that further longitudinal studies are needed to clarify the etiological relationship between psychological disorders and dental fear [67].

In order to investigate the longitudinal course of dental anxiety Hägglin et al. [68] performed a longitudinal (1968-1993) epidemiological study among women. It was shown that high dental fear was associated with a higher number of other phobias, a higher level of neuroticism, more psychiatric impairment and more social disability due to phobic disorders [68]. Furthermore, among women carrying dental fear into older age ("chronic dental fear") an association with higher neuroticism, lower extraversion, and more psychiatric impairments at baseline was found [68].

Thus, even though a causal relationship between psychological disorders and dental anxiety has not yet been established, it seems quite clear that the presence of other strong fears, anxiety disorders and general emotional distress may complicate the picture of dental fear.

**Health, life consequences, and coping in relation to dental fear**

**Oral health, oral status and dental attendance**

One obvious consequence of severe dental fear is avoidance of dental care i.e. total avoidance or irregular dental care habits [4, 5, 29, 47, 50]. Several studies have shown that severe dental fear and phobic avoidance of dental care has a negative impact on oral health [3, 6, 23, 33]. Berggren and Meynert [3] investigated a selected group of 160 adult patients with severe dental fear and found that dental status was strongly affected by fear and avoidance. They observed (even though no control group was available) that oral status was even worse than could be expected if only avoidance time was considered and suggested that fear, pain, and guilt may prevent not only dental attendance, but also adequate oral hygiene, thus reinforcing the deterioration of oral health [3]. In a representative sample of 784 women Hällström and Halling [23] showed that dental phobia was significantly related to high number of missing teeth, increased amount of alveolar bone loss and a high prevalence of removable dentures. Hakeberg et al. [6] compared dental health based on radiographic registrations in a group of
90 adult patients with severe dental fear and a matched control group of ordinary dental patients. It was shown that dental fear patients in general had a substantially deteriorated oral status compared to ordinary dental patients. Further, Hägglin et al. [33] found in a cross-sectional study of 1000 women, that high levels of dental anxiety were correlated with longer intervals between dental visits, poorer oral functioning and aesthetics, as well as with a higher frequency of oral symptoms.

Even though dental anxiety negatively affects dental attendance, a fairly large proportion of patients with high dental fear still receive dental care on a regular basis [4, 25, 27, 47]. Hakeberg et al. [25] investigated a random adult sample of more than 600 patients and found that among subjects with severe dental fear (5%), a large majority (78%) reported ≤2 years since their last regular dental treatment. These figures were further supported in a Norwegian population study by Vassend [27], as well as in another Swedish population study among women by Hägglin et al. [47], suggesting that a group of non-selected patients with high dental fear nevertheless attend dental treatment clinics regularly. However, even though Milgrom et al. [4] found that many high-fear patients had seen a dentist within the last 12 months, approximately 60% reported delays in making appointments or often failed to keep scheduled dental appointments. Milgrom et al. [21] suggested a typology of dental fear patients: "the apprehensive patient" who experiences a moderate degree of fear not necessarily leading to avoidance behavior or significant treatment problems; "goers but haters" who experience more intense fear and anxiety, but who attend dental appointments on a relatively regular basis; "partial avoiders" in many respects similar to the former type, but with a considerably stronger avoidance tendency; and "total avoiders" who avoid dentistry at all costs. It has been argued that it is crucial to identify apprehensive patients as well as "goers but haters" since these patients may be at risk for future phobic avoidance behavior [21]. However, little is known about these anxious but regular dental visitors, since most research so far has been concentrated on investigating patients with high dental fear and phobic avoidance behavior.

The relationship between the (fearful) dental patient and the dentist/dental team

The dentist-patient interaction

Several articles have described the dentist-patient interaction and its possible influence on treatment. The majority of these articles concern the authors' own opinions and do not contain research results. Further, most studies reflect either only the view of the dentist or only that of the patient. Thus one can say that the dentist-patient interaction has been poorly studied (for a
review see [28, 69]). In addition, there are few theoretical models specifically aimed at describing the communicative encounters between the dentist/dental team members and the patient. Sondell and Söderfeldt [70] evaluated models of patient-provider communication with a special focus on the dental context, and suggested that “what is done and what is said” during dentist-patient encounters will have an impact on treatment quality and treatment outcome. The dentist and the patient are seen as contributing equally to the ongoing communication process and to the treatment alliance [70]. However, dentist-patient interactions are complex and there are several different factors that may influence how they develop.

Using a qualitative method Kulich et al. [71] explored dentist-patient interactions in consultations with dental phobic patients visiting a specialized dental fear clinic for the first time. The consultations were video-recorded and semi-structured interviews were conducted with the dentists afterwards. The dentist’s professional and interpersonal skills, as well as the patient’s verbal and non-verbal cues and emotions were identified as important aspects of the dentist-patient encounter [71]. Furthermore, a “holistic perception and understanding” from the dentist was found to be central in a patient-centered consultation [72]. The dentist who has a “holistic view” understands the “whole” patient, takes everything around the patient into account and gives a greater weight to the patient’s opinion. Thus, dental phobia is only one aspect of the patient’s “wholeness”. The opposite of the holistic view is when the dentist is mostly concerned with technical/odontological aspects of dentistry or his/her own needs and interests [72].

Patient perspectives
Several studies have investigated patients’ views of dentists and how dentistry is performed (for a review see [12, 28]). Thus, Bernstein et al. [73] investigated students separated into high and low dental fear groups, and asked them to write an essay about their visits to the dentist in childhood. It was found that about 50% in the high fear group did not mention pain but did mention negative dentist behavior (i.e. impersonal, mean, uncaring, nervous, rough) as the most important causal factor behind their present feelings of fear and anxiety. Among the low fear patients, present experiences of pain in many cases seemed to have been mitigated by a careful and concerned dentist. Gale et al. [74] investigated interactive effects of dentist behavior on patient beliefs and found (not surprisingly) that patients rate a dentist who interacts with them much more positively than a dentist who does not communicate. In addition, Corah et al. [75] rated the dentist’s empathy and communicative skills as important
factors contributing to patient satisfaction. The dentist's explicit effort to prevent pain was the most important factor for anxiety reduction, as well as friendly, calm and supportive behavior from the nurse. Further, Rouse and Hamilton [76] found that patient's perceptions of dentist's professional skills (competence, interpersonal and communication skills) were important as predictors of dental anxiety. Thus, communication between the patient and the dentist/dental team seems to have an important effect on perceived stress and anxiety in dentistry.

**Dentists perspective**

It is well-known that fearful dental patients often fail to keep their appointments and many dental phobic patients visit the dentist only when they are in pain. Fearful patients may also take longer to treat, and when oral status deteriorates treatment becomes more complicated. This may of course create occupational stress among dental staff, and influence the relationship between the patient and the dental team [21, 77-79].

Hakeberg et al. [78] investigated how Swedish dentists perceive the frequency and character of behavioral problems in their patients. Even though a majority of the more than 300 responding dentists evaluated their own performance positively, some frequently occurring behavioral problems were reported: “poor oral hygiene despite instructions”, “patients showing fear”, and “missing/being late for appointments”. In addition, “patients not appreciating the dentist’s therapy” was ranked as the most stressful event. Thirty-five percent of the participating dentists’ stated that the quality of care was indeed affected by the patient-dentist relationship [78]. These results are congruent with earlier findings by Weinstein et al. [80], indicating that a lower quality of treatment was given to patients who were perceived as not being cooperative and appreciative. Corah [77] argued that some annoying patient behaviors, such as being critical or questioning the dentist’s performance, are attempts to cope with anxiety. If the patient’s emotions are overlooked this may influence the relationship negatively. More recently, Moore and Brødsgaard [79] investigated Danish dentists’ perceived stress and its relation to perceptions about anxious patients. Even though most of these dentists expressed confidence in treating patients with dental anxiety, it was found that psychosocial aspects of dental practice and the dentist’s own stress often had an adverse effect on the dentist’s perception of anxious dental patients. Further, 60% of the dentists surveyed perceived their work as more stressful than that of other professions [79]. Thus, it should be taken into account that dentists who experience high professional stress may be less sensitive to anxious patients’ needs.
Maintenance of dental fear

It is easy to understand that avoidance of dental care may result in relief and immediate anxiety reduction for many fearful patients. However, for the patient it is obvious that the decision to put off visiting the dentist may have subsequent negative consequences for oral health and also increase the likelihood of invasive dental treatment. Milgrom et al. [21] discussed the two competing tendencies of “approach-avoidance”. The patient knows that he/she needs dental care and wants to have healthy teeth. In that respect he is highly motivated to attend dental appointments. On the other hand phobic dental fear may lead to avoidance of the situation. These two competing tendencies leave the patient in a state of conflict that may have negative emotional consequences and increase anxiety. It has been suggested that dental anxiety creates its own “vicious circle” [50]. The phobic patients’ inability to accept dental treatment leads to a (real or perceived) deterioration of oral health, which in turn can create feelings of shame, guilt and inferiority, subsequently reinforcing fear, increasing anxiety, and resulting in further avoidance of dental care. This may subsequently lead to social isolation [16, 50]. The “vicious circle” model explains how dental fear is maintained by phobic avoidance behavior. However, it does not explain why dental anxiety is maintained in those fearful patients who continue to receive regular dental care.

The “vicious circle” model has been further elaborated on by de Jongh [81], who emphasized the cognitive aspects of the problem. Such cognitive aspects refer to the mental processes of perception, memory, and information processing by which individuals acquire information, make plans, and solve problems. Many anxious (dental) patients are inclined to engage in negative thinking. They also believe more in their negative thoughts, and perceive less control over these thoughts than patients low in anxiety [81, 82]. Thus, it is obvious that negative cognitive processes affect the “vicious circle” model and that they are crucial for the maintenance of dental fear and avoidance [81].

A cognitive approach to dental anxiety may also contribute to a better understanding of why anxiety is maintained in patients with regular dental contacts [83]. Even though dental care is not consistently pain free, studies have indicated that anxious dental patients expect much more pain than they actually experience during treatment [84, 85]. They may also consider pain-free dental experiences as atypical and not generalizable to the future [86] and memories of discomfort-free experiences may be modified to become consistent with negative expectations about dental care [85]. Thus, anxiety is not conceptualized only as a response to what has happened in the past, but rather as a response to what patients believe could happen in the future. This may serve to maintain anxiety by the activation of threat-
related “schemata” when anxious individuals are confronted with threatening situations. This results in the selective monitoring of environmental and bodily cues [87] and may explain why anxiety and (unrealistic) expectations about dental care persist. Once negative cognitions are in place, they unfortunately seem to be highly resistant to change [88].

**The impact of dental fear on daily life**

One of the main distinctions between “dental fear” and “dental phobia” refers to the consequences the disorders have for general functioning. Even so, the DSM-IV [11] criterion E (the consequences of dental fear on an individual’s normal routine and functioning, occupational functioning, and social activities and relationships) has so far been given limited attention. However, there is some evidence that severe dental fear, especially if combined with long-term avoidance of necessary dental care and poor oral health conditions, may have a significant negative impact on social contacts and daily-life [3, 7, 16, 89]. Most studies in this area have been performed among the specific group of dental fear patients seeking treatment at specialized dental fear clinics.

Berggren and Meynert [3] found that among dental fear patients, psychosomatic symptoms i.e. tension, headaches and stomachache problems were common. Some patients reported that they had become socially withdrawn because of their poor oral health, and many expressed a lack of social support and were even criticized by their friends and families. Moore et al. [16] found that many dental phobic patients suffered social embarrassment about their dental fear and/or about their inability to do anything about it. This social embarrassment was manifest at the dentist’s as well as in other social situations, and for some patients it had dramatically affected close relationships. In addition, Berggren [7] investigated the psychosocial effects associated with dental fear and found that many patients reported feelings of loneliness and overt social isolation, and especially among long-term avoiders widespread negative psychosocial consequences were common. More than 50% of patients reported that their dental fear caused them considerable problems in their social lives such as meeting friends, eating out, going on vacations, in relation to family/friends and at work [7]. More recently, Cohen et al. [89] used qualitative methodology to explore the impact of dental anxiety on daily life. These authors [89] found that the impact of dental fear on people’s lives could be wide-ranging and dynamic, interfering with social contacts, as well as having a negative effect on health and normal functioning.

It has also been shown that patients successfully treated for their severe dental fear reported several areas of improved psychosocial functioning and well-being, including a
reduced frequency of psychosomatic symptoms, reduced alcohol intake and decreased time on sick leave [90]. Hakeberg and Berggren [91] investigated exclusively changes in sick leave after dental fear treatment and found that the number of sick leave days was significantly reduced after treatment. When compared with a matched control group, the results were further supported by a significant pre-treatment difference and a non-significant post-treatment difference.

Thus, severe (phobic) dental fear might have far-reaching consequences, not only for the suffering individual but also for the community. This demonstrates the importance of effective dental fear treatment. However, little is known about individual differences in how people cope with and reacts to their dental fear problems, as well as about how environmental and psychosocial factors may affect the impact of dental fear on daily life.

**Coping efficacy and dental fear treatment**

As described earlier it seems clear that cognitive factors are important in the development, maintenance and expression of dental fear. Also, there are differences with regard to how individuals react to and cope with their dental fear problem. According to Lazarus [92], “coping consists of cognitive and behavioral efforts to manage specific external and internal demands (and conflicts between them) that are appraised as taxing or exceeding the resources of a person” (p.112). Effective coping has been defined in terms of “quality of fit” between environmental demands and the person involved, including subjective well-being, social functioning and somatic health [93]. Lazarus views this relationship or “fit” between the person and the environment as constantly changing, or as a process that depends on shifting demands and settings and “a fluid personal outlook”. Thus, coping involves ongoing transactions with the environment and has to be viewed as a dynamic process. However, what is meant by effective coping strategies is less clear [93]. From the anxious dental patient’s perspective one’s perceived ability to control one’s own behavior and to control negative thoughts seem to be crucial. This was referred to as self-efficacy by Bandura [94]. Kent and Gibbons [82] suggested that Bandura’s self-efficacy theory may contribute to an understanding of the experience of dental anxiety, since it appears that anxiety is closely related to the person’s feelings of control/or loss of control over physiological, cognitive and behavioral symptoms experienced in dentistry.

A wide variety of behavioral interventions have been employed in the treatment of severe dental fear, aiming to structure negative thoughts about treatment and to increase patients’ feelings of control and self-efficacy. Many studies have shown that dental fear can
be treated effectively and have confirmed the beneficial effect of behavioral interventions (for a review see [12, 28, 95]). However, only a few studies have included evaluations over time and in particular follow-up studies of general dentistry outside the dental fear clinic [95]. In Sweden, Berggren and Carlsson [96] evaluated a broad-based behavioral therapy for dental phobic patients. The method combines a video desensitization procedure in combination with relaxation and biofeedback-training, and cognitive reattribution. These authors [96] found that the treatment was successful in more than 80% of their patients. Moreover, after dental fear treatment patients were able to complete oral rehabilitation followed by a one-year check-up at a general dental practitioner. In subsequent studies [90, 97, 98] the effects of the behavioral therapy (BT) described above were compared with general anesthesia treatment (GT), both followed by clinical treatment training. Thus, Berggren and Linde [97] found that significantly more BT patients completed the treatment program, had a significantly lower frequency of cancellations and a significantly greater decrease in dental fear, than GT patients. A follow-up 2 years after successful treatment indicated a significantly better effect with regard to regular dental attendance, anxiety reduction, increased mood and a reduced frequency of psychosomatic symptoms among patients who had received behavioral therapy [90, 98]. The beneficial effect of dental fear treatment, and in particular of behavioral therapy including cognitive reattribution, has been further confirmed at follow-up investigations on a small sub-sample 10 years after treatment at the specialized dental fear clinic [99, 100]. More recently, Berggren et al. [101] investigated the outcome of two different behavioral therapies for dental fear; relaxation training and cognitively oriented therapy. Even though both methods were effective, cognitive therapy resulted in a higher number of patients completing therapy, while relaxation training resulted in a more significant reduction in both dental fear and in general fear and anxiety, which further supports the importance of a wide-spectrum approach to treatment [101].

However, a considerable number of patients (20-30%) do not benefit from or cannot follow through with treatment [12]. One critical factor here is general fearfulness and general psychological distress, which has been shown to have a negative influence on the treatment of dental fear [18, 101-104]. Furthermore, Artman et al. [104] and Kvale et al. [18] found that although a significant anxiety reduction was achieved after dental fear treatment, some 35% of patients had not visited a dentist at follow-up one year later. Accordingly, relief in dental anxiety after fear treatment is not necessarily related to regular dental attendance after leaving the specialized clinic. Recently, Moore et al. [105] presented the results of a 3-year comparison of dental anxiety treatment outcomes among patients treated at a specialized
fear clinic versus those who did not receive any specialist treatment. These authors [105] found that many anxious dental patients could maintain regular dental treatment habits with dentists successfully, despite severe dental fear and years of phobic avoidance. Although patients treated at the specialized clinic showed more anxiety reduction, the result indicated that dental beliefs (i.e. patients' subjective perceptions about dentists' behavior) were a key variable that directly affected dental attendance [105].

The rationale for the study

Thus, it is obvious that patients with dental fear do not constitute a homogenous group, and that dental fear and anxiety are complex phenomena. Even though dental fear and anxiety have frequently been investigated, only limited attention has so far been paid to some areas. Accordingly, there is need to further explore individual differences in how people react to and cope with their dental fear, in what way dental fear may impact on daily life, and how psychosocial factors interact and operate in dental fear. This knowledge is important not only for dental care workers, but also outside the dental clinic since dental fear may affect patients' lives outside of the dental setting. Furthermore, elucidating behavioral aspects of dentistry may provide important information that can be generalized to "ordinary" dental patients, as well as to other patient populations.
AIMS OF THE THESIS

The general aim of this thesis was to study psychological and psychosocial factors in relation to dental fear and oral health behavior i.e. to investigate psychological and psychosocial factors involved in the development, maintenance and expression of dental fear and anxiety, how individuals cope with their dental fear, and how dental fear may impact on health and daily life.

The specific aims were to:

➢ Investigate dental fearful patients with low versus high general fear with regard to dental fear reactions, general psychological distress, and how these problems affect daily life (Study I).

➢ Investigate patients with high dental fear reporting different attendance patterns (phobic avoidance versus regular dental care) with regard to dental fear reactions, oral status, general psychological distress and social consequences (Study II).

➢ Explore and describe dental phobic patients’ views about their dental fear and experiences in dental care (Study III).

➢ Explore and describe the general situation of dental phobic patients: how dental phobia interferes with normal routines and functioning, social activities and relationships, which factors contribute to the maintenance of dental fear, and how individuals cope with their fear (Study IV).

➢ Investigate whether initial dental beliefs, and changes in beliefs after meeting the dentist, predict treatment outcome among adult dental fear patients (Study V).
MATERIALS AND METHODS

Design

Cross-sectional, comparative, descriptive and interventional designs were used for the present studies. Data were collected by questionnaires, structured interviews, oral examinations, clinical ratings and qualitative in-depth interviews. Table 1 shows the design and data-collection methods used in Studies I-V, respectively.

Table 1. Design and data collection methods used in Studies I-V.

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Data collection method</th>
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<tr>
<td>I</td>
<td>Cross-sectional, comparative</td>
<td>Questionnaires</td>
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<tr>
<td>II</td>
<td>Cross-sectional, comparative</td>
<td>Questionnaires, structured interviews, oral examinations</td>
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<tr>
<td>III; IV</td>
<td>Cross-sectional, descriptive</td>
<td>Questionnaires, qualitative in-depth interviews</td>
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<tr>
<td>V</td>
<td>Interventional, comparative</td>
<td>Questionnaires, structured interviews, oral examinations, clinical ratings</td>
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Subjects and procedure

Study I

Subjects were 67 adult patients (25 men and 42 women), applying for treatment of severe dental fear at the specialized Dental Fear Research and Treatment Clinic (DFRTC) at the Faculty of Odontology, Göteborg University, Sweden. In 1995, during a period of 10 months, 103 new patients applied for dental fear treatment. The study was performed under normal daily clinical circumstances. At the first visit, patients were informed about the project and questionnaires were given to all who consented to participate. In total 36 patients were excluded from the study. These were patients with reported psychiatric treatment or diagnoses, or severe psychosocial problems (i.e. abuse problems). Further, patients who failed to complete the questionnaire package in time for the study were excluded. A few patients did not wish to participate, or had difficulty in understanding the questionnaires because of language problems. The included 67 patients showed mean dental fear score values on the
Dental Anxiety Scale (DAS) of 15.8 indicating high dental fear. Further, the participants had a mean age of 36.5 years and a mean avoidance time from regular dental care of 6 years.

Studies II and V

These two studies were part of a longitudinal treatment study. During the period 1991–1993, 191 adult patients were selected for the investigation. Patients were either referred from dental or medical institutions (29%) or self-referred to the DFRTC by the patient or by relatives or friends (71%) [106]. A step-wise screening procedure was performed. This screening procedure has previously been described in detail [106]. The first step constituted separate intake interviews performed by a dentist and a clinical psychologist. The patients first saw the dentist for a 30-minute structured interview covering dental and medical history and including in-take questionnaires, and were requested to participate in the research project. A signed informed consent was obtained. At the second visit, patients saw the psychologist (1.5-hour visit) for a structured screening interview and a number of questionnaires (see below). In the next step an X-ray examination was conducted at the Radiology Department. In the final step of the screening procedure patients saw the dentist for an oral examination (adapted to patient capacity) in order to plan treatment. Only patients with high dental fear (DAS >13) who refused conventional dental care, and who had an estimated need of at least two restorations were included in subsequent treatment studies. Patients who did not meet the criteria for inclusion were offered treatment for dental fear in accordance with ordinary clinic routines.

The step-wise screening procedure excluded patients with psychiatric diagnoses and/or current psychiatric treatment, as well as major psychosocial problems (i.e. panic disorders, depression, drug abuse) [106]. The rationale for this extensive screening procedure was to achieve a better understanding of the nature of dental fear without the risk of data being confounded by other disorders. However, the study populations in Studies II and V were selected on different steps of the screening procedure due to the different aims of these studies.

Study II - The study group consisted of 169 highly fearful patients (DAS mean score 17.2), 46 men and 123 women, with a mean age of 33.1 years. With regard to the aim of the study, all patients who passed the first two steps of the screening procedure (including interviews by the dentist and psychologist) were grouped on the basis of dental attendance pattern. Thus, 28 patients reported a history of regular dental care (at least once a year), while 141 patients reported that they had avoided dental care for at least two years (mean avoidance
time 9.9 years) and that they never, or only when absolutely necessary, saw a dentist or dental hygienist.

Study V - Among 137 patients available for subsequent treatment studies, 117 patients passed all steps of the screening procedure described above and met the criteria for inclusion in this study. Pre-treatment data were collected during the screening procedure. The 117 patients (32 men and 85 women) had a DAS mean score of 17.3, a mean age of 33.3 years, and a mean avoidance time from regular dental care of 9.7 years. The scheduled dental fear treatment comprised cognitive-behavioral treatments with the psychologist with a maximum of eight treatment sessions, followed by three standardized dental treatments. The dental treatments comprised scaling during the first visit, and local anesthesia and restorations during the second and third visits. One psychologist and three dentists (all men) performed treatments. Outcome measurements were completed after dental fear treatment, and the specialist dentist rated patients’ behavior, cooperation and treatment capacity on a scale 1 (totally relaxed) to 6 (patient refuses treatment) [96, 101]. Sixty-nine patients with a dentist rating score of \( \leq 3 \) (fair relaxation, treatment can be performed with minor adjustment to patients reactions) were regarded as clinically “successful in treatment”, and were referred to general dental practitioners outside the dental fear clinic. Forty-eight patients were “unsuccessful in treatment”. Among these, 14 patients completed the scheduled dental fear treatments unsuccessfully (with a dentist rating >3) and were offered further treatment at the specialist clinic. However, the unsuccessful group also comprised patients who for several stated reasons (fear, lack of finances, lack of time, not interested) were not able to go through with dental fear treatment at the time of the study (n=28) or never showed up for treatment (n=6). Drop-out was most frequent during the behavioral therapy with the psychologist and has previously been described in detail [101].

Studies III and IV

The two qualitative studies are based on the same population. The study sample consisted of 18 adult patients, 12 women (aged 22-61 years, mean 39.5) and six men (aged 29-55 years, mean 39.2) strategically selected among patients applying for treatment at the DFRTC. The purpose of this strategic sampling method was to create a heterogeneous group of patients with severe dental fear in order to maximize the range of experiences in the group studied. However, patients with language difficulties and with significant psychiatric problems or diagnoses, other than dental phobia, were not selected/asked to participate. Patients’ educational backgrounds varied: four patients had nine-year compulsory school or less, nine
patients had completed secondary school, and five had higher education. Data were collected during a period of nine months: from August 2000 to April 2001. At the first visit patients saw the dentist for an intake interview including a questionnaire about dental anxiety, and were requested to participate in the research project. The inclusion criterion was a DAS score indicating high dental fear (mean 18.0). All patients refused conventional dental care (due to dental fear) at the time of the study. The mean avoidance time from regular dental care was 6.8 years. Three patients reported a history of regular dental care (at least once a year), in spite of their dental fear. Two patients reported that they had never managed regular dental care. Before the in-depth interview the patients were informed about full confidentiality and about their right to break off participation at any time. A signed informed consent was obtained. A senior researcher (LH) with extensive experience of qualitative in-depth interviewing and grounded theory methodology in medical research, acted as a consultant throughout the study.

In-depth interviews
Audio-taped, open-ended interviews were conducted by the first author (KHA). The purpose of using open-ended interviews in the data collection was to explore the general situation of dental phobic patients, as expressed by patients themselves. The interviews took place in a convenient room at the faculty, but outside the treatment clinic and lasted for 50 minutes to 1.5 hour (mean 58 min). An interview guide was used as a basic checklist to make sure that relevant topics were covered. Thus, the interviews focused on the onset of dental fear, family, experiences in dental care, health and consequences on daily life, coping strategies, and thoughts about the future. Topics related to these areas were often brought up spontaneously by the informants themselves, or were introduced by the interviewer. The interviews were introduced by questions such as: “can you tell me when you first felt that you were afraid of dental treatment”; “could you tell me about your life situation at that time”. These questions were followed by questions such as: “in what way”, “what did you do, feel and think” etc. To further collect information and as a memorandum, the interviewer wrote “observational notes” during the interviews. A specially trained project secretary transcribed all the interviews verbatim. The interview transcripts comprised between 11 and 27 pages, in total 305 typewritten pages with double spacing. Each interview was transcribed and analyzed before the next informant was selected. The process of analysis will be described below (Analysis of qualitative data: Grounded theory).
Assessments
Questionnaires investigated background data, dental fear and anxiety, dental beliefs, general fear and anxiety, aspects of mood and depression, general psychological status, emotional and social consequences of dental fear, and motivation and willingness to engage in dental fear treatment. Oral health effects were examined. Table 2 shows the assessments in Studies I-V, respectively.

Table 2. Assessments in Studies I-V.

<table>
<thead>
<tr>
<th>Assessments</th>
<th>Study I</th>
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<td>DMFT</td>
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<td><strong>Dental beliefs</strong></td>
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<td>DBS</td>
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<td><strong>General fear and Anxiety</strong></td>
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<td>SCL-90</td>
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<td><strong>Motivation and beliefs in treatment</strong></td>
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<td>In-depth interviews</td>
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**Background data** - the investigated variables were gender, age, education level and dental attendance pattern/last regular dental visit. In Study II education level was rated as follows: (a) nine-year compulsory school or less, (b) upper secondary school, (c) post-secondary vocational training and similar, and (d) university studies. In Studies III-V education was rated as follows: (a) nine-year compulsory school or less, (b) upper secondary school and (c) higher education. In addition, in Study I perceived etiology of dental fear was assessed in five questions on a 0-6 point Likert scale, indicating well-known and often reported reasons for dental fear (Paper I; Table 2).

**Oral Health effects** were indicated according to the DMFT index (Decayed, Missing and Filled Teeth). Clinical examinations (commonly only visual inspection without probing was possible) and radiographs were used. The criteria for decay were manifest caries level 3-5, according to Gröndahl et al. [107]. Swedish normative mean DMFT values in 1993 of 12.5 and 17.7 have been reported for the age groups of 30 and 40 years, respectively [108].

**Dental Anxiety** was measured by two well-established instruments, the Dental Anxiety Scale (DAS) [109, 110] and the Dental Fear Survey (DFS) [111, 112]. The DAS (Appendix A) consists of four items describing imagined dental situations including "appointment tomorrow" and three different treatment situations. Responses are scored from 1 (no anxiety) to 5 (extreme anxiety) giving total scores varying from 4 to 20. Average DAS scores of 8 to 9 in ordinary patients and 13 or above among fearful dental patients have been reported in several studies [102, 109, 110]. The DFS consists of 20 items, each item rating anxiety reactions from 1 (low intensity) to 5 (high intensity) giving a range of total scores from 20 to 100. Patients with severe dental fear have shown sums of scores >65. The DFS concerns different dimensions of dental fear and avoidance, autonomic arousal, and fear of specific objects or situations [113-115].

**Dental beliefs** were assessed by Getz’s 15-item Dental Beliefs Survey (DBS) [20] (Paper V; Table 3) exploring patients’ confidence in the interaction with the dentist on a scale with sum of scores from 15 (highly positive) to 75 (highly negative). The validity and reliability of DBS has been tested and confirmed in several studies [116-119]. Among adult dental attendants a mean normative score of 25 has been proposed [119]. For phobic dental patients pre-treatment average item scores of 3.3 and 3.2 have been presented [116, 117] decreasing to 1.6 and 1.1, respectively, after treatment. Four separate dimensions of DBS (communication, trust, belittlement and lack of control) have been suggested in order to capture the specific concerns of the patient and to help in clinical diagnosis and treatment planning [20]. Kulich et al. [120] investigated the factor structure of the 15-item DBS and this
exploratory factor analysis indicated a 3-factor solution including dimensions of communication, trust, and fear of negative information. However, the main finding of Kulich’s study was a general dimension “social interaction distress in dental treatment”, proposing the use of DBS as an overall measure of dental beliefs [120].

**General anxiety** was assessed by the State-Trait Anxiety Inventory (STAI) [121] and **general fear** was measured by the Geer Fear Scale (GFS), which is a shortened and modified version of the original Fear Survey Schedule-II [122, 123]. The STAI scale measures both short-term fluctuation (STAI-State) and levels of anxiety, which are more stable over time (STAI-Trait). Scores for both STAI-subcales can vary from a minimum of 20 to a maximum of 80. In general, the mean STAI-S score for a group will be approximately equal to its mean STAI-T score when the scale is given under neutral conditions. Normative data for working adults has been presented as a mean value of 35-36, and for patients with psychiatric complications as a mean value of 42-44 [121]. The STAI scale has been frequently used in assessing clinical anxiety in dentistry [16, 53, 124]. The GFS scale investigated number and levels of fears other than dental fear in 32 items, scored from 1 (no fear) to 7 (totally terrified). The GFS sum-score was used as an indicator of general fearfulness [53]. Berggren et al. [123] investigated the factor structure of the Fear Survey Schedule-II and found 5-fear dimensions: illness and death, failures and embarrassment, social situations, physical injuries, and animals and natural phenomena. Further, an ad hoc reduction of items was carried out to form a shortened, more practical questionnaire [123]. Thus, in Study I this shortened form of GFS (Appendix B) with 22 items was used and the GFS sum-score, as well as sum-scores of dimensions were presented.

**General psychological distress** was assessed by the Symptom CheckList SCL-90 [125, 126]. The questionnaire consists of 90 items rated on a five-point scale ranging from 0 (not at all) to 4 (very much) and the symptoms relate to nine different dimensions: (i) somatization (reflects distress arising from perceptions of bodily dysfunctions), (ii) obsessive-compulsive (reflects thoughts, impulses and actions that are experienced as unremitting and irresistible by the individual but are of an ego-alien or unwanted nature, (iii) interpersonal sensitivity (feelings of personal inadequacy and inferiority, particularly in comparison with other individuals, (iv) depression (reflects a broad range of the concomitants of the clinical depressive syndrome; dysphoric affect and mood, lack of motivation, loss of vital energy etc), (v) anxiety (manifest anxiety, restlessness, nervousness, tension), (vi) hostility (reflects three aspects of anger and hostile behavior: thoughts, feelings and actions), (vii) phobic anxiety (reflects phobic symptoms e.g. social phobic behavior, open spaces, crowds etc), (viii)
paranoid ideation (reflects paranoid thoughts: suspiciousness, delusions etc.) and (ix) psychoticism (reflects a wide range of psychotic symptoms; symptoms of schizophrenia, auditory hallucinations etc.).

In addition to these nine dimensions, global scores are presented in a General Symptomatic (Severity) Index (GSI), which is the mean of all items, indicating the degree of overall psychological distress. The SCL-90 has primarily been designed as a general measure of psychiatric outpatient symptomatology, for use in both clinical and research situations. For psychiatric outpatients a GSI value of 1.35 has been reported [125], and for American and German normative (non-patient) groups GSI values of 0.31 and 0.33, respectively [127]. Swedish normative data has recently been presented of GSI values for women and men (aged 25-40 years) of 0.45 and 0.33, respectively [128]. In a study by Kleinhauz et al. [103] the pre-treatment values of GSI for dental phobic patients were reported as 0.67 and 1.10 respectively for those who were successful and non-successful in treatment.

**Mood states and depression** were measured with the Mood Adjective CheckList (MACL) [129], and the Beck Depression Inventory (BDI) [130]. The MACL has been shown to be an excellent indicator of general emotional reactions to a dental appointment [53, 131, 132]. In the present work we used a version with 32 items describing 4 mood dimensions: hedonic tone (pleasantness/unpleasantness), relaxation (calm/nervous), activation (alert/tired), and social orientation (self-confident/shy). For each of the MACL dimensions an average item score is calculated, ranging from 1 to 4, where 1 is a strongly negative and 4 is a highly positive level of mood.

The BDI contains 21 items (scored 0-3) forming a 0 to 63-point scale indicating the level of depression. The BDI has become one of the most widely used instruments for rating depression. The following guidelines have been presented by The Center of Cognitive Therapy [133]: <10 no to mild depression, 10–18 mild to moderate, 19–29 moderate to severe, 30–63 severe depression.

**Social and emotional consequences** were assessed as the influences of dental fear on different aspects of quality of life i.e. the influence of fear on daily life. This was part of a questionnaire used in conjunction with the patients’ first visit to the clinic.

In Study I the participants answered seven statements on a 0 (not at all) to 6- (very much) point Likert scale. Four statements assessed social consequences (at work, in relation to family, opposite sex and friends), and three statements assessed different emotions (feelings of anger, depression or shame) related to dental fear. The statements were formulated as follows; “My dental fear has a negative impact on my work (relation to the
opposite sex, relations to family, friends)” or; “My dental fear makes me feel angry (ashamed, depressed)”. Internal consistency (Cronbach’s alpha) among social consequence items was estimated to be 0.86, and for emotional questions 0.61.

In Study II the participants answered six questions on a 0 (never) to 6- (very often) point scale, describing the relation between dental fear and negative experiences in daily life (i.e. activity, relations, work), and two additional questions assessing whether the individual considers these problems as related to either dental fear or to poor dental status (Paper II; Table I). An analysis of internal consistency revealed a Cronbach’s alpha of 0.86.

Motivation and willingness to engage in treatment, and beliefs in dental fear treatment was assessed in Study V. Before treatment patients rated how likely they thought it was that their fear could be cured on a scale from 0 (not at all possible) to 10 (absolutely sure). Furthermore, patients made a 0 to 100% assessment of their motivation and willingness to engage in treatment in their answers to the following question “How willing are you to engage in treatment for your dental fear considering your life situation (family, work, leisure activities and so on)?”.

Analysis and Statistical procedures

Statistical analyses

The statistical methods used for analyses are presented in Table 3. Detailed descriptions are presented in the method section of each study. All data analyses were processed by the Statistical Package for Social Sciences/Statistical Products Service Solutions (SPSS) version 7.5 and 10.0 [134, 135] and a p-value of 0.05 was taken as the level of statistical significance.
Table 3. Methods of analyses in Studies I-V.

<table>
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<td>Descriptive statistics, Chi-square analyses and Fishers exact test, $t$-test for independent groups, Cronbach’s alpha reliability coefficient, multiple linear regression analyses (forward stepwise).</td>
</tr>
<tr>
<td>II</td>
<td>Descriptive statistics, Chi-square analyses, One-way ANOVA, Cronbach’s alpha reliability coefficient, general linear model analysis (GLM), explorative factor analysis (Varimax-rotated), $z$-transformation, multiple logistic regression analysis (enter), missing value analysis.</td>
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<td>Descriptive statistics, Chi-square analyses, $t$-test and Mann-Whitney for independent groups, Spearman rank-order correlation coefficient, Cronbach’s alpha reliability coefficient, bivariate and multiple linear and logistic regression analyses (forward stepwise).</td>
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**Analysis of qualitative data – Grounded theory (Studies III and IV)**

The interview protocols were analyzed using the constant comparative method for grounded theory [136-138]. The aim of this method is to focus on different qualities of a phenomenon in order to generate concepts, models or “theories”, rather than testing a hypothesis based on pre-existing theory. The method aims to examine psychosocial processes, to discover existing problems, and to investigate how people handle them. The method can be used to explore a new and unfamiliar research area, or to bring new knowledge into a familiar and earlier studied issue that is difficult to capture with traditional (quantitative) methods [139].

**Grounded theory method**

The theoretical basis of grounded theory, symbolic interactionism, was developed between 1920 and 1950 at the Chicago School of Sociology, and stressed the importance of qualitative inquiry for studying human behavior in its natural context. The basic assumptions of symbolic interactionism are described as follows: (a) Human beings act on things according to the meaning those things have for them; (b) The meaning of such things is derived from, or arises out of, social interaction; (c) Meaning is interpreted in each encounter [140]. The grounded
theory method was formulated and introduced by Glaser and Strauss in 1967 [136]. This classical version of grounded theory is essentially inductive and provides guidelines for systematic qualitative research. Throughout the research process analytical interpretations of data direct the focus of further data collection (i.e. theoretical sampling), and this new data refines and eventually saturates the emerging categories. With a constant comparative approach (i.e. comparing data with data, and category with category) data is effectively analyzed and a grounded theory emerges. Thus, classical grounded theory stresses the emergence of theory from empirical data, and assumes an external reality that researchers can discover.

In 1990 Strauss and Corbin reformulated grounded theory [137, 141]. They introduced new procedures in data analysis in order to help the researcher in thinking systematically about the data i.e. how categories are linked to each other. Although Strauss and Corbin also assumed an external objective reality, they stated that the informants’ interpretations and perspective are incorporated into the researchers own interpretation and perspective [137, 141]. Thus, the aim is to develop a grounded theory that is verified to some degree [142]. Reformulated grounded theory has been criticized for being more mechanical in analyzing data, less open-ended and more interpretative than the classical version, and also on the grounds that the suggested coding paradigm may force data into preconceived categories [143]. However, the reformulated grounded theory method has been found to be easier to use and more pragmatic than the classical version, and has thus been more widely used [139].

More recently Charmaz [138, 144] proposed a constructivist version of grounded theory. Constructivist grounded theory aims at achieving an interpretative understanding of subjects’ meanings rather than seeking the “truth”. Unlike Glaser and Strauss [136], and partly also Strauss and Corbin [137], Charmaz assumes that the interaction between the researcher and the researched produces the data, and therefore the meanings that the researcher observes and defines. Thus, the discovered “reality” is a product, or a construction, of interpretations between the researcher and the data. According to Charmaz, the power of grounded theory is that it provides tools for understanding and can be used flexibly, thus avoiding static procedures and rigid descriptions. Thus, an emphasis on action and process, as well as on meaning and emergence characterize constructivist grounded theory [144].

Although different versions of grounded theory have been developed, the fundamental principles are the same, i.e. simultaneous collection and analysis of data, hierarchical analysis levels, theoretical sampling, theoretical sensitivity (the researcher’s
reflexive way of developing research questions and doing analysis), constant comparisons and saturation. Saturation, although somewhat “elastic”, is reached when new interviews do not add additional information to the emerging categories (i.e. when new data fit into the categories already devised). The present work was initially inspired by the constant comparative approach described by Glaser and Strauss [136]. The systematic method of coding and verifying data described by Strauss and Corbin [137, 141] facilitated the author’s (KHA) understanding of the method and the principles of analyzing data. Furthermore, the constructivist view proposed by Charmaz [144] with its emphasis on action and process, guided the analysis and the interpretation of the data.

**Grounded theory analysis**

Analyzing qualitative data is a systematic, rigorous and time-consuming process. As described the purpose is to generate concepts, models or “theories” by means of systematic coding and constant comparison [136]. Raw data are coded (step-by-step) as they are collected, and are then re-coded later on a more abstract level. In order to make an overview analysis of the research question and to develop theoretical sensitivity, theoretical memos and ideas are written down. The coding process is an analytic process through which concepts, their properties and dimensions are identified [141]. However, despite the technical rules for coding, grounded theory is also flexible [144].

In the present work analysis of data can briefly be described in two steps: open and selective coding. In the open coding process the interviews were analyzed line-by-line and broken down into segments reflecting the substance of the data, i.e. substantive codes/concepts. The substantive codes were given names close to the data i.e. the words expressed by the informants (in-vivo codes). Codes with the same content were grouped together to form categories on a more abstract level. In the selective coding process connections between categories were sought and the core categories and central phenomena were systematically identified, refined and saturated. The core category is central in the data and categories related to this central theme are integrated to form a theoretical model. In the present work this model was applied to psychosocial processes behind dental fear. Data analysis and data collection were carried out in parallel, starting after the first interview and proceeding until saturation of information was reached i.e. additional data did not give new information.
Reliability and validity

Reliability and validity in qualitative research is discussed in terms of “adequacy of evidence”, and “trustworthiness” i.e. when similar relationships repeatedly emerge from data and are validated in additional interviews. Since “discovery” is the purpose, the interviewer has to be open-minded and not preoccupied by preconceived categories and theories [139]. However, no researcher is without a history. This fact may constitute a risk and a scientific weakness. Therefore the content of the interviews was analyzed by KHA in close collaboration with the senior researchers. As the preliminary model developed, the categories and the connection between categories were confirmed by the informants and validated in additional interviews. In the present study saturation of emerging categories was deemed to have been reached after collecting and analyzing 14 interviews. However, four additional interviews were performed in order to ensure that conceptual weaknesses in the developing models were compensated for. The correspondence between the theoretical concept and its indicators is illustrated by interview quotations (Paper III; IV, Results section).

Ethical considerations

All data were treated confidentially. In Study I an informed consent from the participants was obtained. In addition, in Studies II-V patients received written information and a signed informed consent was obtained. With regard to confidentiality in the qualitative study (Studies III and IV), a special contract was signed with the project secretary who transcribed the interviews. After transcription all names were replaced by codes before the data was analyzed. The interview quotations were selected carefully to ensure confidentiality. The informants were also ensured that the interviewer/researcher had no part in the following treatment. The Ethics Committee of Göteborg University approved the studies.
RESULTS

Study I
This study was designed to investigate dental anxiety in relation to general fear and general psychological distress, and how these problems affect daily life. The patients were grouped according to the GFS (Appendix B) median value of 54.5, into a low (n=33) and a high (n=34) general fear group and were then compared in relation to the variables of interest.

Background data
The majority of patients in both groups reported phobic dental avoidance (total avoidance or irregular/symptomatic dental care), while four patients reported a history of previous regular dental contacts in spite of severe dental fear. Among these “regular visitors” one was found in the low fear group and three in the high fear group. The proportion of women (71%) was higher in the high general fear group, than in the low general fear group (54%). Furthermore, the high general fear group was somewhat older (mean 38 years) and reported a somewhat shorter mean time of dental avoidance (5.3 years), compared to the low general fear group (mean age 35 years; mean avoidance time 6.7 years). However, there were no statistically significant differences between the groups with regard to avoidance time, gender distribution, or age (Paper I; Table 1). Both groups reported painful dental experiences as the main reason for their dental fear, followed by “I have always been fearful”, and that dental fear was caused by an “inconsiderate dentist”. There was a statistically significant difference between the groups with regard to “negative medical experiences”, this being more often reported as a reason for dental fear among patients with high general fear (t=-2.88; p=0.006). Consistently, patients high in general fear assessed the etiologic factors higher than the low fear group (Paper I; Table 2).

Dental fear
Both groups showed dental fear levels well over established scores for severe dental fear. There was a significant difference in DFS mean sum scores for high general fear and low general fear patients (77.2 and 69.8, respectively; t=-2.18; p=0.034). The high general fear patients reported more DFS anticipatory anxiety (t=-1.98; p=0.051) and significantly more physiological reactions (t=-2.42; p=0.018), while situational dental anxiety was rated on about the same level in both groups (Paper I; Table 3).
**General fear**

The total GFS mean value was 54.3, (range 23-99). The mean value in the low fear group was 41.2 while the high fear group had a mean value of 67.1. There were statistically significant differences between the groups with regard to all the five GFS sub-dimensions. Thus, the dimension differences revealed t-values ranging from 3.45 to 8.17 (all p-values <0.001). With regard to frequencies of extreme fear (score 6 or 7) it was shown that patients with high general fear had on average more than 3 extreme fears, compared to less than one among low fear patients. These extreme fears were commonly related to the illness and death and the physical injury dimensions, these differing significantly between the groups (t=-4.59; p=0.000 and t=-2.69; p=0.009, respectively) (Paper I; Table 4).

**General psychological distress**

The high general fear patients showed on average higher SCL-90 values, indicating more general psychological distress, than in the low fear group. Thus, there were statistically significant differences between the groups with regard to the GSI value (t=-3.72; p=0.000) as well as with regard to the following SCL-90 dimensions; obsessive compulsive (t=-3.86; p=0.000), interpersonal sensitivity (t=-3.13; p=0.003), somatization (t=-3.37; p=0.001), depression (t=-3.38; p=0.001), general anxiety (t=-3.21; p=0.002), phobic anxiety (t=-2.86; p=0.006) (Paper I; Table 5).

**Social and emotional consequences**

The impact of dental fear on daily life was generally rated higher among patients with high general fear. Thus, there were significant differences between the groups with regard to “relation to family” (t=-3.13; p=0.003), “to the opposite sex” (t=-2.23; p=0.029) and “to friends” (t=-2.46; p=0.017), while no significant differences were found for “impact on work/working ability”. Further, high general fear patients reported significantly more often that they felt depressed about their dental fear (t=-2.29; p=0.025) (Paper I; Table 6).

Finally two multiple regression analyses were performed to estimate the social and emotional consequences of general fear (GFS), general psychological distress (SCL-90; GSI), dental fear (DFS), gender and age. The analyses showed that negative social consequences were significantly predicted by SCL-90 (t=3.7; p=0.000), while negative emotional consequences were predicted by DFS (t=3.9; p=0.000) and by SCL-90 (t=2.4; p=0.022) (Paper I; Table 7). General fear (GFS) did not predict any social and emotional consequences of dental fear in these analyses.
Study II

This study was designed to investigate patients with high dental fear reporting different attendance patterns, namely phobic avoidance and regular dental care. Patients were therefore grouped into a phobic avoidance group (n=141) and a group reporting a history of regular dental care (at least once a year) (n=28), and were then compared in relation to the variables of interest.

**Background data**

Patients in the avoidance group reported an average time of 9.9 years (SD 8.0) (range 2-43 years) since their last regular dental treatment. Thirty-four patients reported that they had never managed regular dental care. Most patients in the phobic avoidance group were self-referred to the clinic (108 patients), the self-referral sometimes being facilitated by relatives or friends, whereas other individuals were referred by dentists (30 patients) or by medical institutions (3 patients). In the regular dental attendance group there was an equal distribution of patients who were referred by a dentist and who were self-referred. There were no significant differences with regard to age or gender between the groups. The education level was significantly higher among patients with regular dental care. Thus, among regular dental visitors 18% had nine-year compulsory school or less, 43% upper secondary school education, and 39% had higher education. These proportions among the avoiders were 40%, 42% and 18%, respectively ($\chi^2=8.19; p=0.017$) (Paper II; Table 2).

**Dental fear**

Both groups reported a dental fear well over established cut-off scores for severe dental anxiety. Nevertheless, the self-assessment of dental fear among the avoiders was significantly higher. This was especially evident with regard to the DFS anticipatory dimension ($F=35.1; p=0.000$), but also in DAS level ($F=4.0; p=0.046$) (Paper II; Table 2).

**Oral status**

Both groups had similar mean DMFT scores. However, the avoiders had significantly more missing teeth ($F=3.9; p=0.048$), while the regular visitors had significantly more filled teeth ($F=5.6; p=0.019$) (Paper II; Table 2). Thus, the seemingly equal DMFT values were quite different and indicated major differences in treatment history.
General fear, anxiety, depressed mood, and social consequences

There were no significant differences between the groups with regard to general fear (GFS), anxiety (STAI-S-T), or depression (BDI). Both groups showed average total sum-scores in accordance with earlier reports for severe dental fear patients. The BDI values indicated no to mild depression, even though somewhat higher assessed among the avoiders. There was a significant difference between the groups with regard to the MACL dimension social orientation \((F=4.1; p=0.045)\) with regular attenders showing more social orientation.

The avoiders reported a stronger negative impact on their daily life. This was most evident with regard to the negative influence of dental fear on work life \((F=8.2; p=0.005)\) and talking to other people \((F=7.9; p=0.006)\). Further, the avoiders more often attributed these negative daily life consequences to their dental fear \((F=8.7; p=0.004)\) or to poor dental status \((F=6.3; p=0.013)\). This indicated a stronger negative impact from both fear and poor oral status among the avoiders (Paper II; Table 3). A separate GLM analysis with the level of dental fear (DAS) as a covariate showed that these differences remained statistically significant with the exception of the MACL social orientation dimension.

Data reduction method

Fourteen independent variables were selected for further analyses. Thus, variables were created from the GFS, BDI and both STAI-scales, constituting sum scores of each instrument, while the MACL was represented by the dimensions, and social consequences by separate items. With regard to a few cases in the regular group, an exploratory factor analysis among these variables was performed to reduce the number of variables for a logistic regression analysis. The factor analysis showed three distinct factors with eigenvalues >1 (1.5–5.0), explaining 66.7% of the variance. The selected factors were rotated to orthogonal simple structure using the Varimax criterion. Factor 1 contained the social consequence items, Factor 2 the MACL dimensions, and Factor 3 the GFS, BDI and STAI scales (Paper II; Table 4). The variables were normalized with z-transformation (standardized to z scores, with a mean of 0 and a standard deviation of 1) before inclusion in the logistic regression analysis.

Final analyses

The logistic regression analysis was performed with regular dental care versus avoidance as dependent variable. The following independent variables were used: education, anticipatory dental anxiety (DFS-anticipation), missing and filled teeth, and the three created factors. The analysis showed that avoidance of dental care was significantly predicted by anticipatory
dental anxiety (DFS-anticipation) \((p=0.000, \text{ odds ratio OR}=6.4, \text{ confidence interval CI 95\%=2.5-16.4})\) and missing teeth \((p=0.028, \text{ OR}=3.9, \text{ CI 95\%=1.2-13.5})\), while other variables lacked predictive power (Paper II; Table 5).

Missing value analyses was performed to detect a possible systematic bias from the subjects with missing data. Thus, a missing value analysis among the 46 cases lacking DMFT (39 subjects (28%) in the avoidance group and 7 (25%) in the regular attendance group) indicated that these individuals did not differ in any significant way with regard to dental fear (DAS, DFS) compared to cases with DMFT. However, among missing cases the expression of general negative emotions (GFS, BDI and STAI) was significantly higher. This was also shown for social consequence items, with significantly more negative social consequences among missing cases (data not presented). These drop-outs were mainly individuals who for different reasons (i.e. fear, lack of finances, lack of time for treatment, not interested) were not able to go through with an oral examination at the time of the study. Further, another 17 subjects from the avoidance group were not included in the final logistic regression analysis. These were subjects with missing data in the variable “the impact of dental fear on work”. A separate analysis revealed that these 17 subjects did not differ significantly from those included in the regression analysis, with respect to the other independent variables.

The qualitative study (Studies III and IV)
In order to address questions raised by previous quantitative studies, and because of the difficulty of doing so with available psychometric instruments, we decided to adopt a qualitative research approach. Dental fear research has so far mainly been conducted by means of quantitative studies, and has been performed using psychometric instruments modified from general psychology and adapted to the field of dental anxiety. However, there is always a risk that valuable information is lost when using quantitative instruments. Qualitative research methods may contribute to a deeper understanding of the phenomenon of dental fear and the psychosocial processes involved. Thus, the purpose of this qualitative study was to explore the situation of patients with severe dental fear, as expressed by the patients themselves.

Study III
This study reports on dental phobic patients’ views about their dental fear and experiences in dental care.
In the analysis three main categories related to the dental care situation, to individual vulnerability and to the unsupportive dentist were developed and labeled: *existential threat, vulnerability* and *unsupportive dentist*. One category, *existential threat*, was identified as the core concept, describing the central meaning of the dental phobic patients' experiences in dental care. Each main category was composed of a number of descriptive categories and subcategories (Paper III; Tables 1 and 2) and illustrated by interview excerpts (Paper III; Results section). All categories are integrated into a preliminary model framing the process of dental fear (Paper III; Figure 1). The interpretation of the results suggests that the onset of dental fear was commonly related to individual vulnerability and to traumatic dental care experiences, where perceived negative dentist behavior played a significant role. When dental fear was established the patient seemed to be caught in a “vicious circle” that was difficult to break, and where fear and anxiety were maintained by negative expectations about treatment and about the patient’s own ability to cope in dental care situations.

**Existential threat**
The core category, *existential threat* and its two dimensions labeled *threat of violation* and *threat of loss of autonomy and independence*, describe the central meaning of the informants’ experiences in dental care. Thus, the informants described their dental fear/phobic reaction in terms of strong fears about unpredictable events where pain was central, but where the feeling that something awful was going to happen during treatment was also important. Further, informants described strong feelings of powerlessness, feelings of being deserted and vulnerable, fear of dying, suffocation and fear of losing control/panicking. The informants described how the fear increased as the day of the dental appointment approached, and how it culminated in treatment.

**Vulnerability**
This main category, *vulnerability*, described the informants’ life history and possible predisposition to anxiety and fear. The category was composed of three descriptive categories labeled *traumatic life history, anxiety-prone personality* and *negative preconceptions of dental care*. Thus, the informants described a present or earlier traumatic life history and believed that these experiences, most often in childhood, may have been related to the onset of dental fear. Some informants described traumatic experiences outside dental care as something that may have influenced their dental fear. These traumatic experiences were described in terms of a strong emotional upset and were expressed in terms of feelings of
threat and panic. These feelings seemed to be awakened and strengthened in dental care. Furthermore, informants described a history of general anxiety or panic attacks, or other strong fears, and thought that they might be connected to their dental fear. A strong need for control was also reported and the informants were clearly disturbed by not being able to control their fear and go through with dental treatment. Some of the informants said that they had heard “horror stories” about dental treatment, which they were very frightened by. They believed that this might have influenced their own dental fear.

**Unsupportive dentist**

This main category described the informants’ experiences of the *unsupportive dentist*. The category was composed of three descriptive categories labeled *perceived lack of empathy and respect*, *doubts about dentists’ skills*, and *perceived lack of support from dental team*. Thus, informants perceived the dentist’s lack of empathy and respect as one of the most significant factors behind their dental fear. Experiences of the “awful” dentist were vividly remembered and expressed in terms of feelings of being completely disregarded or even violated. Once this negative picture of dentists was established it seemed to be quite stable and could easily be transferred to new dentists, even if they were more respectful and empathic. Furthermore, several informants had doubts about treatment and did not trust information from dentists. Even though some informants said that they had been supported by and felt empathy from members of the dental team, it was more common to perceive a lack of support. Most informants described how they were so frightened that they were mainly focused on the dentist and not on other members of the dental team. The assistant was, no matter how kind and gentle, in most cases perceived as acting in collaboration with the dentist, or as having no power to act on her own.

**Study IV**

This study reports on the situation of dental phobic patients: on how dental phobia interferes with normal routines and functioning; on how it affects social activities and relationships; on factors that contribute to the maintenance of dental fear; and on how patients cope with their dental fear.

In the analysis four main categories were identified and labeled *threat to self-respect and well-being*, *avoidance*, *readiness to act*, and *ambivalence in coping*. One category, *threat to self-respect and well-being*, was identified as the core concept, describing the central meaning of the informants’ experiences of their ambivalence in coping with dental
fear. The ambivalence was between, on the one hand their tendency to avoid dental care, and on the other hand the need they felt for dental care and their attempt to find active problem solving-strategies. Thus, the informants seemed to oscillate between a state of avoidance and a state of being ready to act. This ambivalence had negative consequences for self-respect and well-being (schematically illustrated in Paper IV; Figure 1). Each main category was composed of a number of descriptive categories and subcategories (Paper IV; Figure 2) and illustrated by interview excerpts (Paper IV; Results section). The results show that several psychological and social factors interact in determining how dental phobic individuals cope with their dental fear, and demonstrate how dental fear affects their daily lives.

**Threat to self-respect and well-being**

This core category was composed of two dimensions elucidating experiences of threat to health and threat to social life. Thus, the informants described the threat to oral health as a significant aspect of their dental fear. They also expressed a worry about general health deteriorating on account of dental fear and the deterioration of their teeth. The informants described how their worry and anxiety had got worse over time and that they had become extremely focused on their dentition. Recurrent nightmares about poor oral health were common and the informants expressed feelings of shame, impurity, loss, degradation and sorrow. All informants said that their present dental problems or worries about future problems were the main reason for seeking dental fear treatment. They described it as a problem demanding attention. In addition, most informants felt that their dental fear/poor oral status had a strong general negative effect on their lives. From the interviews it was obvious that deteriorating oral health results in a restricted social life, and in wide-spread negative life-consequences.

**Avoidance**

This main category, describing dental phobic patients’ avoidance, was composed of three descriptive categories labeled avoidance and suppression, factors preventing problem-solving, and lack of social support and understanding. Phobic avoidance from dental care was common and often connected with a history of frequently missed or cancelled appointments. The informants described how they felt relieved when they had just made a cancellation, or had taken the decision not to show up. However, this relief was only temporary and accompanied by feelings of shame and guilt. Further, informants described how the avoidance was transferred to everything that reminded them of their dental fear, and difficulties in
performing oral hygiene procedures were common. Even though some informants managed quite successfully to suppress thoughts and feelings about their dental problems, they were not totally successful. They repressed them, but “they were there all the time”. The informants described how their fear and aversion increased with avoidance. All informants said that fear was the main reason for avoidance. However, financial considerations were also important, especially if patients expected a lot of dental treatment. Feelings of shame and inferiority toward the dental team were also mentioned as a reason for further avoidance. In addition, some informants perceived a lack of social support and understanding from “those around them”. Especially the male informants said that they were ashamed of their dental fear and expressed feelings of being “pathetic and ridiculous”. Feelings of inferiority were thus accompanied by feelings of low self-esteem.

**Readiness to act**

The main category, *readiness to act*, described the demands dental phobic patients felt and their active problem-solving strategies. The category was composed of three descriptive categories labeled *problem-solving strategies, self-strength, and social support*. Thus, in contrast to avoidance, several informants described how they had become active in looking for information i.e. reading articles about dental information, watching related TV programs. In addition, they talked to others about their dental problems, searching for information, advice, and support. Different forms of self-care were also reported. Even though most informants reported that they only visited dentists when they were in pain or not at all, different strategies for handling dental care were described. Further, financial planning for dental treatment was also described. Several informants stated that they saw themselves as being “strong” and that their dental fear did not fit in with the rest of their personality. They said that they had to believe in their own ability to manage their dental fear. Further, informants felt strong pressure to live up to “norms of behavior”. This was especially evident among the informants reporting regular dental care. A healthy mouth as well as being in control in general, was important to maintain a positive self-image. Although some informants described how other people had difficulty in understanding them, most informants experienced encouragement and support from someone close. Social support seemed for some to effectively reduce the negative emotional effects of dental fear.


**Ambivalence in coping**

The main category *ambivalence in coping* concerned the conflict between on the one hand the dental phobic patient’s tendency towards avoidance, and the demands experienced and the patient’s active problem-solving strategies. Patients seemed to oscillate between a state of avoidance and a state of being ready to act. The informants described how they “worked with themselves” and struggled to do something about their situation and their dental fear. They really wanted to deal with their fear and be able to see a dentist on regular basis in the future. Phobic dental fear and the threat to health and social life thus left the individual in a state of conflict, with negative consequences for self-respect and well-being.

**Study V**

This study was designed to investigate the importance of dental beliefs and the predictive value of the Dental Belief Survey (DBS) (Paper V; Table 3) in dental fear treatment. Patients were grouped into those clinically successful (n=69) and those unsuccessful (n=48) in treatment for dental fear.

**Background data**

It was shown that men were significantly more successful in treatment than women ($\chi^2=4.67$, $p=0.031$). Patients successful and unsuccessful in treatment reported an average time since last regular dental treatment of 9.2 (SD 7.8) and 10.6 (SD 8.1) years, respectively. Twenty-three patients reported that they had never managed regular dental care. The avoidance variables were dichotomized according to the median value into ≤8 years and >8 years since last regular dental treatment. The latter group included those who had never managed regular dental care. There was no statistically significant difference between the groups with regard to education level, age, time since last regular dental visit, or oral status (DMFT) (Paper V; Table 1).

**Dental anxiety and dental beliefs**

A correlation analysis (Spearman’s rho) showed that pretreatment values of DBS-sum scores were significantly correlated with gender (women showing higher values), age (younger showing higher values), and pre-treatment values of dental fear (DAS, DFS), state anxiety (STAI-S), general fear (GFS) and depressed mood (BDI). These correlations were however only moderately high (rho 0.18–0.41).
Both groups had equally high initial dental fear values (DAS, DFS). Patients unsuccessful in treatment showed higher DBS values indicating more negative dental beliefs. At the second visit to the dentist both groups revealed a decrease in negative dental beliefs, with a somewhat larger reduction among patients successful in treatment. However, there was no statistically significant difference between the groups with regard to initial DBS or to decreased DBS values (Paper V; Table 2).

The rank order of DBS items followed the same pattern in both groups, but patients unsuccessful in treatment showed somewhat higher values on all items, except on the highest ranked item 9, “Dentists do not take my worries seriously” and item 13, “I do not feel I can stop for a rest during treatment”. There was a significant difference between the groups with regard to the lower ranked item 10 “Dentists put me down” ($t=-2.24; p=0.027$) and item 11 “I worry if dentists are technically competent” ($t=-2.61; p=0.033$), with higher values among patients unsuccessful in treatment (Paper V; Table 3). There were no statistically significant differences between the groups with regard to DBS dimensions or factors suggested by Milgrom et al. [20] and Kulich et al. [120] at the first visit to the dentist. However, at visit two clinically successful patients showed significantly lower DBS communication scores. Thus, the communication dimension (item 1, 3, 4, 14, 15) [20] and factor (item 1-5, 11) [120] revealed $t$-values of 2.10 ($p=0.038$) and 2.70 ($p=0.008$), respectively.

The alpha reliabilities among the belief survey scores were generally high, with a Cronbach’s alpha coefficient of 0.93.

**General fear, anxiety and depression**

Both groups showed pre-treatment levels of general fear (GFS) and trait anxiety (STAI-T) in accordance with earlier reports for dental phobic patients. The state anxiety (STAI-S) levels were somewhat lower than those reported elsewhere. Even though the patients unsuccessful in treatment showed higher values with regard to GFS and STAI-T these differences were limited and statistically non-significant. The BDI values indicated no to mild depression in both groups. However, there was a significant difference ($t=-2.94; p=0.004$) between the groups with regard to BDI, with higher values among patients unsuccessful in treatment (Paper V; Table 4).
**Motivation and beliefs in treatment**

Both groups reported a generally high motivation and belief in treatment for dental fear. Still, patients successful in treatment showed a significantly greater willingness to engage in dental fear treatment ($Z=-3.34; p=0.001$) (Paper V; Table 4).

**Regression analyses**

Logistic regression analyses were performed in order to explore predictors of successful and unsuccessful treatment outcome. The following independent variables were used in the regression analyses: gender, age, education, last regular dental visit, DAS, DBS, GFS, BDI, and willingness to engage in treatment. Before entering the logistic equation the variables age and willingness to engage in treatment were transformed into categorical variables. Thus, age was trichotomized according to the age classes: 20-28 yr (40%), 29-39 yr (33.5%), and ≥40 yr (26.5%), while willingness to engage was dichotomized according to mean value in 0-80%, and >80% engagement. Changes in DBS between visit one and visit two indicated the importance of the initial meeting with the dentist for treatment outcome. The final model (Paper V; Table 5) showed that last regular visit ($p=0.013$, OR=3.2, CI 95%=1.3-8.0), willingness to engage ($p=0.001$, OR=4.3, CI 95%=1.8-10.6) and gender ($p=0.039$, OR=3.0, CI 95%=1.1-8.3) significantly predicted dental fear treatment outcome, but also that there was a non-significantly increased risk for unsuccessful treatment with higher pre-treatment values of BDI ($p=0.055$; OR=1.1, CI 95%=0.9-1.2). Thus, longer avoidance time from regular dental care, low engagement in treatment, female gender, and depressed mood increased the risk for clinically unsuccessful treatment outcome.

Finally, to predict decrease in dental fear (DAS) from the first assessment to outcome measurement after dental fear treatment, a linear regression analysis was performed. The predictor variables were, with the exception of DAS, the same as those used in the logistic regression analysis. The final model of the forward stepwise procedure (Paper V; Table 6) showed that BDI ($r=-2.58; p=0.012$) and a decrease in DBS scores between visit 1 and 2 ($r=2.00; p=0.049$) significantly predicted dental fear reduction. Thus, a depressed mood seemed to counteract dental fear remedy, while improved dental beliefs (DBS) after meeting with the dentist predicted greater dental fear reduction. However, the level of explained variance in this model was low (Adjusted $R^2=0.085$).
DISCUSSION

General aspects and summary of the results

The general aim of this thesis was to study psychological and psychosocial factors in relation to dental fear and oral health behavior. Both quantitative and qualitative research methods were used in a broad-spectrum approach to factors and processes influencing the development, maintenance and expression of dental fear and anxiety, how individuals cope with their fear, and how dental fear may impact on health and daily life. The study samples consisted of adult dental fear patients seeking treatment at a specialized dental fear clinic in Göteborg, Sweden.

The main findings from the studies can be summarized as follows:

- Dental fear patients with a concomitant high degree of general fear differ in several ways from patients with less frequent and widespread fears. These differences concern dental fear reactions and related emotions, as well as general psychological dimensions. The results indicate an overall more negative and complex life- and dental-care situation for patients with high dental and general fear (Study I).

- Differences between dental fear patients with phobic avoidance behavior versus those with a reported history of regular dental care can be summarized as follows. Patients with phobic avoidance behavior had in general lower education, a higher degree of anticipated dental fear and anxiety and more missing teeth, while patients with regular dental care had more filled teeth. Moreover, patients with phobic avoidance behavior reported a stronger negative impact from dental fear and poor oral health status on their daily life than regular attenders (Study II).

- According to the qualitative interviews the onset of dental fear was commonly related to an individual vulnerability and to traumatic dental care experiences, where perceived negative dentist behavior played a significant role. The patient was caught in a “vicious circle” which was difficult to break. Fear and anxiety were maintained by negative expectations about treatment and about the patient’s own ability to cope in dental care situations. The results emphasize the significance of several psychosocial and cognitive factors/processes underlying the development and maintenance of dental fear and anxiety (Study III).

- The interviews brought out the patients’ ambivalence in coping with dental fear. The ambivalence was between, on the one hand their tendency to avoid dental care, and on the other hand the need they felt for dental care and their attempts to find active problem-solving strategies. The phobic dental fear and the threat to health and social
activities left them in a state of conflict, with negative consequences for self-respect and well-being. The results show that several psychological and social factors interact in determining how dental phobic individuals cope with their fear, and demonstrate how dental fear affects their daily lives (Study IV).

- Patients unsuccessful in dental fear treatment reported more initial negative dental beliefs, while patients successful in treatment showed a larger decrease in negative dental beliefs between the first and the second visit to the dentist. However, these differences were small. There was a significant difference between the groups at the second visit to the dentist. Thus, patients unsuccessful in dental fear treatment reported more negative beliefs about how dentists communicate. The results suggest that assessment of dental beliefs provides valuable information and that patient’s subjective perceptions about how dentists communicate are important for treatment outcome. Although predictive of dental fear reduction, initial dental beliefs were not found to predict clinical treatment outcome and should be regarded as one of many interacting factors influencing the treatment of dental fear (Study V).

**Psychosocial aspects of dental and general fears**

The first aim (Study I) of this thesis was to investigate dental anxiety in relation to general fear, psychological distress and reported negative life-consequences.

Regardless of whether dental fear is a specific phobic reaction or one among several strong fears, it may create significant problems for individuals with phobic avoidance behavior and thus impact on general health and well-being [7]. Thus, we found it interesting to investigate general psychological and social factors among severe dental fear patients, high and low in concomitant general fear.

The high as well as the low general fear group reported mean values >5 years of dental avoidance, and a majority of individuals in both groups had completely avoided dental care for at least two years. Even though the reported mean avoidance time was somewhat shorter among patients with high general fear, the groups did not differ in any statistically significant way with regard to this aspect. Thus, dental avoidance was not related to general fearfulness in this study sample. The most commonly reported reason given for dental fear in both groups was painful dental experiences, and both groups showed mean dental fear scores indicating severe dental fear. However, patients with a high degree of general fear reported more anticipated dental anxiety and a significantly higher awareness of physiological dental fear reactions. Pauli et al. [145] investigated anxiety induced by cardiac perceptions among
patients with panic attacks and suggested that the physiological reaction confirms and strengthens the fear, which leads to a negative circle which is difficult to break. It has been suggested that when dental fear is established, it has a tendency to stay or get stronger because the individual focuses on the feared object or situation, and also on emotional and bodily reactions [81]. Our results suggest that these emotional and bodily reactions are more significant among dental fear patients with a concomitant high level of general fear. This may have implications for the maintenance of dental anxiety over time [67], as well as for therapy and treatment outcome [18, 102, 103].

High general fear patients reported considerably more extreme fears in relation to illness, death, physical injuries etc., than low general fear patients. These dimensions include many of the health-care related fears. In addition, high general fear patients assessed all the potentially conditioning etiological factors for dental fear comparably higher. This was especially evident with regard to fear caused by "negative medical experiences", but also by an "inconsiderate dentist". Thus, it seems that individuals high in general fear more often reacted to conditioning experiences in both dental and medical care. As suggested by Frazer and Hampson [64] this may indicate a greater vulnerability in some cases, and that these fear-prone individuals more easily acquire conditioned fear and anxiety.

It is also possible that these differences reflect a tendency among individuals high in general fear to report such negative experiences on a higher level. General anxiety conditions are positively correlated to negative affectivity and individuals high in negative affectivity express thoughts and feelings about themselves and their environment in a more negative way [146]. Thus, the construct of trait negative affectivity closely resembles the personality conception of neuroticism [147]. Individuals high in trait negative affectivity are more likely to experience discomfort at all times and across situations, even in the absence of overt stress. It must be taken into account that several tests designed to measure different negative emotions, such as anxiety and depression scales, health complaint scales etc. share some common variance with negative affectivity, even though they are clearly not pure measures of the construct [146, 147].

One of the main criteria for dental phobia refers to the consequences the disorder has on daily life and general functioning [11]. One weakness in Study I is the lack of oral status data. However, both groups had avoided dental care for several years. Nevertheless, the negative impact of dental fear on daily life differed between the groups. The results are in accordance with other studies indicating that patients with severe dental fear and concomitant high general fear/general phobic anxiety are more distressed and functionally
impaired by their fear, than patients with less wide-spread fears [7, 17, 18]. Thus, high general fear patients reported considerably more general psychological distress (SCL-90). The most evident difference between the groups was with regard to somatization, obsessive compulsive and depression dimensions. Further, the negative impact from dental fear on daily life was rated generally higher among patients high in general fear. These patients reported to a significantly higher extent that dental fear caused problems in social relations, and that they felt depressed because of their dental fear. Taken together, our results signify an overall more negative and complex situation for patients high in general fear. However, general fear was not found to predict social and emotional consequences in the final regression analyses. Thus, the regression analyses revealed that negative social consequences were predicted by general psychological distress (SCL-90), while negative emotional consequences were predicted by both dental fear (DFS) and general psychological distress.

The results suggest that the character of dental fear and the influence of dental fear on daily life differ between different groups of dental fear patients. Moreover, the results emphasize the complexity of dental fear and anxiety, and elucidate the need for further knowledge about how general psychological and psychosocial factors may impact on dental fear and its consequences on daily life and general functioning. These aspects should be included in therapy investigations. The use of formal psychiatric diagnostic systems (or other classification systems) may be helpful within clinical and scientific settings to differentiate subgroups of dental fear patients [17, 18]. Treatment programs based on cognitive-behavioral approaches, which target fear reactions and negative cognitions, may be of special benefit for severe dental fear patients showing these general symptoms of fear and distress [12].

Phobic avoidance and regular dental care
The second aim (Study II) of this thesis was to investigate and compare patients with high dental fear reporting different attendance patterns that is phobic avoidance versus regular dental care, with regard to dental fear reactions, oral status, general psychological distress and social consequences. It was hypothesized that avoidance of dental care was predicted by negative emotions and consequences.

It was found that patients with a history of regular dental care had a significantly higher level of education, than patients with phobic avoidance behavior. Both groups reported dental fear scores well over established levels for severe dental fear. Nevertheless, the assessments of dental fear and in particular anticipatory dental anxiety were significantly higher among the avoiders. The avoiders had significantly more missing teeth, while regular
dental visitors had significantly more filled teeth. Furthermore, patients with avoidance reported significantly more often that their dental fear and/or poor oral conditions had a negative influence on work, as well as on social life i.e. “talking to other people”. There were no major differences between the groups with regard to general emotional distress (GFS, STAI-T, BDI).

The results can be discussed in the light of a vicious circle model [50]. Initial fear and anxiety may lead to avoidance often with a deteriorated oral health status, and a growing need for dental treatment. When severe oral health problems and pain arise, some patients undergo necessary acute dental treatment, which are often perceived as difficult and painful, reinforcing the fear and anxiety. The results from the present study, with significantly more anticipatory dental anxiety among patients with phobic avoidance behavior support these arguments. Furthermore, when seemingly equal DMFT values in the two groups were examined more closely they revealed major differences in treatment history indicating more radical treatment procedures among the “avoiders”. Thus, overall DMFT values are not sufficient for describing oral health status among dental fear patients.

It has also been argued that initial dental fear and avoidance of dental care may result in exaggeration of negative aspects of the oral health situation, which consequently increases anxiety [16, 50]. Irregular dental attenders may be more anxious than regular attenders because they believe that they will require more extensive treatment, and not because they have a greater fear of dentistry per se [83]. The importance of such negative circles in developing and maintaining fear has mainly been used to explain phobic avoidance behavior [50, 81]. As discussed previously, negative cognitions may be even more pronounced among individuals high in general fear and anxiety, and it is well-known that general fears/high general phobic anxiety has a negative impact on dental fear and treatment outcome [18, 67, 101, 102]. However, in the present study no major differences between the groups were found with regard to general fear or trait anxiety. Thus, in accordance with the results from Study I, dental avoidance was not related to general fearfulness in this study sample. This was an interesting finding, and it supports earlier findings by Skaret et al. [5]. They investigated possible explanations for dental avoidance among 12-18 years old adolescents in Norway and found a higher mean frequency of missed appointments among subjects with low general fear [5]. This may indicate that high general fear/phobic anxiety does not necessarily represent a problem related to dental attendance [5]. In fact, elevated general fear/anxiety may further increase the worry about oral health and thus force some patients to seek treatment despite their fear.
The results indicated a stronger negative impact on daily life from both dental fear and poor oral conditions among the avoiders. These negative effects were most evident in relation to work and talking to other people. Thus, the negative effects on daily life among the avoiders in this study seemed to be more limited to specific situations compared to the results in Study I, which indicated more wide-spread negative life effects among patients with high general fear. However, the duration of dental avoidance should also be considered and it has been shown that negative life-consequences are more pronounced among patients with long-term dental phobic avoidance (>10 years) [7]. Avoidance time was not controlled for in the present analyses. Nevertheless, it was somewhat unexpected that the groups did not differ more with regard to general (GFS, BDI, STAI-T) or situational emotions (MACL). One reason for this may be that both groups applied for treatment at a specialized dental fear clinic, which indicated an attendance problem also for those with a history of previous regular dental care. It may also be due to the extensive screening procedure [106], which excluded patients with psychiatric diagnoses/and or treatment, as well as major psychosocial problems. Thus, the study population in Study II (and V) may differ from the other study samples in this thesis, as well as from other dental “phobic” populations seeking treatment at specialized dental fear clinics.

In Scandinavia most studies have shown that dental fear is unrelated, or only weakly related to education [25, 27, 47]. In Study II, the higher education level among the regular dental attenders may indicate an overall more stable social situation, with possibly stronger social pressure or support for regular dental care despite high dental fear. However, no significant impact was found on dental visiting habits with regard to education in the final logistic regression. Thus, avoidance of dental care was significantly predicted only by anticipatory dental anxiety and missing teeth, while other variables lacked predictive power. Study II should be seen as a first step in the comparison of dental fear patients with regular dental care habits and those with phobic avoidance behavior. Vassend [27] suggested that high dental fear individuals with regular dental care habits might have at their disposal adequate coping strategies or act in accordance with social norms with stronger behavioral impact than the tendency to phobic dental avoidance. These aspects need further attention.

**Patients’ views of dental anxiety and experiences in dental care**

The qualitative study (Studies III and IV) was performed in order to explore the situation of patients with severe dental fear, as expressed by patients themselves, and to gain a deeper understanding of the psychosocial processes involved in dental fear. The study sample reflects
the predominance of women among patients at the specialized dental fear clinic. Women are more likely to report high dental fear [25], as well as to seek treatment for their fear [21]. It has been argued that it is more socially acceptable for women to report dental fear, which may explain some of these gender differences [43]. In this qualitative study both men and women expressed their fear and their experiences in dental care in a very similar way. Thus, the variation in their experiences seemed to be more related to the individual than to gender differences. However, there were some differences worth special attention. The interviews with the male informants were generally somewhat shorter, although the longest interview was with a male informant. Further, men more often expressed their fear in terms of shame, of feeling ridiculous or childish, while especially some young women expressed that they wanted to be “good girls” and that they made high demands on themselves to “do the right thing”.

The third aim (Study III) of this thesis was to explore and describe dental phobic patients’ perceptions of their dental fear and their experiences in dental care. The qualitative analysis revealed categories related to the dental care situation, to the individual, and to the dentist, and supported the view of dental fear as a complex problem where several factors interact [16, 20, 50]. Dental fear has mostly been described as a conditioned reaction to a traumatic dental experience originating early in life [16, 50, 52]. However, it has also been pointed out that there are individual (genetic/personality) differences in how people react to dental care or other fearful stimuli or situations [52, 59, 61, 64]. In the present study most informants stated that their dental fear had started in childhood with a negative experience in dentistry. This was commonly expressed as a painful event and meeting a rough dentist. Patients expressed a perceived lack of empathy and respect from the dentist as one of the most significant factors behind their dental fear. These experiences of the “awful” dentist were vividly remembered, and once this negative picture was established it seemed to be quite stable and could easily be transferred to new dentists, even if they were more empathic and understanding. The results support earlier suggestions that it is not pain itself that creates fear, but rather something about the perception of the situation and the response to pain, and that perceived dentist behavior is an important factor in the expression and development of dental fear [3, 73, 148].

Negative preconceptions about dental care, caused by dental fear in the family or by negative information about dentistry, have been proposed as a possible cause of dental fear [3, 26, 149]. Arnrup et al. [150] found that parents of uncooperative children differed from parents of ordinary child dental patients, not only in socioeconomic status and dental
fear, but also in dimensions such as dental knowledge and responsibility taking for their children’s oral health behavior. Although some of the present informants described dental fear in the family, most informants were not aware of fear among close relations when dental fear started. However, several informants described a parallel traumatic life situation with difficulties in the family and/or interpersonal problems at school and with friends, and believed that these experiences might have been related to the onset of dental fear.

It has been suggested that invasive procedures and modeling are most important for child onset, while general psychological factors play a more prominent role in later (adult) onset of dental anxiety [35, 48]. A few informants described how their dental fear had started in adulthood and associated it with a traumatic experience outside dental care, and with general psychological pressure. Further, some informants expressed a history of general anxiety or panic ‘attacks, or other strong specific fears, and thought that this might be connected with their dental fear. The results seemed to be in agreement with previously reported etiological factors for dental fear. However, most subjects in this study displayed a psychological vulnerability associated with the onset of dental fear.

The informants described a strong situational dental fear/phobic reaction, where threat of violation and threat of loss of autonomy and independence dominated the experience. They described it as a fear that increased as the day of the dental appointment approached, and which culminated in treatment. Threat of violation was described as a strong fear about unpredictable events, such as pain, as well as thoughts of catastrophe and feelings of being vulnerable and completely powerless in the dental care situation. The threat of loss of autonomy and independence was expressed in terms of fear of dying, suffocating or losing control. From this description it seemed that perceived ‘lack of control’ is central for dental phobic patients’ experiences in dental care, and that phobic dental fear may even constitute an “existential threat” for the suffering individual. Berggren [66] found in a dental phobic population that fear of suffocation was ranked as the most common of extreme fears. In addition, among fearful dental patients thoughts about/fear of dying during dental treatment have previously been reported [81, 89].

According to Kent [151] it appears that the experience of anxiety is closely allied to feelings of control, or loss of control in dental care. It has also been suggested that the dentist-patient relationship strongly influences patients’ feelings of safety and control during treatment [75, 151]. Corah et al. [75] demonstrated that empathy and communicativeness from the dentist are important for patient satisfaction. In addition, the dentist’s explicit effort to predict pain, and a friendly, calm and supportive behavior from the
auxiliary were ranked as important factors for anxiety reduction [75]. Although several informants in the present study stated that they had been shown empathy and support by members of the dental team, it was more common to experience a lack of support. The patients' descriptions suggested that their attitude to the dental-assistant was highly dependent on the dentist-patient relationship.

The results emphasize the psychosocial factors/processes underlying the development and maintenance of dental anxiety. According to Kent [12] it may be helpful in understanding high levels of anxiety and phobia to consider them not only as residing within the individual, but more within the relationship between the patient and the dentist. Such a model suggests that both the behavior of the caregiver and the anxiety of the patient could be considered as equally important [12].

Ambivalence in coping with dental fear

The fourth aim (Study IV) of this thesis was to explore and describe the general situation of dental phobic patients: how dental phobia interferes with normal routines and functioning, social activities and relationships, which factors contribute to the maintenance of dental fear, and how individuals cope with their fear. The qualitative analysis revealed four main categories: threat to self-respect and well-being, avoidance, readiness to act, and ambivalence in coping. Threat to self-respect and well-being were found to be central. The informants described how phobic dental fear left them in a state of conflict. This conflict or "ambivalence" concerned the conflict between their tendency to avoid dental care, and the need/demands they felt for dental care and their attempt to find active problem-solving strategies.

Milgrom et al. [21] suggested that an approach-avoidance conflict exists when a person has two competing tendencies with respect to a situation. The individual knows that he or she needs dental care and wants to have healthy teeth. In this respect the individual is highly motivated to attend dental appointments. On the other hand the phobic dental fear may lead to a perceived inability to cope and a need to avoid the situation. These two competing tendencies leave the person in a state of conflict. The present results suggest that ambivalence in coping should be seen in a wider perspective; it is determined by self-image, norms of behavior and social support, as well as by the strength of the threat. The informants struggled between their dental fear and the threat to their self-respect and well-being.

Most informants described the decision to put off dental care as resulting in short-term reduction of anxiety. However, the feeling of relief was temporary and
accompanied by feelings of guilt and shame both toward the dental team and toward themselves. They described how their fear, guilt and aversion to dental care increased with the avoidance, as did the consequences for self-respect and well-being. The results of this qualitative study partly confirmed the previously discussed “vicious circle” model [50]. This model suggests that fear, avoidance, deteriorated oral health, and the inability to go through with dental care result in feelings of shame, guilt, and inferiority, which subsequently reinforce fear, increase anxiety and result in further avoidance and concomitant social withdrawal [16, 50]. Thus, the conflict described by the informants in the present study seemed to support several steps in this ad-hoc theoretical model.

Also patients reporting a history of regular dental care mentioned the threat to oral health as a significant aspect of their dental fear and the main reason for seeking treatment for dental fear. Avoidance of dental care did not seem to be an alternative for these patients, although dental care was perceived as extremely unpleasant. They described that they felt strong demands to live up to social norms and to “do the right thing”, but also that they were frightened of developing avoidance behavior in the future. Thus, our results support the suggestion by Vassend [27] that high dental fear individuals with regular dental care habits might have at their disposal adequate coping strategies or act in accordance with social norms with stronger behavioral impact than the tendency to phobic dental avoidance. Further, the results emphasize the importance of identifying fearful patients with regular dental care habits and of alleviating anxiety in order to prevent further problems and avoidance behavior in the future [21].

The informants described that the avoidance was transferred to everything that threatened to remind them of their dental fear, e.g. TV programs and advertisements. Difficulties in performing oral hygiene procedures were also common. These results were in accordance with previous reports, suggesting that fear may prevent not only dental attendance, but also adequate oral hygiene, thus reinforcing the deterioration of oral health status [3]. In contrast, Cohen et al. [89] found that dental anxiety had a positive impact on oral hygiene practices. Most participants in their study stated that they aimed to avoid dental treatment by preventing dental disease [89]. However, in the present study most informants perceived the implementation of an adequate oral hygiene regimen as a problem, even though they had high demands on themselves to take care of their teeth and felt that their oral health was threatened if they did not succeed in living up to this. The inconsistent results of these studies may be due to differences between study samples in relation to phobic dental avoidance. Thus, in the study by Cohen et al. [89] all patients had been referred by a general
dental practitioner for treatment with sedation. Further, patients were either new patients to the sedation clinic or already existing patients invited for interview [89]. In the present study, as well as in the study by Berggren and Meynert [3], most patients were not referred by a dental practitioner. They were either self-referred or referred by physicians and both studies were carried out before any treatment was performed at the specialized dental fear clinic.

It has been shown that dental fear, especially if combined with phobic avoidance from dental care and self-perceived poor dental health, can result in a restricted social life and in wide-spread negative life-consequences [3, 7, 16, 89]. In accordance with this, in the present study informants expressed a wide range of negative impacts on daily life and general functioning, i.e. interaction with other people, intimate relations, at work, and negative emotions. Berggren and Meynert [3] found that many patients with dental phobia expressed a lack of support or were even criticized for their fear by their friends and relations. This was also expressed in the present study, with subsequent negative consequences for self-respect and well-being. Feelings of shame and inferiority were especially pronounced among male informants. Berggren [7] reported that a negative impact on daily life was evident in general, and among men in particular. This may reflect differences in how men and women perceive their fear and to what extent they seek help and social support to mitigate the negative consequences of dental fear. In the present study, those informants reporting strong social support from their families reported fewer negative emotions, even though they perceived their oral health as poor and as limiting their social life. Thus, perceived social support seemed to effectively reduce the negative emotions caused by dental fear.

Two theories have been developed to explain the role of social support in relation to health [152]. The "main-effect hypothesis", suggests that social support itself is beneficial, and that the absence of social support is in itself stressful. The "stress-buffering hypothesis" suggests that social support has a direct impact on helping the individual to cope with specific stressors [152]. However, support transmitted and support perceived may not necessarily correspond. It has been argued that perceived support is a trait rather than a state; that it is a function of a personal disposition to perceive and report support [153]. It has also been suggested that individuals are more responsive to inputs from others if it complements their own personal coping initiatives [153]. Thus, social support and coping may be seen as complementary to each other and that both are predictive of future social support and coping, respectively [153]. There is a lack of studies describing the relation between social support and the expression of dental fear. This issue needs further attention.
Although coping is aimed to manage perceived stress, coping efforts can be quite varied. Problem-focused and emotion-focused coping are often described as “positive or negative” and as being relatively independent functions. According to Lazarus [93] it is misleading to separately evaluate and compare their efficacy. Both strategies are interdependent and work together in the overall coping process. The present results suggest that the informants moved back and forth between different strategies, the most desirable strategy and the one that was considered to be the best at a particular moment. However, to decrease the threat to self-respect and well-being oral health care is desirable and beneficial. It is therefore important to further identify and to strengthen factors that contribute to improved oral health behavior among fearful dental patients. The results suggest that personal resources for coping with dental fear, as well as social support and a concerned caregiver are such significant factors.

**Importance of dental beliefs in treatment for dental fear**

The fifth aim (Study V) of this thesis was to investigate if initial dental beliefs, and changes in beliefs after meeting the dentist, predict treatment outcome among adult dental fear patients. It was hypothesized that a larger decrease in DBS between the first and the second visit to the dentist would predict (a) successful treatment, and (b) a more significant reduction in dental fear.

Different behavioral treatment regimens have been shown to be effective in reducing dental anxiety [12, 28, 95]. However, a review of the literature found that approximately 20-30% of patients do not benefit from or cannot follow through with dental (fear) treatment [12]. This was obvious also in the present study and constitutes a major challenge to dental fear research. Thus, investigations of dental fear must explore the needs of these patients and find ways to attract them to dentistry. Likewise more research is needed to explore the needs of “non-avoiding” fearful patients to help them keep up regular dental contacts, as indicated in Studies II and IV.

Although all patients successful in treatment were referred to general dental practitioners, this study did not explore whether patients continued to receive regular dental care after leaving the specialized fear clinic. Moreover, nothing is known about what happened subsequently to those patients who did not complete dental fear treatment at the time of the study. Aartman et al. [104] and Kvale et al. [18] investigated dental anxiety reduction and dental attendance after treatment in a dental fear clinic and found that although a reduction in dental anxiety level took place, 37-38% of the patients had not visited a general
dental practitioner at follow-up 1 year later. This reflects the complexity of dental fear and dental visiting habits, and the importance of assessing dental fear treatment outcome in a long-term perspective.

A statistically significant relationship (although with low correlations) between assessments of dental beliefs (DBS), general fears (GFS) and depression (BDI) was confirmed in the present study. Thus, one expression of general psychological and emotional distress may be a more negative attitude to dentists and to how dental care is delivered [16, 64, 106]. For some patients distrust of dental personnel may be reinforced by trait anxiety and general fearfulness [16]. In the present study both patients successful and those unsuccessful in dental fear treatment showed initially high values of negative dental beliefs (DBS). Even so, patients unsuccessful in treatment reported more initial negative dental beliefs and patients successful in treatment showed a larger decrease in negative dental beliefs between the first two visits to the dentist. However, these differences were small and statistically non-significant. Item analyses showed that the initial rank orders in DBS followed the same pattern in both groups. Nevertheless, patients unsuccessful in treatment reported to a significantly higher extent that they worried about dentists’ technical competence, and had feelings of inferiority and social embarrassment in relation to dentists. This supported the results from the qualitative study (IV) where feelings of shame and inferiority were expressed as a reason for further avoidance. Moore et al. [16] argued that social embarrassment could be seen as a major catalyst for the maintenance of dental fear, and that it seems necessary to emphasize the role of the dentist in treating these patients. Thus, the early meeting with the dentist and the fearful dental patient is crucial for treatment outcome.

Kulich et al. [71] explored the dentist-patient interaction in consultations with patients visiting a dental fear clinic. They found that the dentist’s professional and interpersonal skill, as well as the patient’s verbal and non-verbal cues and emotions were important aspects of the dentist-patient encounter. In Study V, assessment of DBS at the second visit to the dentist showed significantly more negative beliefs about how the dentists communicate among patients unsuccessful in treatment. The results indicated that the first meeting with the dentist, and the patients’ subjective perceptions about how dentists communicate, are important factors in dental fear treatment. Even though recent research [120] has proposed the use of DBS as an overall measure of dental beliefs, the present study indicated that especially the DBS communication factor could provide valuable information for the treatment of dental fear and for prediction of treatment outcome. However, for
psychometric reasons, the underlying factor structure of DBS has to be further established [120].

Regression analyses showed that improved dental beliefs (between the first and the second visit to the dentist) predicted dental fear reduction, but also that there were several other important factors to consider that may impact on dental fear treatment and treatment outcome. Even though patients reported a generally high motivation for treatment, the analyses confirmed that “willingness to engage” seemed to be crucial for a successful treatment outcome. In a previous study it was shown that a low engagement usually manifested itself early in treatment, and drop-out during the psychologist’s intervention was common [101]. The importance of motivation in dental fear treatment, and the question of which factors contribute to this motivation needs to be further explored. The results from the qualitative study (IV) suggest that “self-strength” (i.e. self-image, norms of behavior) and social support may be such motivational factors. Further, although assessment of BDI indicated no to mild depression, depressed mood increased the risk of unsuccessful treatment outcome. This may further confirm the negative pattern related to dental phobic avoidance, with subsequent negative consequences for general health and well-being [16, 50, 81].

The effect of gender on treatment outcome in the present study was interesting and has to our knowledge not been described earlier. It is well-known that women report more fear, as well as more general emotional distress [25, 43]. This was also found in our analyses (data not presented). Looking at other areas, Weinstock [42] reported on gender differences in the presentation and management of social anxiety disorders. Although most studies indicate that more women suffer from social anxiety disorders, men are more likely to seek treatment. This was discussed in relation to gender roles and social expectations, and may also have implications for dental fear patients. The results from the qualitative study in this thesis suggest that men are more ashamed of their fear. This may result in further avoidance behavior, and it has been shown among dental phobic patients that men are on average older when applying for dental fear treatment [7]. It may be that when men seek help for their dental fear they have made a decision to go through with dental treatment and act in accordance with social expectations. Such gender aspects need further attention in dental fear research.

Thus, dental beliefs are only one of several interacting factors affecting the treatment of dental fear. However, the interpretation of the results suggests that assessment of dental beliefs provides information valuable for the treatment of dental fear, and that the early meeting with the dentist, as well as patients’ subjective perceptions about how dentists
communicate predict their ability to complete therapy as well as treatment outcome. The interaction between patient and dental-care providers and its influence on treatment is an under-researched area and is definitely in need of further attention.

Methodological considerations

Most scientific knowledge about dental fear relies on traditional/quantitative research methods. However, all methods have their limitations and shortcomings. Thus, a broad base of scientific methodology is needed in medical/odontological disciplines, and introducing qualitative methods may contribute to our understanding of these areas [154]. The present thesis relies on both quantitative and qualitative research methods. The psychometric instruments used in the studies are well-established instruments in dental fear research (see Method section). However, there are some specific methodological aspects to consider.

Study I was performed during normal clinical routines and a detailed description of those patients who did not agree to participate, as well as of those who for different reasons were excluded, was unfortunately not available. Studies II and V were both part of a longitudinal treatment study, although with partly different samples (see Method section). With regard to the step-wise screening procedure, which excluded patients with psychiatric or major psychosocial problems, the study populations in Study II and Study V may differ from those in other studies of (phobic) patients seeking treatment at dental fear clinics. This must be taken into account when the results are interpreted. However, there are always limits as to how far one can generalize when investigating selected study groups. Furthermore, there are differences between cultures, dental care organization systems, financial systems etc., which may complicate comparisons between studies. Thus, the results from this thesis may only be transferable to other selected patient groups with similar characteristics. Even so, deeper knowledge of behavioral aspects of dentistry could also tell us something about “ordinary” dental patients, as well as other patient populations.

In the cross-sectional Study II there are aspects of the statistical analyses that must be considered. Thus, there were large differences in group size (avoidance group n=141; regular dental visitors n=28), and limitations with regard to the number of included variables in relation to the number of individuals in the logistic regression analysis. The results from Study II must therefore be interpreted with caution and should be seen as a first step in the comparison of dental fear patients with regular dental care habits and those with phobic avoidance behavior. Study V was a clinical treatment study and the procedures were standardized as far as possible, according to the study protocol (including pretreatment
procedures and treatment sessions). Patients regarded as "unsucessful in treatment" dropped out on different occasions during dental fear therapy, and a detailed description of these patients has been presented by Berggren et al. [101]. However, in Study V the focus was on early (pretreatment) predictors of treatment outcome and in particular on whether initial dental beliefs, or changes in beliefs after meeting with the dentist, predict treatment outcome.

Although there are many similarities between quantitative and qualitative research methods, some procedures are very different due to the questions to be answered [154]. The input of the researcher in the qualitative study, the principles of sampling, and the process of organization and interpretation of data, all affect the results, and are closely related to different aspects of validity. According to Malterud [154], the question is not whether the researcher affects the process or not, but rather concerns researcher reflexivity (i.e. the researcher's attitude to attending systematically to the knowledge construction, especially to the effect of the researcher, at every step during the research process). Different researchers might therefore access different, although equally valid, representations of a situation and this may increase understanding of complex phenomena. Thus, multiple researchers might strengthen the design of a qualitative study by supplementing and contesting each others' statements [154]. The present qualitative study (Studies III and IV) was based on an extensive amount of data (>300 pages) from a strategically selected group of patients with severe dental fear. The design of this grounded theory study (simultaneous collection and analysis of data, hierarchical analysis levels, theoretical sampling and theoretical sensitivity, constant comparisons and saturation) ensured control of quality at all stages. All the interviews were performed by the first author (KHA), and were subsequently analyzed by KHA in close collaboration with senior researchers (representing different scientific disciplines). The emerging categories, describing the psychosocial process of dental fear, were all grounded in data and the quotations given are intended to show the trustworthiness of the interpretations. The aim of all research is to produce information that can be shared and applied beyond the study setting [154]. The combination of quantitative and qualitative methods in this multidisciplinary thesis has hopefully provided new insights about the psychological/psychosocial factors and processes involved in dental fear and oral health behavior.
CONCLUDING REMARKS

The results from this thesis have thrown light on some psychological and psychosocial factors related to dental fear and oral health behavior. This knowledge may be useful to all who meet more or less anxious patients in dental practice. It may thus be important for the prevention of dental fear, as well as for treatment outcome. Improved knowledge about behavioral aspects of dentistry also makes sense at the community level, since the cost-benefit of improved oral health is obvious. Accordingly, it is important to stress behavioral aspects of dental/oral health-care education programs and to create a “dental-care environment” that contributes to (improved) oral health. However, the results from this thesis also emphasize the complexity of dental fear and oral health behavior, where personality characteristics and environmental factors interact in the process of dental fear, and elucidate the need for further knowledge.

The results showed that the character of dental fear and the influence of dental fear on daily life differed between different groups of dental fear patients. This indicated a generally more negative and complex situation for dental fear patients with a high degree of concomitant general fear, compared to dental fear patients with less frequent and widespread fears. Thus, the negative emotional effects of dental fear, and the negative impact of dental fear on daily life and general functioning were more pronounced when dental fear was accompanied by high general fear/general psychological distress. However, there was no significant difference between patients high and low in general fear with regard to average time of dental avoidance, even though there was a somewhat shorter reported avoidance time among high general fear patients. Formal classification systems may be helpful in differentiating subgroups of dental fear patients seeking treatment at specialized dental fear clinics. Treatment programs based on cognitive-behavioral approaches, which target fear reactions and negative cognitions, may be of special benefit for patients showing general symptoms of fear and distress.

Comparisons between severe dental fear patients reporting different dental attendance patterns showed that patients with a history of previous regular dental care had a higher level of education and more filled teeth, and that patients with phobic dental avoidance behavior had more anticipatory dental anxiety and more missing teeth. Furthermore patients with phobic avoidance reported a stronger negative impact from dental fear/poor oral health status on daily life. However, the negative effects on daily life among the avoiders were limited to specific social situations, and there were no major differences between the groups with regard to general emotional distress. Thus, general fearfulness was not related to phobic dental avoidance. The results indicate that high general fear/phobic anxiety is not necessarily
a problem directly related to dental attendance. The higher education level among regular dental visitors may indicate an overall more stable social situation, with stronger social pressure or support favouring regular dental care. The notion of social norms of behavior/normative oral health beliefs in relation to dental attendance pattern/oral health behavior was supported by the qualitative interviews.

The qualitative interviews brought out the fact that the patient’s feelings and emotions, as well as the perceived behavior of the dentist are key factors in the onset and development dental fear. The patients described how their dental fear left them in a state of conflict between phobic avoidance and the needs/demands they felt for dental care. It was obvious that dental fear and deteriorated oral health status resulted for many patients in widespread negative life consequences. The patients’ descriptions confirmed/validated the theoretical “vicious circle” model [50] in several of the steps it uses to describe the development of the consequences of a dental phobic reaction. However, it was also obvious that several psychosocial factors interact in determining how dental phobic patients cope with their fear, and demonstrate how dental fear affects their daily lives. The results suggested that personal resources for coping with dental fear, as well as social support and a concerned caregiver are significant factors for desirable and beneficial oral health behavior among fearful dental patients. This qualitative study contributes to a deeper understanding of dental fear and the psychosocial processes involved, and raises some new questions.

The interpretation of the results suggests that assessments of dental beliefs provide valuable information for treatment and that the early meeting between the patient-dentist, and patient’s subjective perceptions about how dentists communicate are important for treatment outcome. However, dental beliefs are one of several psychosocial factors interacting in the treatment of dental fear, and willingness to engage in treatment seemed to be crucial for successful treatment outcome.

Implications for future research

- There is need for more research about how general psychological and psychosocial factors relate to dental fear, and how this impacts on daily life. These aspects should also be included in therapy investigations.
- It seems important to further investigate patients who continue to attend dental care on a regular basis despite their fear, as well as to identify these patients early in order to prevent further problems/avoidance behavior.
• Future research should focus on the needs of those patients who do not benefit from or cannot follow through with dental (fear) treatment and to find ways in which to attract them to dentistry/have them accept dental care.

• It is important to further identify factors that contribute to improved oral health behavior among fearful dental patients. Thus, further knowledge about different coping strategies/personal resources (demands, motives) for coping with dental fear is needed, and the relation between social support and coping needs further attention in dental fear research.

• Gender aspects in the presentation and management of dental fear i.e. gender roles and social expectations need to be explored.

• Last but certainly not least, the interaction between the patient and the dental-care provider is an under-researched area.
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