

School of Health Sciences, Jönköping University

Dental anxiety among 15-year-olds

Psychosocial factors and oral health

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“Your big opportunity may be right where you are now. Do not wait; the time will never be “just right”. Start where you stand, and work with whatever tools you may have at your command, and better tools will be found as you go along”

Napoleon Hill

Abstract

AIM: The overall aim of this thesis was to examine the associations between dental anxiety, experiences of dental care, psychosocial factors and oral health among 15-year-olds, and to analyse changes in the prevalence of dental anxiety over time.

MATERIALS AND METHODS: The thesis was based on two cross-sectional epidemiological studies in Jönköping, Sweden. Papers I, II, and III were based on a random sample of 15-year-old individuals. The total sample consisted of 221 individuals. Six questionnaires were used, one included items of socio-demography, while the others were psychometric instruments measuring dental anxiety, temperament, general anxiety and depression, general fearfulness and attitudes to dental care. Paper IV was based on the Jönköping studies, a series of epidemiological studies from 1973, 1983, 1993, and 2003 in which random samples of 15-year-old individuals were included. The total sample consisted of 405 individuals. Questionnaires including background data and dental anxiety were used and clinical data were collected. **RESULTS:** Of the 15-year-old individuals 6.5% were classified as dentally anxious with girls proportionally more fearful than boys (*Papers I-III*). Dental anxiety correlated significantly with three of the temperament dimensions; emotionality, activity and impulsivity. Reported pain or unpleasant experiences during dental care treatment were clear predictors concerning dental anxiety (*Paper I*). Both symptoms of general anxiety and depression were significantly correlated with dental anxiety after controlling for other potential risk factors (*Paper II*). Dental anxiety was associated with both general fearfulness and with attitudes to dental care, where the strongest predictor of dental anxiety was general fearfulness (*Paper III*). A trend analysis over the 30-year period showed a gradient of statistically significantly decreasing dental anxiety prevalence, from 38.1% in 1973 to 12.8% in 2003. Over the period the 15-year-old individuals with dental anxiety had significantly higher number of filled tooth-surfaces than those with no dental anxiety, and also more caries in 1973. There were no such differences concerning plaque and gingivitis (*Paper IV*). **CONCLUSIONS:** Dental anxiety in 15-year-olds

correlated with experiences of dental care, psychosocial factors as well as to oral health. Specifically, pain experiences related to dental care, attitudes to dental care and general fearfulness seem to have the strongest impact on dental anxiety. Dental anxiety showed a clear declining change over time. More girls than boys reported dental anxiety. The thesis shows that dental care providers need paying attention on providing a supportive dental care situation, in which the patients should not experience pain. One part may be adequate local anaesthesia during operative dentistry or similar dental treatments. Another part may be a good oral health to prevent negative experiences of dental care. There is a need for the understanding of psychological factors associated with dental care procedures.

Keywords: *Adolescents, cross-sectional, dental anxiety, experiences of dental care, oral health, prevalence, psychosocial factors*

Original papers

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

Paper I

Stenebrand A, Wide Boman U, Hakeberg, M. Dental anxiety and temperament in 15-year-olds. *Acta Odontol Scand* 2013;71:15-21.

Paper II

Stenebrand A, Wide Boman U, Hakeberg, M. Dental anxiety and symptoms of general anxiety and depression in 15-years-olds. *Int J Dent Hyg* 2013;11:99-104.

Paper III

Stenebrand A, Wide Boman U, Hakeberg, M. General fearfulness, attitudes to dental care, and dental anxiety in adolescents. *Eur J Oral Sci* 2013;121:252-257.

Paper IV

Stenebrand A, Hakeberg M, Nydell Helkimo A, Koch G, Wide Boman U. Dental anxiety and oral health in 15-year-olds—a repeated cross-sectional study over 30 years. *Community Dent Health*, accepted for publication April 9, 2015.

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Abbreviations

The following terminology has been used in this thesis:

| | |
|-----------------|--|
| ANOVA | Analysis Of Variance |
| CFSS-DS | Children's Fear Survey Schedule - Dental Subscale |
| CI | Confidence Interval |
| DAS | Corah's Dental Anxiety Scale |
| DBS | Dental Beliefs Survey |
| DCA | Dental Care Act |
| DFS | Dental Fear Survey |
| DSM-V | Diagnostic and Statistical Manual of Mental Disorders, fifth edition |
| EASI | Temperament survey measuring dimensions of temperament (Emotionality, Activity, Sociability, Impulsivity as well as shyness as a dependent part) |
| et al. | et alia = and others |
| GFS | Geer Fear Scale |
| HADS | Hospital Anxiety and Depression Scale |
| HADS-A | Hospital Anxiety and Depression Scale - Anxiety subscale |
| HADS-D | Hospital Anxiety and Depression Scale - Depression subscale |
| i.a. | in absentia = for instance |
| i.e. | id est = that is |
| <i>M</i> | Mean |
| <i>n</i> | Number |
| <i>p</i> -value | Significance level |
| SD | Standard Deviation |
| SEM | Stand Error of the Mean |
| SES | Socio Economic Status |
| SPSS | Statistical Package of Social Sciences |
| US | United States |

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Introduction

This thesis presents research concerning dental anxiety among 15-year-old individuals. The purpose has been to examine the influence of different psychological and social factors on reported dental anxiety. Moreover, the prevalence of dental anxiety and trends over time in relation to demographic factors and oral health has also been analysed.

Dental anxiety

Fear and anxiety can be explained as protective states that are induced by natural environmental threats that serve to detect and avoid danger. The two conditions are normal emotional responses elicited in situations perceived as dangerous or threatening. The imminent threat may be based on the characteristics of the stimuli, such as distance and size. It may also depend on the perception of the threat, such as the assessment of the danger and own coping resources. The source of the threat may be external, such as people, places and objects, or internal, such as thoughts, beliefs or feelings ¹. The source of the threat can also be conditioned or unconditioned by own experiences ².

Fear and anxiety are similar in many ways, but there are also important differences^{1,3}. The two conditions can be said to be on the same continuum, but in positions that differ, depending on the proximity of the threat ¹. Contrary to fears, which concern real threats, there is not always a clear threat in anxiety⁴. Theoretically, undiscovered and uncertain threats may provoke anxiety and alertness, while real danger induces fear of a specific stimulus ¹.

The reaction to a threat also differs, depending on whether the threat is immediate or distant ¹. Fanselow and Lester ⁵ argued that the reaction is determined by how large

the imminent danger is in terms of spatial distance to the threat, the probability of getting in touch with the threat and other factors of a psychological and physiological background. An escape behaviour seems to be the most appropriate reaction to a nearby physical threat, whereas if the threat is far away, avoidance may be a better option ¹.

Circumstances that can normally lead to anxiety reactions are threats to self-esteem or security, separation, and actions that can be expected (anticipated) to cause criticism or sanctions from other people ⁶. The anxiety is closely linked to the expectation of suffering from adverse events and is more about emotional effects; a response to feared threats or disasters ⁴.

A person is suffering from a phobia—a psychiatric disorder—when the anxiety meets certain criteria according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) ⁷: The fear in a specific phobia is induced by a specific and limited set of stimuli. The phobic situation is avoided or endured with intense anxiety or distress. The fear is excessive and unreasonable in the sense that its intensity is unnecessarily large in relation to the actual threat, to a degree that makes it interfere with daily life ⁷.

There are also differences between the concepts of fear and anxiety reactions in relation to dentistry, as the visit to the dental service could certainly be fearful without giving rise to anxiety. Broberg och Klingberg ⁸ conclude that “dental fear is a normal emotional reaction to one or more specific, threatening stimuli in the dental situation. Dental anxiety denotes a state of apprehension that something dreadful is going to happen in relation to dental treatment, and it is coupled with a sense of losing control. Dental phobia represents a severe type of dental anxiety and is characterised by marked and persistent anxiety in relation either to clearly discernible situations/objects (e.g. drilling, injections) or to the dental situation in general.” An individual must have attained dental treatment maturity, 2.5-3 years of age, to be said to have dental fear. The fear is adaptive as it helps the child to avoid

a similar threat in the future. The concept of dental anxiety first enters at a later age⁹. In the literature, the terms dental fear and dental anxiety are often used synonymously. In this thesis, the term used is dental anxiety.

Dental anxiety among adolescents

Adolescence

Adolescence, approximately between 13 and 20 years of age, is a period of life with significant biological¹⁰, socio-emotional¹¹ and cognitive development¹⁰. The development is fast and there is great variation within the group; thus, to talk about adolescents as a homogeneous group is problematic¹².

In early adolescence, the individual is more a child than an adult, as opposed to the end of the period, when the individual is more an adult than a child¹³. Intellectual maturity, in terms of abstract thinking, occurs at 11-12 years of age. The youngster can then, to a varying degree, think abstractly; that is, reflect on his/her own thinking and use hypothetical concepts¹⁴. It is only after that developmental stage that any dental anxiety can be said to begin to resemble that of the adult⁹. This development of abstract thinking continues through adolescence and young adulthood¹⁴.

Adolescents constitute a special group with its own characteristics that differ from those of both the childhood and the adult culture¹³. The development is the result of many different causes that interact with each other; internal as well as external factors related to the individual. The development process is divided into several phases or crises and may be hindered by negative experiences, as well as promoted by positive experiences¹¹.

Different individuals may respond quite differently to the same “objective” stress. Individuals are, therefore, affected differently by traumatic events; depending also on when in life they occur. The interaction between the individual’s vulnerability

and external risk factors in the environment is important and these factors interact constantly with each other ¹².

Prevalence

In several studies ¹⁵⁻²⁷ performed worldwide, the overall outcome indicates that the prevalence of dental anxiety among adolescents ranges between approximately 3 and 19 % (Table 1).

Table 1. Prevalence of dental anxiety worldwide

| Authors | Material collected | Country | n | Age in years | Prevalence | Boys vs. girls | Instrument | Cut-offs |
|----------------------------------|--------------------|--------------|------|--------------------|---------------|----------------|----------------------|----------------------|
| Murray et al. ¹⁵ | 1986 | Newfoundland | 223 | 12 | 9.4% 5.0% | Boys < girls | DAS | ≥13 ≥16 |
| Bedi et al. ¹⁶ | 1989 | Scotland | 1103 | 14 | 7.1% | Boys < girls | DAS | ≥15 |
| Bergius et al. ¹⁷ | 1992 | Russia | 288 | 13-18 (mean=15.3) | 12.6% | Boys < girls | DAS | ≥15 |
| Thomson et al. ¹⁸ | 1987 | New Zealand | 691 | 15 | 10.9% | Boys < girls | DAS | ≥13 |
| Thomson et al. ¹⁸ | 1990 | New Zealand | 691 | 18 | 13.2% | Boys < girls | DAS | ≥13 |
| De Calvalho et al. ²⁷ | 2010 | Brazilian | 340 | 12-18 (mean=13.8%) | 18.0% 1.8% | Boys < girls | DAS | ≥11 ≥16 |
| De Moraes et al. ¹⁹ | No report | Brazil | 1045 | 15-20 (mean=17.0) | 5.7% | Boys < girls | DFS | >59 |
| Milgrom et al. ²⁰ | 1990 | Singapore | 1564 | 13-15 | 12.2% | Boys = girls | DFS | >59 |
| Skaret et al. ²⁶ | 1996 | Norway | 571 | 18 | 19.0% | Boys < girls | DFS | >59 |
| Taani et al. ²¹ | No report | Jordan | 1021 | 12-15 (mean 12.9) | 10.0% | Boys < girls | DFS (15-item) | >1 (<i>M/item</i>) |
| Klaassen et al. ²³ | No report | Germany | 218 | 8-13 (mean=10.4) | 9.0% | Boys < girls | CFSS-DS | ≥32 |
| Chellappah et al. ²⁵ | 1989 | Singapore | 505 | 10-14 (mean=11.4) | 13.5% | Boys < girls | CFSS-DS | ≥42 |
| Armfield et al. ²² | 2002 | Australia | 516 | 13-17 | 9.5% | Boys < girls | Single-item question | |
| Poulton et al. ²⁴ | 1983 | New Zealand | 1037 | 11 | 3.3% | No report | Single-item question | |
| Poulton et al. ²⁴ | 1990 | New Zealand | 993 | 18 | 9.5% | No report | Single-item question | |

There may be several reasons for the variability in dental anxiety prevalence, for example, the use of different measurement methods. Some examples of scales are Corah's Dental Anxiety Scale (DAS) ²⁸⁻³⁰, the Dental Fear Survey (DFS) ³¹, the Children's Fear Survey Schedule - Dental Subscale (CFSS-DS) ³²⁻³³, or the single-item Dental Anxiety Question ³⁴⁻³⁵. Furthermore, studies ^{15-16, 27} using the same measurement method sometimes use different cut-off levels. The differences in prevalence may also be due to the study being carried out in different countries, with diverse cultural characteristics and different dental care provision.

It appears difficult to establish the changes in the prevalence of dental anxiety over time, in part because of the different ways to measure, but also because of the different age categories used, not always with exact definitions of the different age groups. An attempt to look at adolescents approximately 15 years old ^{17-18, 20-22} showed a probable decrease in prevalence over time, but this is more difficult to determine when studies ^{15-16, 19, 23-27} with a wider age range are included. The studies on dental anxiety prevalence in 15-year-olds are mostly cross-sectional studies ^{17, 20-22}, although single longitudinal studies ¹⁸ are also available. However, there still appears to be a lack of studies in younger adolescents that report on how the changes in the prevalence of dental anxiety have developed over time. To obtain that information, several repeated cross-sectional studies should be carried out, using the same method of measurement and in adolescent samples of the same age and in the same region.

Aetiology

The causes of dental anxiety are multifactorial. It has been suggested that both exogenous and endogenous constituents play a role ³⁶. The exogenous components related to dental anxiety are acquired as a function of direct or vicarious experiences³⁷. The endogenous components refer to dental anxiety as a part of more complex psychological disorders, such as multiple phobias, other anxiety and mood disorders and psychiatric diagnoses ³⁸⁻³⁹. The results of studies ³⁸⁻⁴⁰ also suggest that some people may have a constitutional vulnerability to anxiety and/or mental health

problems. People are also influenced by culture, gender, and social demands when we learn how to express our emotions ⁴¹.

Figure 1 shows a transactional model illuminating the factors that may cause dental anxiety. Transactional means that the model describes how the development of individuals occurs in interaction with the environment and specific situations, and that these dimensions interact over time to initiate and sustain dental anxiety ⁴²⁻⁴³.

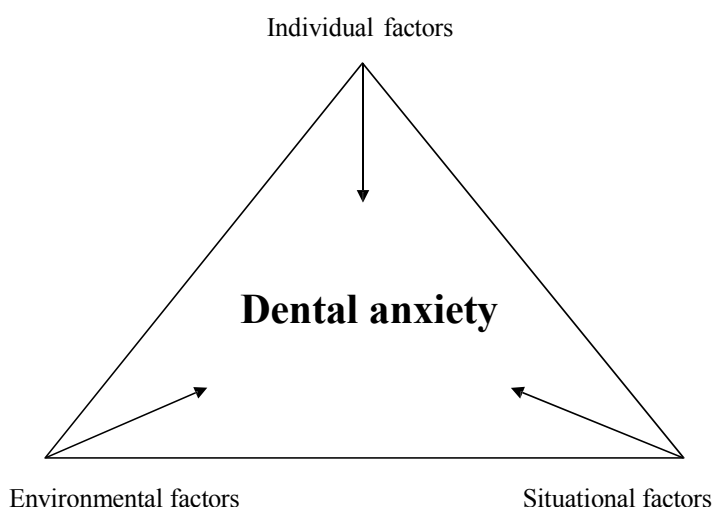


Figure 1. *Transactional model concerning dental anxiety. Adapted by Klingberg et al. ⁴⁴.*

According to the model, the factors could be grouped into individual factors (such as gender, maturity, “present fitness”, temperament, psychological disorders, vulnerability to fear), situational factors (such as dental treatment experience, lack of control in the dental treatment situation, perceived negative behaviour of the dental clinician, painful dental treatment), and environmental factors (such as socio-demographic factors, including familial dental anxiety).

Individual factors

Gender

In most studies, the girls report more dental anxiety than the boys, both in terms of prevalence ^{15, 17, 19, 21-22, 25-27} and higher scores ^{16-19, 23, 26}. Despite this trend, gender differences are not always found ²⁰. Girls and boys appear to differ in their cognitive processing of potentially stressful dental events ⁴⁵⁻⁴⁶. In a recent study ⁴⁵, the girls tended to perceive possible negative dental events in a more aversive or catastrophic way, compared with the boys. Females have been found to overestimate the probability of danger and anticipate lower self-efficacy compared with males. The inability to cope appropriately with these cognitive appraisals may trigger a greater anxiety response ⁴⁶. The socialisation process, involving gender-dependent rules for emotional expression, may also contribute to gender variations in emotional reporting (i.a. anxiety) ⁴⁷.

Temperament

Temperament has been associated with dental anxiety in children ⁴⁸⁻⁵⁰, in young adults ⁵¹ and in adults ⁵². Temperament means an emotional capacity that varies between individuals, is fairly stable over time and situations, has some genetic influence and manifests itself early in life ⁵³⁻⁵⁵.

It has been stated that an individual's temperament includes his/her characteristic way of being; that is, the individual's relatively similar behaviour and reactions in various situations ⁵⁶, where an important point has been the individual's typical way of reacting to new situations. Seen from a development-oriented perspective, this has been of particular interest, as each individual must learn to deal with many new situations, also dangerous ones. Approaching the unknown because of curiosity, or withdrawing due to caution, have been found to be important aspects of human development ⁵⁷.

Individual differences during adolescence are presented interchangeably as temperamental traits or personality traits. The child's temperamental orientation has been described as the basis for the personality^{56, 58-59}, while personality develops as a result of both environmental factors and the original temperamental basis^{55-56, 60}.

Buss and Plomin⁶¹ introduced a theory that saw temperament as being composed originally of four dimensions; emotionality, activity, sociability and impulsivity (EASI), to which shyness was later added⁶². Some of the dimensions of temperament may differ between genders^{52, 61}. *Emotionality* is equivalent to the intensity of a reaction. The emotional individual is easily enlivened and tends to have an excess of vigorous emotions. The person may appear to be of a determined nature that tends to have mood swings. *Activity* refers to the overall energy yield. The active individual is constantly on the move and rushed. He or she likes to be on the move and seems to have tireless energy. His/her speech and actions are energetic. *Sociability* mainly consists of a strong desire to be with others, to be a part of a community. For a sociable person, interaction with others is much more rewarding than most non-social forms of reinforcement. It is also assumed that sociable individuals are responsive and committed to others. *Impulsivity* includes the inclination to react quickly and impulsively, instead of holding back a reaction and allow time for planning before taking the next step⁶¹.

Shyness and sociability tend to be regarded as more or less the same personality trait. *Shyness*, however, refers to the person's behaviour when meeting with strangers or casual acquaintances, while sociability refers to the tendency to want to be in the company of other people in general⁶². According to Buss and Plomin⁶², only sociability can be regarded as a temperamental trait, while shyness is a derivation or a dependent part. Sociability is more general, while shyness can be seen as fear of social situations.

Previous results concerning the relationship between dental anxiety and temperament suggested that temperament, and then foremost shyness and possibly

shyness combined with emotionality, may be contributing factors in the development of dental anxiety in children ⁴⁸. Shyness alone has also been attributed as the cause of dental anxiety ⁵⁰. Other findings suggest that temperament in general acts as the causative factor of dental anxiety in young adults ⁵¹, whereas Lundgren et al. ⁵² found that adult patients with high levels of dental anxiety had significantly higher values of emotionality and impulsivity than patients without dental anxiety.

Psychological disorders

Locker ³⁶ concluded that psychological disorders relate to the development of dental anxiety in a population of young adults. Psychological disorders have also been seen to be associated with high levels of dental anxiety among young adults, and specifically related to the maintenance of dental anxiety over time ³⁹. The two most common forms of psychological distress, in severe forms diagnosed as psychiatric disorders, are anxiety and depression ⁶³. Anxiety is closely linked to the expectation of suffering from adverse events and is about emotional effects, responses to feared threats or disasters ⁴. Depression refers to a state of low mood and aversion to activity that can affect a person's thoughts, behaviour, feelings and sense of well-being. A person with depressed mood can feel empty, sad, hopeless or helpless. Depressed mood could make a person lose interest in activities that were once pleasurable or in oneself ⁷.

The relationship to general fearfulness, which indicates a person reporting several strong fears, has also been investigated. Such results have revealed that dental anxiety is related to general fearfulness in children ⁶⁴⁻⁶⁶, and high levels of general fearfulness in young adults ²⁶ and in adults ⁶⁷. General fearfulness is the overall measure of fear propensity, obtained by calculating the reaction to a number of phenomena and situations ⁶⁸.

It has been shown that cognitive vulnerability-related perceptions in adolescents are positively correlated with their levels of dental anxiety. Vulnerability perceptions have also been shown to mediate the relationship between negative dental

experiences and dental anxiety⁶⁹. A cognitive vulnerability is an erroneous belief, or pattern of thought, that predisposes an individual to psychological problems. After the individual has encountered a stressful experience, his/her cognitive vulnerability contributes to a maladaptive response that increases the likelihood of a psychological disorder⁷⁰.

Situational factors

Experience of dental treatment

The dental treatment experience itself could play a significant aetiological role with respect to the onset of dental anxiety^{17, 26-27, 36, 45}. Bergius et al.¹⁷ revealed higher scores of dental anxiety among adolescents (13-18 years of age) with more treatment experience. The likelihood of dental anxiety has been shown to be greater among individuals for whom the reason for the last visit to the dentist was restorative treatment rather than a dental examination²⁷. Locker et al.³⁶ came to the conclusion in a young adult sample that invasive dental treatment were predictive of onset of dental anxiety. Skaret et al.²⁶ concluded, in a sample of 18-year-olds, that dental anxiety for those who had received either conservative or surgical treatment were higher than in patients who had not undergone these treatments. Carrillo-Diaz et al.⁴⁵ argued that having received fillings was significantly associated with the perceived probability of negative dental events. However, a higher frequency of regular innocuous dental visits was in the same sample associated with less dental anxiety, contrary to those who more sporadically visited their dentist⁴⁵ a result consistent with that concluded by Poulton et al.²⁴.

Lack of control in the dental treatment situation

Dental anxiety can be acquired after the person has experienced a lack of control in the dental treatment situation^{20, 71-73}. The dental clinician's behaviour may strongly affect the patient's sense of control and security in the dental situation⁷⁴⁻⁷⁶. When adult dental phobic patients describe their view of their dental anxiety and

experiences of dental care, they express feelings of powerlessness in the dental treatment situation and feelings that the treatment was going to continue whether they liked it or not ⁷⁷.

Perceived negative behaviour of the dental clinician

Adults have stated that the onset of their dental anxiety was in early adolescence ⁷⁸. The cause could be traumatic dental experiences, in which the perceived negative behaviour of the dentist played a significant role ⁷⁷. Interpersonal relationships in dentistry, focusing on the patient's own perceptions of the behaviour of the dentist and how the dental care is performed, have been shown to correlate with measures of dental anxiety ⁷⁹⁻⁸¹. Skaret et al. ²⁶ concluded that a favourable opinion by the adolescents regarding the degree of cooperation and satisfaction they experienced with the dentist, tended to be significantly associated with low dental anxiety.

Painful dental treatment

Dental anxiety can also be acquired after the child ^{20, 71-73} or young adult ²⁶ has been exposed to painful dental experiences. Bergius et al. ¹⁷ revealed higher DAS scores among adolescents with more experience of painful treatment. Students who reported more than one previous experience of pain were 9.9 times more likely to report high dental anxiety than the rest of the group ²⁶.

Pain is an experience that is associated with emotional and psychological reactions and which cannot be measured objectively ⁸². Dental tissues are highly innervated with pain receptors and almost any dental operation is likely to cause pain ⁸³. Lack of trust in children's ability to report pain may result in less than optimum pain control during dental treatment ⁸⁴.

Environmental factors

Socio-demographic factors

Dental anxiety in adolescents may be associated with a lack of economic resources in the household and low educational levels ²⁷. However, for adults, the results are conflicting and not all studies ^{22, 85} show an association between socio-demographic factors and dental anxiety.

A relationship has been found between dental anxiety in children and their parents^{71,86-87}. Especially dental anxiety in the mother is known to be an associated factor in the development of dental anxiety ⁷¹. However, at least one study shows that there is no statistically significant correlation between the dental anxiety level of the mother or the father and that of their child ⁸⁸.

The levels of cognitive vulnerability of the father and mother have been shown to predict the levels of dental anxiety in children but not in adolescents ⁶⁹.

Oral health and consequences of dental anxiety in young people

Oral health means more than good teeth; it is integral to general health and essential to well-being ⁸⁹. It is also a determinant factor for oral health-related quality of life⁹⁰, and it is important to understand how oral health and general health influence each other ⁹¹. The term oral health is not merely the absence of disease and not only an objective approach, but also includes subjective experiences ⁹². Oral health problems may restrict activities at school, at work and at home, causing millions of school and work hours to be lost each year worldwide ⁸⁹.

If not dealt with, dental anxiety may be associated with negative consequences for dental care behaviour ^{27, 93-94} and for oral health ^{64, 95-96}, and may also result in negative psychosocial effects ⁹⁷⁻¹⁰⁰. Dental anxiety may affect the seeking of dental

care and has in younger adults been found to be higher in irregular dental attendee than regular attendee ⁹⁴. In a publication by Skaret et al. ⁹³, adolescent subjects with high dental anxiety had a significantly higher frequency of missed dental appointments, compared with individuals with low dental anxiety. More than one previous painful or unpleasant treatment experience has also been found to increase the risk of avoiding dental care ⁹³. Dental anxiety is associated with poor oral health^{64,95-96}. Common oral health problems are dental caries and gingivitis, both ¹⁰¹⁻¹⁰² with multifactorial causes; however, in adolescent samples, there have been conflicting results concerning dental anxiety and oral health, specifically with regard to caries ^{21, 103}. The results of Taani et al. ²¹, showed no association between dental anxiety and dental caries. This study, however, had a slightly different cut-off value for dental anxiety (Table 1). Kruger et al. ¹⁰³ revealed that dental anxiety (cut-off, see Thomson ¹⁸) is likely to be a significant predictor of dental caries experience, and may be a risk factor for dental caries incidence. Filled tooth-surfaces may also signify poor oral health. In children and young adult samples, there have been conflicting results concerning dental anxiety and this variable ^{51, 64}. The study by Klingberg et al. ⁶⁴ revealed that children with dental anxiety, aged 9 to 11 years, had significantly more filled tooth-surfaces than those with no dental anxiety. In contrast with these results, Thomson et al. ⁵¹ concluded, in a young adult sample, that there were no significant differences in filled tooth surface mean scores between individuals with and without dental anxiety. Caries may potentially involve other interrelated problems, such as social stigma or feelings of shame or inferiority, as dental anxiety may be interlinked with negative social and emotional consequences¹⁰⁴, and can be explained by the “vicious circle” of dental anxiety proposed by Berggren in 1984 ⁹⁷; a result later supported by other studies ⁹⁸⁻¹⁰⁰.

Dental care

Several laws and government regulations regulate dental care in Sweden. The basic legal instrument is The Swedish Dental Care Act (DCA) (Swedish Code of Statutes, SFS 1985:125) ¹⁰⁵, which regulates the goals and requirements for dental care. Dental care providers consist of dental hygienists, dentists and dental nurses. Dental

hygienists and dentists are licensed and their work governed by the National Board of Health and Welfare ¹⁰⁶.

According to § 7 of the DCA, the Swedish Public Dental Service, administered by the county councils, is responsible for regular and comprehensive dental care for children and adolescents, up to and including the year they turn 19 years of age. Dental care for children and adolescents is free of charge (§15 a) ¹⁰⁵.

From one year of age, all children in Sweden are included and participate in almost the same dental care programme, regardless of which dental clinic they belong to. The first contact with the dental staff takes place at a childcare centre or at a dental clinic. Up to and including the year they turn 19, adolescents undergo regular dental examinations, normally once a year depending on their individual indications. If an adolescent has good oral health, there may be more than one year between examinations, whereas adolescents with special needs may require more frequent check-ups. The focus should be on prevention ¹⁰⁵.

According to DCA ¹⁰⁵, dental care in Sweden should focus on the patient's needs and be provided in such a way as to make the patient feel confident in the treatment situation. The patient's personal integrity and right to self-determination should always be respected. Care and treatment shall, as far as possible, be designed and implemented in consultation with the patient. Dental care should also promote good relations between the patient and the dental staff. Efforts to prevent and treat oral health problems should be directed on equal terms to all young people ¹⁰⁵. This means that the care must be based on the patient's entire situation, so that physical as well as psychological and social needs are met.

Rationale for the Study

Dental anxiety often starts in young adolescence and may constitute a major problem for patients and dental care providers, with missed appointments and problems with treatment and oral health. According to the literature, important theoretically based questions remain on the aetiology of dental anxiety and associated risk factors in adolescence. The remaining issues concern the role of individual, situational and environmental factors for the initiation and maintenance of dental anxiety. Few, if any, scientific projects include this broad range of possibly related factors, where several important psychosocial factors need to be elucidated. There also appears to be a lack of studies reporting on the time trends of dental anxiety for this age group; for instance, whether the prevalence of dental anxiety among adolescents has changed over time. Nor is the relationship between dental anxiety and oral health in adolescents clear, as conflicting results are reported in the literature.

Another reason for investigating the relationship between dental anxiety, psychosocial factors and oral health in this specific age group is the fact that adolescence is a critical period when the individual develops towards an independent adult. The basis for adult health-related behaviour is conclusively formed during adolescence, including oral health behaviour, such as dental care attendance, preventive measures, and the formation of attitudes to oral health.

Overall and Specific Aims

The overall aim of this thesis was to examine the associations between dental anxiety, experiences of dental care, psychosocial factors and oral health among 15-year-olds, and to analyse changes in the prevalence of dental anxiety over time.

The specific aims were:

- I. To analyse the association between dental anxiety, temperament, socio-demography and experiences of dental care among 15-year-old individuals;
- II. To analyse the relationship between dental anxiety and symptoms of general anxiety and depression among 15-year-old individuals;
- III. To examine how general fearfulness and attitudes to dental care were related to dental anxiety in 15-year-old individuals, and
- IV. To investigate the prevalence of dental anxiety in Swedish 15-year-old individuals over a 30-year period, and the relationship between dental anxiety and oral health.

Materials and methods

Design

The thesis was based on two cross-sectional epidemiological studies in Jönköping (Table 2). In Papers I, II and III, a cross-sectional explorative quantitative design was used. Paper IV was based on the Jönköping epidemiological studies, which used a repeated cross-sectional explorative quantitative design.

Table 2. Summary of design, sample and methods used in the studies included in the thesis.

| Paper | Design | Study population | n | Boys / Girls | Data collection |
|--------------|--|-------------------------|--|---|---|
| Paper I | cross-sectional explorative quantitative design | Jönköping | 221 | 116 / 105 | 20-item DFS 25-item EASI |
| Paper II | cross-sectional explorative quantitative design | Jönköping | 221 | 116 / 105 | 20-item DFS 14-item HADS |
| Paper III | cross-sectional explorative quantitative design | Jönköping | 221 | 116 / 105 | 20-item DFS 30-item GFS 15-item DBS |
| Paper IV | repeated cross-sectional explorative quantitative design | Jönköping | 1973: 100 1983: 107 1993: 102 2003: 96 Total: 405 | 45 / 55 52 / 55 51 / 51 45 / 51 193 / 212 | Dental anxiety – 3 single-item questions Clinical and radiographic examination |

Participants

Papers I, II and III

In 2004, a random sample of adolescents (15 years of age) was selected by a two-shape cluster method. Four schools were selected and three classes were chosen in each school. The included classes consisted of 263 individuals, or 15 % of the total number of 15-year-olds in Jönköping municipality in 2004.

The selected classes and students were visited in their classrooms for an invitation to participate in the study. At the time of the implementation of the study, 42 (16 %) individuals were absent from the classrooms. The absent students participated in other education/activities or were reported absent due to illness. All the students who were present agreed to participate; thus, 221 individuals were included, which constituted 84 % of the selected adolescents.

Papers IV

In 1973, 1983, 1993 and 2003, random samples of the age group of 15-year-old individuals were selected from the city of Jönköping, Sweden, among individuals having their birthdays in the months of March through May each year. A registrar at the County Council performed the randomisation. In 1973, the participants were listed in chronological order according to their date of birth. The first 100 individuals who accepted to participate were included in the study. In 1983, 1993 and 2003, 130 individuals were randomly selected each year. All the individuals were personally invited to participate in the investigation through a personal letter of invitation. They were informed about the purpose of the investigation, the details of the examination procedures, and about the questionnaire that they would be asked to fill in at the clinic before the examination. For various reasons, 18–26 % of those invited, depending on the year, declined to participate. Detailed information about the

number of non-respondents and the reasons for not taking part in 1973, 1983, 1993 and 2003 have been published elsewhere ¹⁰⁷⁻¹¹⁰.

Data collection

Papers I, II and III

In Papers I, II and III, six self-reported questionnaires were used; one questionnaire including background data (Appendix 1), and five psychometric instruments measuring; dental anxiety (Appendix 2), temperament (Appendix 3), general anxiety and depression (Appendix 4), general fearfulness (Appendix 5), and attitudes to dental care (Appendix 6).

Background data

The questions chosen for the different papers were gender (Papers I, II, III), reported immigrant background (Paper II), parental educational level (Papers I, II, III), satisfaction or dissatisfaction with tooth appearance (Paper II), the student's self-perceived dental health (Paper II), the student's last visit to the dentist (Paper I), whether pain was experienced at the last dental appointment (Papers I, II), previous uncomfortable dental treatment or pain experiences during dental care treatment (Papers I, II), and whether someone in the family was afraid of going to the dentist (Paper I).

Dental anxiety (Papers I, II, III)

Dental anxiety was measured with the Swedish version of the Dental Fear Survey (DFS), a questionnaire containing 20 items specifically measuring the level of dental anxiety. The answers to the various questions are set out on a five-point Likert scale where 5 is rated as the most intense fear. Based on the sum of scores, dental anxiety

is graded from 20 to 100. The questions can be divided into 3 parts (domains). These describe the person's behaviour with possible avoidance of dental care and anticipation anxiety, physiological arousal during dental treatment and also fear behaviours associated with specific stimuli and treatment procedures ³¹. The normative value for an adult reference group in Norway has been found to be 44.6 points ⁷⁹. A DFS result of 60 points or more has been used as a measure of severe dental fear ^{20, 111-112}. In Papers I, II and III, the DFS was used either as a continuous or a categorical scale. A DFS result of 60 points or more was considered to represent dental anxiety and a score of less than 60 points was assessed as non-dental anxiety. The internal consistency of the DFS scale of the sample in this study was analysed and resulted in a Cronbach alpha coefficient of 0.94.

Temperament (Paper I)

The temperament of the adolescents was measured using the EASI, an improved version of "The EAS Temperament Survey for Children" ⁶², translated into Swedish by Hagekull and Bohlin ¹¹³. The survey now consists of 25 items, which have been modified for self-reporting by adults ⁵². The EASI form used measures the four dimensions of temperaments; emotionality, activity, sociability and impulsivity, as well as shyness as a dependent part. Each temperament is measured by five sub-questions. Each sub-question is measured on a 1-5 scale, with 1 being "strongly disagree" and 5 signifying "agree completely". The score value for 9 of the answers should be reversed as the statements on these questions are inversely formulated; for example, item number 6 under the "sociability" temperament is expressed as, "I prefer being alone to being with others". If a high score is obtained for a temperament, that specific temperament is strongly pronounced. According to Buss and Plomin ⁶², the total point value of each temperament should be divided by 5 (the number of sub-questions), in order to express an average value between 1 and 5. In the present study, the mean value of each temperament was used in the analyses. The reliability of the EASI form for the sample in the present study was verified. Each temper and the dependent part shyness were tested separately, resulting in Cronbach alpha coefficients for the various temperaments between 0.59 and 0.73.

General anxiety and depression (Paper II)

The Swedish version of the Hospital Anxiety and Depression Scale (HADS) was used to measure general anxiety and depression in the adolescents. The HADS is a self-report rating scale that has been developed for screening for clinically significant anxiety and depression in non-psychiatric patients ⁶³. It is composed of 14 items divided into two subscales, with seven items in each subscale. The items focus on cognitive and emotional issues of clinical anxiety and depression; thus, the subscales generate individual scores for anxiety (Anxiety subscale, HADS-A) and depression (Depression subscale, HADS-D). Each item is measured on a four-point Likert scale, ranging from 0 to 3, giving total scores varying from 0 to 21 for each subscale. A score on each subscale above seven indicates the presence of clinically significant distress, according to the following cut-off levels: 0–7 (normal), 8–10 (mild), 11–14 (moderate), and 15–21 (severe) ⁶³. Each subscale was examined for internal reliability and resulted in Cronbach's alpha coefficients of 0.78 for the HADS-A and 0.56 for the HADS-D, which indicated moderate to acceptable reliability.

General fearfulness (Paper III)

The psychometric instrument used to measure general fearfulness was the Geer Fear Scale (GFS) developed from the original scale ⁶⁸. Swedish versions have been reported in previous studies ¹¹⁴⁻¹¹⁵. Slightly different versions of the GFS exist^{79,104,115}, and a version based on the version revised by Berggren et al. ¹¹⁵, with ten items added, was used in the present study. The item on unemployment was excluded, as it was not relevant to the study group, and one item was removed due to an administrative error. In total, the GFS used included 30 items. In the GFS, the respondent estimates the degree of his/her fear reaction to a number of phenomena and situations in responding to the question “how fearful are you of the following objects or situations?”. The response options range from 1 (no fear) to 7 (extreme fear). An overall measure of fear propensity is obtained by calculating the respondent's mean score for all the questions (total item mean score) or the total GFS sum of scores. A decision was made to dichotomise at a cut-off level of the mean

total sum score plus one standard deviation to detect individuals with high general fear, as previously performed²⁶. The items where the respondent chose the response options of 6 or 7 were also regarded as indicators of extreme fear¹¹⁵. The internal consistency of the GFS in this study was analysed and resulted in a Cronbach alpha coefficient of 0.94.

Attitudes to dental care (Paper III)

Attitudes to dental care were measured using the Dental Beliefs Survey (DBS)¹¹⁶, a 15-item instrument developed in the US and also used in Sweden in a Swedish version^{80, 117}. It was developed to assess patient attitudes to how the dentist provides dental care and respects the patient and his or her preferences, thus indicating "dental beliefs" or attitudes to dental care. A factor structure of three factors (communication, trust, and fear of negative evaluation) has been suggested in a study by Kulich et al.¹¹⁸; however, the recommendation from this study was to use the DBS as a one-dimensional measure. Each item is a negatively worded statement, such as "Dentists do not listen properly to what I say". The answers are scored on a five-point Likert-type scale, where a score of 5 means "agree completely" and a score of 1 means "not at all true". This gives a sum score between 15 and 75, where a high score indicates poor confidence in the interaction with the dentist. In Norway, the mean DBS score was reported to be 25.2 for adults seeing a dentist⁷⁹. In the present study, it was decided to dichotomise at a cut-off level of the mean score plus one standard deviation, where scores above the cut-off were classified as highly negative dental beliefs. The internal consistency of the DBS scale in this study was analysed and resulted in a Cronbach alpha coefficient of 0.92.

Paper IV

In Paper IV, the data collection was made using questionnaires and clinical data. The questionnaire used included background data (gender) and dental anxiety. Clinical data were collected through clinical and radiographic examinations, where the

number of permanent teeth, clinical and radiographic caries, restorations, decayed and filled tooth-surfaces, plaque and gingivitis were recorded in a standardised protocol. If recent radiographs were available, they were obtained from each individual's general dentist. Dentists carried out all the examinations in 1973, 1983, 1993 and 2003. The clinical examinations were performed in a dental operator. The dentists, from the Department of Paediatric Dentistry, were calibrated prior to the study, according to the applied diagnostic criteria.

Dental anxiety

Dental anxiety was assessed using three single-item questions; *Do you feel uncomfortable before a dental visit*, *Do you feel afraid before a dental visit*, *Do you feel sick before a dental visit*. The response format was *yes* or *no*. The participants who answered *yes* to one or more of the three single-item questions were considered as dentally anxious.

Dental caries, clinical and radiographic

The number of permanent teeth was recorded. *Clinical caries* was examined on all tooth-surfaces available for clinical evaluation. Caries was then examined according to the criteria described by Koch ¹¹⁹, as follows; *Initial caries*: loss of mineral in the enamel, causing a chalky appearance but not clinically classified as a cavity. *Manifest caries*: carious lesions on previously unrestored tooth-surfaces that could be verified as cavities by probing and in which the probe stuck on probing the fissures using light pressure. *Radiographic caries* were recorded as lesions seen on the proximal tooth-surfaces as clearly defined reductions in mineral content. *Initial caries*: (i) the lesion was not deeper than two-thirds of the enamel, and (ii) the lesion was deeper than two-thirds of the enamel but did not involve the dentine. *Manifest caries*: the lesion extended into the dentine. Hereafter, caries refers to the sum of initial and manifest lesions, unless otherwise stated. For each tooth surface, the presence of any restoration was also recorded as filled tooth-surfaces. The number of decayed and filled permanent tooth-surfaces was calculated for the existing teeth.

Plaque

The presence of visible plaque was recorded for all surfaces after drying with air, according to the criteria for Plaque Indices, PLI 2 (moderate accumulation of plaque in the gingival sulcus and/or on the tooth and free gingival margin, perceptible with the naked eye), and PLI 3 (abundant plaque in the gingival sulcus and/or on the tooth and free gingival margin, and the interdental room filled with soft-touch coating) ¹²⁰.

Gingival status

The occurrence of gingival inflammation, corresponding to the Gingival Indices, GI 2 (moderate inflammation – redness, edema and glazing, bleeding on probing), and GI 3 (severe inflammation – marked redness and edema, ulceration with tendency to spontaneous bleeding), was recorded for all surfaces. Gingival inflammation was thus recorded if the gingivae bled on gentle probing ¹²¹.

For further information on the method used, see Hugoson et al. ^{107, 122}.

Statistical methods

All analyses were performed using the SPSS version 16.0 (Paper I), 19 (Papers II, III) and 21 (Paper IV) (IBM Corp., Armonk, NY, USA).

Descriptive statistics were presented as frequencies, percentages, means (*M*), medians and standard deviations (SD) in Papers I, II, III and IV, and graphically presented in Paper IV. In Paper I, the means and SD were complemented with the standard error of the means (SEM) and in Papers III and IV with 95% confidence intervals (CI).

The t-test was used to analyse differences between groups on variables measured on a continuous scale (Papers I, II, III). For skewed distributions implicating non-

normality, non-parametric tests were used (Paper IV). The Chi-2 test or Fisher's exact test were used for categorical variables (Papers I, II, III, IV, Thesis). Fisher's exact test was used when the conditions for the Chi-2 test were not met (Papers I, II, Thesis).

A one-way between-groups analysis of variance (ANOVA) was conducted when differences between more than two groups were tested (Papers II, III, thesis). A two-way between-groups ANOVA was conducted to compare the scores of several variables between different occasions and also to consider the impact of dental anxiety in any findings (Paper IV). The ANOVA included the Tukey HSD test for post-hoc comparisons (Papers II, IV).

Pearson's correlation coefficient was applied to analyse relationships between continuous variables (Papers I, II, III). Regression analyses were performed to verify the effects of various factors on dental anxiety (Papers I, II, III, IV, Thesis).

Cronbach's alpha was used for analysing the internal reliability of the different scales in the sample in Papers I, II and III. The Bonferroni adjustment was applied to assess statistical significance when a large number of comparisons were explored (Paper III).

Pairwise exclusion was used for missing data; hence, the number of observations varies in the respective analyses. The chosen significance level was $p < 0.05$. Dental anxiety was treated as the dependent variable.

Ethical issues

The data for Papers I, II and III were all collected at the same time during 2004 before the Act from 2008¹²³ had entered into force. In consultation with the Swedish Research Ethics Committee, it was decided that no application for ethical approval

was required, as the survey was anonymous and based on voluntary participation. However, when questions are asked about fear and mental health, there may be a risk that thoughts may be brought up because of the nature of the questions. The ethical implications of dental staff asking these questions could also be discussed. In accordance with the legislation governing research on humans, the Swedish Personal Data Act ¹²⁴, an assessment was made if the questionnaires contained something that could produce a harmful effect or have a negative impact on the privacy of the individuals, but it was concluded that the questionnaires did not constitute a risk of such a negative impact.

The part of the material for Paper IV (based on the Jönköping epidemiological studies) gathered in 1973, 1983 and 1993 required no ethical approval, as neither the new Swedish Act on Ethical Review of Research Involving Humans ¹²⁵ from 2003, nor the amendment in 2008 ¹²³, had entered into force. However, the Jönköping epidemiological study conducted in 2003 required such approval, and this was granted by the Ethical Committee at the University of Linköping, Linköping, Sweden.

In Papers I, II and III, one of the authors visited the selected classes and students in their classrooms. Approval to perform the data collection was given by each principal at each school. Consent was obtained from the study participants themselves, as the consent of a parent/guardian is not required when the study participants are 15 years of age or older, and if the survey does not include anything that may have a harmful effect or a negative impact on the individual's privacy ¹²⁶⁻¹²⁷. Prior to the different study occasions included in Paper IV, all of the individuals were personally invited to participate in the investigation through a personal written invitation. Consent was obtained, not only from the adolescents but also from parents/guardians, as a clinical and radiographic examination should be carried out¹²⁶⁻¹²⁷.

On the occasion of the data collection, a presentation about the purpose of the study and the importance of the youths' participation was given. It was also emphasised that their participation was voluntary and anonymous, which meant that the information requirement was met ¹²⁶⁻¹²⁷. In Paper IV, the adolescents were also informed about the details of the clinical examination procedures and about the questionnaire that they would be asked to fill in at the clinical examination. The adolescents' right to withdraw their participation at any time, without further explanation ¹²⁸, was also emphasised. It was stated that all material collected would be kept confidential in accordance with the confidentiality requirement ¹²⁶⁻¹²⁷, and that the research results would be filed in a secure manner.

The collected material has only been used for research purposes in accordance with the requirement of use ¹²⁶. However, the results of the clinical and radiographic examination were notified to the home clinic, so that the adolescents would not have to undergo their yearly examination all over again.

Biomedical ethics

The principle of autonomy may be considered fulfilled in the studies, as the youths were both asked about their participation and given the right to withdraw their participation at any time. The principle of beneficence is about preventing suffering, which is an extended purpose of this thesis, but also about not inflicting suffering, thus satisfying the principle of non-maleficence. Regarding the principle of justice, it coincides with the goal of health care and dental care, which states that the goal is health care on equal terms for the entire population ^{105, 129}, which is also the desire of the present thesis. The mentioned ethical principles should be applied to all human relationships. Some research ethics can also be associated with them and thereby achieve greater weight ¹²⁷.

Results

Papers I, II, III

Dental anxiety was analysed both as a continuous variable (DFS $M = 34.2$; $SD = 14.9$; 95 % CI, 32.2-36.2), and as a dichotomous variable using the established DFS cut-off of ≥ 60 , classifying 6.5 % of the participants as having dental anxiety. Girls reported more dental anxiety than boys ($p < 0.001$) (Paper I Table I).

About 90 % of the participants had visited the dentist during the past year. Table 3 shows the number of individuals who reported experiences of painful or unpleasant dental treatments at some level. More than half of the participants had experienced painful or unpleasant dental treatments, and just over one third reported a painful experience at the last dental visit. More girls than boys reported experiences of painful or unpleasant dental treatment ($p < 0.05$). Within the group with dental anxiety, there was a higher proportion of participants who reported exposure to pain at the last dental appointment or more than one painful or unpleasant dental treatment during childhood ($p < 0.01$). Almost 25 % of the participants had a family member with dental anxiety. More girls than boys reported having a family member with dental anxiety ($p < 0.001$). A greater proportion of those with dental anxiety also reported having a family member who is afraid of going to the dentist ($p < 0.05$) (Paper I).

Table 3. Number of individuals who reported experience of painful or unpleasant dental treatments at some level

| | | Experience of pain at the last dental visit | | | | Experience of painful or unpleasant dental treatments during childhood | | |
|-------|---|---|-----------|------------|------------|--|---|---------|
| | | No pain | Yes, some | Yes, a lot | Total | No painful or unpleasant dental treatments | One or more painful or unpleasant dental treatments | Missing |
| Girls | n | 59 (56%) | 38 (36%) | 8 (8%) | 105 | 33 (31%) | 71 (68%) | 1 (1%) |
| Boys | n | 82 (71%) | 26 (22%) | 8 (7%) | 116 | 56 (48%) | 59 (51%) | 1 (1%) |
| Total | n | 141 (64%) | 64 (29%) | 16 (7%) | 221 | 89 (40%) | 130 (59%) | 2 (1%) |

To complement the results, Chi-2 test and Fisher's exact test were also conducted in this thesis, but indicated no significant association between dental anxiety and the respective parents' educational level or dental anxiety and reported immigrant background. However, the results regarding the mother's educational level ($p<0.087$) and reported immigrant background ($p<0.064$) were close to significant. The impact of satisfaction with tooth appearance, and self-rated oral health, on the levels of dental anxiety were also explored. The participants were divided into three groups according to their satisfaction level (dissatisfied, neither dissatisfied nor satisfied, and satisfied). A one-way between-groups ANOVA was conducted (Table 4). There was a statistical difference at the $p<0.05$ level in the DFS scores for the three groups: $F(2, 213) = 12.9, p<0.001$. The effect size, calculated using eta squared, was 0.11. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for dental anxiety for the dissatisfied group was significantly higher than the scores for the other two groups. The satisfied group and the group that was neither dissatisfied, nor satisfied did not differ from each other.

Table 4. Impact of students' satisfaction with tooth appearance on levels of dental anxiety (DFS)

| | <i>n</i> | <i>M</i> | <i>SD</i> | 95 % CI |
|------------------------------------|----------|----------|-----------|----------------|
| Dissatisfied | 40 | 44.3 | 20.5 | 37.8 – 50.8 |
| Neither dissatisfied nor satisfied | 53 | 33.2 | 12.3 | 29.8 – 36.6 |
| Satisfied | 123 | 31.3 | 12.2 | 29.2 – 33.5 |
| Total | 216 | 34.2 | 14.9 | 32.2 – 36.2 |

As a further complementary analysis, the impact of the student's self-perceived dental health on levels of dental anxiety was explored. A one-way between-groups ANOVA was conducted between the three groups, with the options "very good", "good" and "bad" (Table 5). There was a statistical difference at the $p<0.05$ level in

the DFS scores for the three groups: $F(2, 213) = 22.5, p < 0.001$. The effect size, calculated using eta squared, was 0.17. Post-hoc comparisons using the Tukey HSD test indicated that the mean score for dental anxiety for the group that perceived their dental health as being bad was significantly higher than the scores for the other two groups. The two groups “very good” and “good” did not differ from each other.

Table 5. Impact of students’ self-perceived dental health on levels of dental anxiety (DFS)

| | <i>n</i> | <i>M</i> | <i>SD</i> | 95 % CI |
|--------------|----------|----------|-----------|----------------|
| Very good | 62 | 30.0 | 11.4 | 27.1 - 32.8 |
| Good | 143 | 34.1 | 13.5 | 31.9 - 36.3 |
| Bad | 11 | 59.7 | 23.7 | 43.8 - 75.6 |
| Total | 216 | 34.2 | 14.9 | 32.2 - 36.2 |

The correlation analyses in Papers I, II and III revealed associations between dental anxiety and most investigated psychosocial factors; that is, the temperaments of emotionality (positive), activity (negative) and impulsivity (positive) (Paper I Table IV), general anxiety (positive) and depression (positive) (Paper II Table 4), general fearfulness (positive), and attitudes to dental care (positive) (Paper III).

Multivariate models were applied in Papers I, II and III, to illuminate different aspects of the predictive ability psychosocial factors have on dental anxiety, while adjusting for other independent variables. In Paper I Table V, the different dimensions of temperament were analysed. These factors increased the amount of variance explained in the model by 6 %, a statistically significant change. The overall model explained 35 %. Two dimensions of temperament, activity and impulsivity, were significantly correlated to dental anxiety. Paper II Table 6, evaluated the impact of general anxiety and depression, using the Hospital Anxiety and Depression Scale, on dental anxiety. The predictive ability of the HADS was in the same range as that of the temperament dimensions, capturing about 6 % of the variability in dental

anxiety. Both general anxiety and depression were significantly correlated to dental anxiety. Paper III clarified the impact of general fearfulness and attitudes to dental care on dental anxiety. In the standard multivariate regression model (Paper III Table 2), the two main regressors, general fearfulness and attitudes to dental care, were the only independent variables that showed a statistically significant correlation to dental anxiety. Neither gender, nor the socio-demographic measure, was found significant in the model. The measure “general fearfulness” alone explained more than 37 % of the variability in dental anxiety, and the full model as much as 46 %, as shown by the adjusted R-square. The statistical model implicated that general fearfulness was the single most predictive variable of dental anxiety of the tested indices. Other strong independent variables in the three reported multivariate models were gender and questions about pain; previous pain experiences during dental care treatment and pain at the last dental appointment.

In an updated multivariate model, all of the psychosocial factors from the multivariate models conducted throughout Papers I, II and III, were included, together with gender and the pain questions, in a hierarchical multiple regression analysis; i.e., the variables that were previously shown to statistically significantly predict dental anxiety. The results are shown here in this thesis (Table 6) and not in any of Papers I, II, III.

Table 6. Hierarchical multiple regression analysis regarding individual factors, situational factors and dental anxiety (DFS). The dependent variable is dental anxiety.

| Model | | Standardised Beta | <i>t</i> value | <i>p</i> value |
|-------|---|-------------------|----------------|----------------|
| 1 | Gender | -0.26 | -4.28 | 0.000 |
| | Pain at the last dental appointment | 0.34 | 5.56 | 0.000 |
| | Previous painful or unpleasant dental treatment | 0.21 | 3.39 | 0.001 |
| 2 | Gender | -0.07 | -1.13 | 0.260 |
| | Pain at the last dental appointment | 0.17 | 3.15 | 0.002 |
| | Previous painful or unpleasant dental treatment | 0.14 | 2.69 | 0.008 |
| | EASI Activity | -0.06 | -1.01 | 0.315 |
| | EASI Impulsivity | 0.04 | 0.63 | 0.531 |
| | General anxiety | 0.02 | 0.34 | 0.732 |
| | Depression | 0.02 | 0.36 | 0.716 |
| | General fearfulness | 0.36 | 5.15 | 0.000 |
| | Attitudes to dental care | 0.27 | 4.73 | 0.000 |

Preliminary analyses were performed to ensure no violation of the assumption of multicollinearity. Gender and previous pain were entered at Step 1, explaining 28 % of the variance in dental anxiety (Model 1). After entry of the psychosocial factors: EASI-activity, EASI-impulsivity, general anxiety, depression, general fearfulness and attitudes to dental care at Step 2, the total variance explained by the model as a whole was 53 % ($F(9, 196) = 24.7; p < 0.0001$) (Model 2). The different psychosocial factors explained an additional 25 % of the variance in dental anxiety, after

controlling for gender and previous pain (R^2 change = 0.25, F change (6, 196) = 17.4; $p < 0.0001$). In the final model, pain at the last dental appointment, previous painful or unpleasant dental treatment, general fearfulness and attitudes to dental care were statistically significant, of which general fearfulness and attitudes to dental care made the strongest unique contribution. Gender, the two temperament dimensions (activity and impulsivity), general anxiety and depression were not found significant in this model.

In Paper III Table 3, a composite index of general fearfulness and attitudes to dental care revealed information concerning their relationship with dental anxiety. Low scores on general fearfulness and attitudes to dental care versus high scores on both measures indicated a gradient of increasing scores of dental anxiety from a mean of 29 up to almost 64. Being prone to other general fear situations and having more negative attitudes to dental care situations clearly increased the likelihood of reporting high dental anxiety.

Paper IV

The proportion of individuals considered to be dentally anxious during the 30-year period showed a statistically significantly decreasing gradient ($p < 0.0001$), from 38.1% in 1973 to 12.8 % in 2003 (Paper IV Figure 1). More girls than boys reported dental anxiety, with the differences in 1983 and in 1993 being significant ($p < 0.005$). Answers to all three questions were received from 97% of the patients in 1973, from 99% in 1983, from 81% in 1993 and from 98% of the patients in 2003, with a distribution of answers and affirmative answers according to Table 7.

Table 7. Distribution of all answers (n) to the different questions concerning dental anxiety and the distribution of the number of affirmative answers in Paper IV

| | | <u>Year of the survey</u> | | | | |
|--|--------------|---------------------------|------|------|------|-------|
| | | 1973 | 1983 | 1993 | 2003 | Total |
| <i>Do you feel uncomfortable before a dental visit?</i> | Yes | 30 | 26 | 17 | 10 | 83 |
| | No | 67 | 81 | 69 | 84 | 301 |
| | Total | 97 | 107 | 86 | 94 | 384 |
| <i>Do you feel afraid before a dental visit?</i> | Yes | 9 | 6 | 2 | 4 | 21 |
| | No | 89 | 100 | 84 | 90 | 363 |
| | Total | 98 | 106 | 86 | 94 | 384 |
| <i>Do you feel sick before a dental visit?</i> | Yes | 2 | 2 | 0 | 1 | 5 |
| | No | 95 | 105 | 83 | 93 | 376 |
| | Total | 97 | 107 | 83 | 94 | 381 |
| | | | | | | |
| <i>Distribution of the number of affirmative answers</i> | 0 | 60 | 78 | 68 | 82 | 288 |
| | 1 | 34 | 23 | 15 | 10 | 82 |
| | 2 | 3 | 5 | 0 | 1 | 9 |
| | 3 | 0 | 0 | 0 | 1 | 1 |
| | Total | 97 | 106 | 83 | 94 | 380 |

Concerning the relationship between dental anxiety and oral health (Paper IV Table 3), there were, with regard to filled tooth-surfaces, a variable reflecting both poor oral health as well as former invasive dental treatment, significant differences ($p < 0.05$) between those with and without dental anxiety in three out of four examination years (apart from 1993). The mean scores of filled tooth-surfaces were higher among those with dental anxiety. The mean number of this variable declined during the four examination years. Concerning decayed tooth-surfaces there was a

significantly ($p<0.05$) higher mean number within the group with dental anxiety in 1973. As a result, the mean number of decayed tooth-surfaces during the period declined. Concerning the relationship between dental anxiety and the other oral health variables, plaque and gingivitis, no significant differences could be detected between those with and without dental anxiety. The mean number of surfaces with plaque declined during the four examination years, except for 1993, while surfaces with gingivitis showed a slight declining trend.

In the multivariate logistic regression performed (Paper IV Table 4), three independent variables were included, based on previous bivariate analyses. The variable “filled tooth-surfaces” was divided into three categories. The model as a whole explained 16 % of the variability in dental anxiety. Gender and time both made a unique, statistically significant contribution ($p<0.01$) to the model and were strong predictors of dental anxiety. Girls were more than three times more likely than boys to report dental anxiety, with an odds ratio of 3.18. The time trend indicated that the later the examination year, the smaller the risk of dental anxiety. The variable “filled tooth-surfaces” was not significant in the model; however, the categories indicated a gradient in the odds ratios. The larger the number of filled tooth-surfaces, the higher was the predicted risk of dental anxiety, where the category ≥ 3 fillings was almost significant ($p<0.067$).

Discussion

The main results of this thesis revealed in a final analysis concerning gender, previous pain experience and psychosocial factors, that previous painful and unpleasant dental treatment, general fearfulness and attitudes to dental care have statistically significant associations with dental anxiety in 15-year-olds. In the analysis, general fearfulness and attitudes to dental care made the strongest unique contribution. This corroborates the suspicion that during adolescence, both individual vulnerability and negative experiences of dental care are associated with dental anxiety. The combination of these risk factors may enhance the risk of developing dental anxiety. A trend analysis over a 30-year period showed a statistically significantly decreasing gradient of the prevalence of dental anxiety. Another interesting finding concerned filled tooth-surfaces, a complex measure indicating different aspects of dental care, such as vicarious experiences of dental care; the more restorative treatment, the stronger the association with dental anxiety.

Materials and methods

Design

This thesis is based on cross-sectional epidemiological studies, including one with a repeated design. Cross-sectional designs have been found to be useful to identify correlates and associated characteristics of interest. One important issue when using this design is that the capacity to prove causal relationships is very weak ¹³⁰.

Participants

Papers I, II, III, IV were based on a random samples of 15-year-olds in Jönköping. The desire was to get as representative a sample as possible, which is a fundamental

requirement in order to reach statistical conclusions. In Papers I, II and III, randomisation was achieved by using two-stage cluster sampling, which may influence the result to some extent, as large groups are selected by classes. The selection procedure including the cluster-design was tested for differences between schools above individual variability. Using the multilevel diagnostic procedure in SPSS, differences in dental anxiety between schools based on levels of Socio Economic Status (SES) were tested. Levels of dental anxiety in schools did not vary significantly due to SES-level indicating adequate assumption of estimating the measures of centrality and dispersion on an individual level. Moreover, the randomization obtained may be considered good, as the adolescents were selected in two steps. The cross-sectional study design, with a two-stage cluster sampling in which the respondents were visited, facilitated the study and a high participation rate was achieved. The sample size may also be considered to be relatively large, as approximately 15 % of the total population of 15-year-olds in Jönköping in 2004 were included. In Paper IV, the randomisation process was conducted by a registrar at the County Council, and the randomness may be considered good. In 1973, however, the randomisation process may be considered to be less good, as the participants were then listed in chronological order according to their date of birth and the first 100 individuals who accepted to participate were included in the study. The reasons why approximately one fifth of the invited adolescents in the different examination years in Paper IV declined to participate may be discussed. According to previously published information ¹⁰⁷⁻¹¹⁰ about the reasons for not taking part on the different occasions, common responses were “no special reason”, “not interested”, and “no time”. The reasons for non-participation may have affected the results. As previously stated, adolescents with dental anxiety more often miss dental appointments ⁹³⁻⁹⁴. Some of the non-participants may be found in this group. Specifically, the sample in paper IV would have benefitted from a larger size. However, this age cohort was one of several age categories in the original study, ensuring reasonable statistical power to the total sample.

All of the adolescents present in Papers I, II and III answered the questionnaires, although not all questions. The number of non-respondents in Paper IV differed between the different examination years. The number of skipped questionnaires was higher among the adolescents in 1993, especially concerning the questions regarding dental anxiety, which may have influenced the results. However, the reason for this is difficult to speculate on.

Data collection

Papers I, II and III use the same data material, while paper IV is using another data material and can be considered to be different from the others. Paper IV is, however, well linked to Papers I, II and III, as it highlights the prevalence of dental anxiety over a long period of time in the same age group and in the same part of the country. The connection with experience of dentistry is also raised in the various studies (Papers I, II, III, IV), but in slightly different ways. One strength of Paper IV is that the same method of measuring dental anxiety was used at all times. In this way, Paper I, II, III and IV complement each other.

Since part of the aim of this thesis was to examine the association between dental anxiety and psychosocial factors, the research focused on psychometrics. The data are collected systematically, then quantified, summarised in statistical form and analysed using quantitative methods ¹³¹, which makes questionnaires suitable.

Papers I, II and III used the DFS instrument, which has shown good stability, reliability ^{31, 132} and acceptable validity ¹³² when measuring dental anxiety. The instrument has also been used in Scandinavia for several years ^{26, 93, 133-135} and has been validated in a Norwegian sample ⁷⁹. The DFS is the preferred clinical instrument for measuring dental anxiety and was regarded as the clinical instrument that best measures a threatening sensation of pain and unpleasant specific dental procedures ⁸¹. Its usefulness to distinguish those patients who perceive themselves as having dental anxiety from those who regularly seek dental care has been

established ⁷⁹. The internal consistency of the DFS in the present sample was proven to be very good, which may be a direct effect of the scale originally being developed and used on young people between 12 and 21 years of age ¹³⁶. When using DFS scores with definite limits in this thesis, a DFS result of 60 points or more was assessed as dental anxiety which is accepted in previous studies ^{20, 26, 93, 111-112, 134}. The fact that the difference between dental anxiety or no dental anxiety is only one point could be discussed. It is, however, necessary to adhere to the accepted limits in order to be able to compare the results with other studies. However, when analysing the DFS-data with multivariate methods the scale was used as a continuous measure.

In Paper IV three single item questions, with a yes (1)/no (0) scale, were used to capture the level of dental anxiety. These questions were collapsed into one index. Measuring dental anxiety with a few questions are acceptable from a methodological point of view inasmuch as it is impractical to apply psychometric tests, like DFS with a large number of items, in studies like the Jönköping epidemiological studies with both clinical and questionnaire data being time consuming for the participants. The single-item Dental Anxiety Question may thus be preferable and has also been used previously ^{22, 24, 34-35}, and has been found to have reliable and valid properties³⁴⁻³⁵.

The degree of the various individual factors in Papers I, II and III were measured with instruments that have all been frequently used recently (EASI ^{49, 52, 137-142}, HADS^{63, 143-146}, GFS ¹¹⁴⁻¹¹⁵, DBS ^{79-80, 117, 147}). The HADS has been found to be a reliable instrument for identifying anxiety disorders and depression in populations¹⁴³⁻¹⁴⁵, and appears to differentiate well between anxiety and depression ^{63, 146}. The reliability also applies to adolescents and its brevity makes it useful for screening and in clinical settings with adolescents ¹⁴⁸. The reliability and validity of the DBS have been reported to be satisfactory ¹⁴⁷ and the instrument has also been validated in a Norwegian sample ⁷⁹. The relatively low Cronbach alpha values obtained in the short scales are not considered as aggravating or surprising. In short scales; that is,

scales with fewer than ten sub-questions, it is common to obtain low Cronbach alpha values, such as 0.5 ¹⁴⁹.

A common feature of the questionnaires used—regarding participant characteristics, the DFS, the DBS and the single-item questions concerning dental anxiety—is that some of the dentistry-related questions are asked in such a way as to only inquire about visits to the dentist. The relevance of this may be questionable, as more professionals performing dental care are involved in dentistry and the patients' attitudes towards them may differ. Hakeberg et al. ¹⁵⁰, for example, revealed that patients reported higher dental anxiety levels for dentist treatment as compared with dental hygienist treatment. Öhrn et al., ¹⁵¹ concluded that participants in general had a less negative attitude towards dental hygienists compared with dentists. The questionnaires used in Öhrn et al. were the revised Dental Beliefs Survey and the Dental Hygienist Beliefs Survey. There was only one item where the attitude was more negative towards dental hygienists than towards dentists. This was the assertion “dental hygienists say things to make me feel guilty about the way I care for my teeth” ¹⁵¹. This difference in how the different professions are perceived should be considered in future research as more dental hygienists are being employed and becoming more involved in dental care.

Paper IV was a part of a series of epidemiological studies conducted by calibrated examiners with considerable experience of clinical investigations.

Considerations concerning the results

Dental anxiety often starts in young adolescence and may constitute a major problem for patients and dental care providers, with missed appointments and problems with treatment and oral health. This thesis increases the knowledge of the individual, situational and environmental factors for the initiation and maintenance of dental anxiety. Findings have revealed the relationship between dental anxiety and oral

health and whether and how the prevalence of dental anxiety among 15-year-old adolescents has changed over time.

Dental anxiety and experiences of dental care

Experiences of dental care may mirror different aspects. Firstly, it may indicate the quality of the communication between the patient and the dental care provider in the dental care situation. This will be further discussed under the heading “Dental anxiety and psychosocial factors”. Importantly under the actual heading though, is the experience of the dental care situation, which mirrors what has actually been done. Carrillo-Diaz et al.⁴⁵ showed that having received fillings is significantly associated with the perceived probability of negative dental events. Previous studies have shown that dental anxiety really is greater among individuals with more treatment experience^{17, 26-27}, such as restorative treatment²⁶⁻²⁷. Thus, the variable “filled tooth-surfaces” in Paper IV is interesting. The multivariate analyses performed indicated, even if it was not significant, that the larger the number of filled tooth-surfaces, the higher the predicted risk of dental anxiety. This result indicates, as revealed by the results of Skaret et al.²⁶ and Locker et al.³⁶, that invasive dental treatment experience, here measured in terms of restorative treatment or filled tooth-surfaces, could play a significant aetiological role with respect to the onset of dental anxiety. However, this is only speculation, because of the difficulty of determining the direction of causality between dental anxiety and filled tooth-surfaces, due to the cross-sectional design of the present study.

Experiences of dental care may also indicate possible experiences of painful and stressful dental care, maybe while making a filling. Concerning this matter, the results in Papers I and II, like several other studies^{17, 20, 26, 71-73}, revealed associations between experience of pain and dental anxiety. This was a consistent result, also after adding other variables to the analyses (Paper I, II). The literature^{17, 20, 26-27, 71-73} also reveals such findings, irrespective of the dental care service settings in different countries.

Positively, the results in Paper I showed a high dentistry attendance rate, which can probably be attributed to the statutory child and adolescent dental care available in Sweden. The few individuals who nonetheless failed to visit the dental service have apparently fallen outside of the system for some reason. A major cause of missed or cancelled dental appointments ⁹³ or irregular dental attendance ⁹⁴ may be dental anxiety. Carrillo-Diaz et al. ⁴⁵ showed that regular dental visits, as well as dental treatment, may influence cognitive elements associated with dental anxiety in children in different ways. The results showed that children who only sporadically visited their dentist reported higher levels of dental anxiety than those who attended more regularly. A higher frequency of regular innocuous dental visits was associated with less dental anxiety and a decreased belief in the probability of negative events occurring during treatment ⁴⁵.

Dental anxiety and psychosocial factors

Temperament has been associated with dental anxiety in children ⁴⁸⁻⁵⁰, in young adults ⁵¹ and in adults ⁵². In Paper I, dental anxiety was found to be correlated to three of the temperament dimensions; activity (negative) emotionality (positive), and impulsivity (positive). Previous studies have shown that shyness ^{48, 50}, and shyness in combination with negative emotionality, could be a contributing factor to the development of dental anxiety in children ⁴⁸. Paper I shows a slightly different result, which should possibly be interpreted with caution, as the group with dental anxiety was relatively small. The negative correlation between dental anxiety and activity that emerged did not find equivalence in other studies, but is consistent with the significantly higher mean value concerning the activity of the adolescents with no dental anxiety (Paper I Table 3). This may also be due, in part, to more boys being found to not have dental anxiety. Boys were shown to have higher values than girls concerning activity (Paper I Table 2). This higher value for the boys; albeit not significant in the present study, was shown to be consistent with the results of Buss and Plomin ⁶¹. The positive correlations concerning emotionality and impulsivity may coincide with the girls being overrepresented with respect to dental anxiety.

Girls were shown to have higher values than boys concerning both emotionality and impulsivity (Paper I Table 2) which may have affected the results. This result coincides well with that of Lundgren et al.⁵², who showed that patients with higher levels of dental anxiety had significantly higher values relating to both emotionality and impulsivity than patients without dental anxiety.

Based on former results, it has been suggested that psychological variables contribute to the development of dental anxiety³⁶, and that high rates of psychological disorder are characteristic of those with high levels of dental anxiety. It has also been suggested that dentally anxious individuals with psychological disorders are more likely to maintain their anxiety over time³⁹. In agreement with these studies, the results in Paper II conclude that dental anxiety was significantly correlated with both general anxiety and depression. An unexpected result, however, was that the correlation was valid for the whole group, as well as for boys, but not for the girls, where there was no correlation with depression (Paper II Table 4). When analysing this result it is interpreted as being due to boys having lower values both in terms of general anxiety and depression, and dental anxiety. Girls, however, have corresponding figures for depression but higher values for both general anxiety and dental anxiety (Paper II Table 1).

In Paper III, general fearfulness and dental anxiety were related, as previously reported^{64-66, 152}. Population-based studies on children 4–14 years of age have reported a relationship between general fear and dental anxiety^{16, 64-65, 152}, and this has also been reported for 18-year-old subjects²⁶. In Paper III Table 1, dental anxiety was related to higher ratings on fear items linked to dental treatment (dental injections, hypodermic needles, blood, pain, and suffocating), as previously reported in an adult sample¹⁵³, but also to fears unrelated to dental treatment (rats, spiders, and arguing with parents). This was the case also after application of the Bonferroni correction to reduce the risk of type 1 errors. In an adult sample, Moore et al.⁸¹ also found that dental anxiety was associated with specific fears, both related and unrelated to dental treatment. The strong correlation found between dental anxiety

and general fears corresponds most closely to that reported for 18-year-old subjects²⁶. Studies on adults have reported a relationship between general fearfulness and dental anxiety in both clinical^{104, 114} and population-based¹⁵⁴⁻¹⁵⁶ samples. High general fearfulness has been found to predict a poorer outcome of psychological treatment for dental anxiety in adults²⁸. The difference between genders, with girls reporting higher fear levels and more extreme fears, was consistent with previous studies^{17, 20, 26, 65, 157-160}.

Attitudes to dental care, measured in Paper III, include the parts “lack of control in the dental treatment situation”, and “perceived negative behaviour of the dental clinician”. Attitudes to dental care include the reaction to the communication in the dental care situation between the patient and the dental care provider. Interpersonal relationships in dentistry have been shown to correlate with measures of dental anxiety⁷⁹⁻⁸¹. Former studies⁷⁴⁻⁷⁶ also argue that the behaviour of the dental clinician strongly affects the patient’s sense of control and security in the dental situation. Consequently, dental anxiety may be acquired after the patient has experienced a lack of control in the dental treatment situation^{20, 71-73}. This agrees well with the results in Paper III, where high dental anxiety correlated with more negative attitudes to dental care. Similar correlations, as found in Paper III, have been reported for 13- to 15-year-old subjects²⁰ and for 18-year-old subjects²⁶, using the same measures of dental anxiety and attitudes to dental care. Also, in a study on adults⁷⁹, the level of attitudes to dental care in the dental anxiety group and in a reference group were similar to those reported in the dental anxiety and the non-dental anxiety groups in Paper III. There were no gender differences in the scores in Paper III, a result similar to a previous study²⁶, with the exception of one study where boys reported slightly more negative attitudes to dental care²⁰.

Concerning family members being afraid of going to the dentist, differences were found in Paper I between the adolescents with and without dental anxiety, with a higher proportion among those with dental anxiety who stated having a family member who was afraid of going to the dentist. This corroborates previous findings

concerning children, where a relationship has been found between dental anxiety and their parents ^{71, 86-87}, but undermines the results of Folayan et al. ⁸⁸, who found no correlation between dental anxiety in the parents and their child.

Dental anxiety, experiences of dental care and psychosocial factors

A series of multivariate models were used throughout Papers I, II and III. An interesting finding in the hierarchical multiple regression analysis in Paper I was that, although two temperamental dimensions showed significant correlations with dental anxiety, the strongest significant correlations were shown by pain at the last dental appointment and previous painful or unpleasant dental treatments. However, as far as the author of this thesis knows, other studies ^{48, 50-52}, which intended to look at the relationship between temperament and dental anxiety and found them associated, have not controlled statistically with multivariate analysis for the effects of previous experiences of pain during dental care. The hierarchical multiple regression analysis performed in Paper II revealed a result pointing in the same direction. The results showed that both general anxiety and depression were significantly correlated to dental anxiety. However, the analysis revealed even stronger correlations between gender and the two variables concerning previous pain. This result contributes to the hypothesis that the conditioning variables (in this thesis, previous pain), in addition to psychological variables, also contribute to the development of dental anxiety in adolescents, a result previously seen in another study ³⁶. The standard multivariate regression model in Paper III differed from the previous models in several ways. The two main regressors, general fearfulness and attitudes to dental care, were the only independent variables that showed a statistically significant correlation to dental anxiety. Neither gender, nor the socioeconomic measure, was found to be significant in the model. The statistical model implied that general fearfulness was the single most predictive variable of dental anxiety of the tested psychosocial indices.

The updated multivariate model shown only in this thesis, concerning the psychosocial factors, gender and pain questions previously being found to have a

significant impact on dental anxiety in Papers I, II and III, revealed important and interesting findings. The analysis differed from the previous models applied in Papers I, II and III, in several ways. Gender, the two temperament dimensions of activity and impulsivity, general anxiety and depression, were not found significant, a result not consistent with previous analyses applied in Papers I and II. The other variables however; pain at the last dental appointment, previous painful or unpleasant dental treatment, general fearfulness and attitudes to dental care were statistically significant, a result consistent with previous analyses in Paper I, II and III. General fearfulness and attitudes to dental care made the strongest unique contribution.

The group with both negative attitudes to dental care and high general fearfulness represented only a small portion of the sample, but their dental anxiety level was above the clinical cut-off point for dental anxiety. Skaret et al.²⁶ revealed in a stepwise regression model, that out of nine variables believed to have an association with dental anxiety, general fearfulness and attitudes to dental care showed a significant relationship. The same study also showed that dental anxiety might be acquired after the young adult has been exposed to painful dental experiences. Students who reported more than one previous experience of pain were 9.9 times more likely to report high dental anxiety than the rest of the group²⁶. Bergius et al.¹⁷ also revealed higher scores of dental anxiety among the adolescents with more experience of painful treatment.

The results of Papers I, II, III, Skaret et al.²⁶ and Bergius et al.¹⁷, indicate that these risk factors may contribute, in part and independently, to dental anxiety. However, the updated multivariate model in this thesis corroborates the suspicion that during adolescence, both individual vulnerability (in terms of general fearfulness) and negative experiences of dental care (both in terms of previous painful experiences and negative attitudes to dental care) are associated with dental anxiety. The combination of these risk factors may enhance the risk of developing dental anxiety.

Dental anxiety and oral health

Dental anxiety has previously been shown to be associated with poor oral health ^{64, 95-96}. The two complementary tests (one-way between-groups ANOVA) performed in the thesis showed an association between negative self-perceived dental health and dental anxiety, as well as between own satisfaction with tooth appearance and dental anxiety. In Paper IV, no significant differences regarding the surfaces with gingivitis could be detected between those with and without dental anxiety, a result consistent with Taani et al. ²¹. Regarding whether dental anxiety is likely to be a significant predictor of dental caries incidence or not, studies performed on adolescent and young adult samples have produced divergent results ^{21, 51, 103}. The results of Taani et al. ²¹ showed no association between dental anxiety and dental caries in an adolescent sample, a result consistent with the result of Thomson et al. ⁵¹ in a young adult sample. However, the results of Kruger et al. ¹⁰³ offered support for a relationship between dental anxiety and caries. In Paper IV, the results revealed that for decayed tooth-surfaces, there were only significant differences between the adolescents with and without dental anxiety in the examination performed in 1973.

The variable “filled tooth-surfaces” may mirror several aspects. The previous discussion, under the heading “Dental anxiety and experiences of dental care” in this thesis, focused on filled tooth-surfaces and experience of dentistry. Here, the variable “filled tooth-surfaces” are linked to oral health as a definite measure of oral disease over time. Concerning this variable, there were significant differences between those with and without dental anxiety in three out of four examination years in Paper IV, and this result is supported in a study by Klingberg et al. ⁶⁴. The result was, however, contradictory to the results of Thomson et al. ⁵¹, who concluded that there were no significant differences between young adults with and without dental anxiety in mean scores of filled tooth-surfaces.

Changes in the prevalence of dental anxiety over time

Epidemiological studies ¹⁵⁻²⁷ performed worldwide over the years have shown that the prevalence of dental anxiety in adolescents ranges between approximately 3 and 19 %, irrespective of the measurement used. In studies ^{19-21, 26} using the DFS as the questionnaire, the prevalence is about 6-19 % in the age groups 12-20 years. The results of Papers I, II and III, using the DFS, was in good agreement with de Moraes et al. ¹⁹, who reported the lowest prevalence. The other studies ^{20-21, 26} all showed higher rates of dental anxiety, with Skaret et al. ²⁶ scoring highest. Paper IV showed a higher prevalence than other studies ^{22, 24} using single-item questions, which resulted in prevalence figures of 3-10 % in the age groups 11-18 years.

The fact that the results concerning prevalence in Papers I and IV are different from those of other studies, even though the same measurement method was used, is not all that remarkable. It may be due to different countries with different samples, diverse cultural characteristics, and different dental care systems. However, the result that there is a difference in the prevalence of dental anxiety between Paper I and Paper IV (the part from 2003) may seem remarkable, as the selection is made in the same part of the country and of adolescents of the same age and at almost the same time (year). The difference is, however, interpreted as being due to the sample sizes and the different ways to measure dental anxiety. In Paper I, a validated instrument (DFS) was used to measure the level of dental anxiety ³¹. In Paper IV, however, a single-item question was used, where reporting “feeling uncomfortable before a dental visit” was enough to be classified as having dental anxiety. It could be discussed whether an affirmative answer to this question really indicates dental anxiety in all cases. This item was also the question with the most affirmative answers. However, the combined results of Papers I, II, III and IV, or rather the result from Paper IV, are still highly relevant, as they provide a picture of the changes in the prevalence of dental anxiety over time.

Consistent with other studies ^{15, 17, 19, 21- 22, 25-27}, there were more girls than boys in Papers I, II, III and IV who reported anxiety, in terms of prevalence. In Paper IV,

girls were more than three times more likely than boys to report dental anxiety. In Paper I, II and III, the girls also reported more anxiety than the boys in terms of higher scores, a result coinciding with other studies ^{16-19, 23, 26}. This can be interpreted as girls and boys differing in their cognitive processing of potentially stressful dental events ⁴⁵⁻⁴⁶. One explanation is that girls tend to perceive possible negative dental events in a more aversive or catastrophic way than boys ⁴⁵. Another explanation could be that females have been found to overestimate the probability of danger and anticipate lower self-efficacy compared with males. The inability to cope appropriately with these cognitive appraisals would then trigger a greater anxiety response ⁴⁶.

The trend analysis performed in Paper IV showed a statistically significantly decreasing gradient in dental anxiety prevalence over time, and the multivariate analyses indicated that the later the examination year, the smaller the risk of dental anxiety. This is similar to some previous studies ^{17-18, 20-22} looking at adolescents of a similar age (about 15 years). However, previous studies have been made in different parts of the world and with different measurement methods. A strength of Paper IV is, therefore, that it shows an overall result from repeated cross-sectional studies conducted with the same method of measurement and in adolescent samples of the same age and in the same region.

It may be speculated what the reason may be for the decreased prevalence of dental anxiety among 15-year-olds over time. One reason may be improvements in oral health among adolescents, leading to less invasive dental treatment. Reports from the Swedish National Board of Health & Welfare show that the dental health among children and adolescents has steadily improved ¹⁶¹⁻¹⁶³. The proportion of 15-year-olds in Jönköping with caries and filled tooth-surfaces has declined in recent decades¹²². Another reason may be improvements in dental care, for example, with regard to the communication skills of the personnel. A relationship based on empathic understanding, warmth and respect may reduce a patient's fear ¹⁶⁴ and presumably also the risk of dental anxiety. The recall intervals may be another

reason. A higher frequency of dental visits is associated with less dental anxiety ⁴⁵, especially if the reason for the visits are something else than restorative ²⁶⁻²⁷ or surgical treatment ²⁶.

Conclusions

- Dental anxiety correlated significantly with three of the temperament dimensions; emotionality, activity and impulsivity. Reported pain or unpleasant experiences during dental care treatment were clear predictors concerning dental anxiety.
- Both symptoms of general anxiety and depression were significantly correlated with dental anxiety after controlling for other potential risk factors.
- Dental anxiety was strongly correlated both with general fearfulness and with attitudes to dental care, where the strongest predictor of dental anxiety was general fearfulness.
- A trend analysis from the 30-year period showed a statistically significantly decreasing dental anxiety prevalence gradient. More girls than boys reported dental anxiety. There were significant differences between those with and without dental anxiety concerning filled tooth-surfaces over the period and caries experience in 1973. No differences were found concerning plaque/gingivitis in any of the study years.

Future directions

Taken together, this thesis shows that dental anxiety in 15-year olds is related to both individual, situational and environmental factors. The individual care plays an important role where dental patients, at the age of 15 and younger, often are dependent on the adults around them, bringing their actions at times when they may feel vulnerable. The situational factors, here in terms of negative experiences of dental care, are of course closely connected to the individual factors, and can be hard to separate. The individual vulnerability may also make the adolescents more sensitive and more prone to experience pain and to get a feeling of lack of control in the dental treatment situation. The dental care situation around the individual plays an important role and it is crucial for the dental staff to succeed in creating a positive, trusting, approving and supportive atmosphere with kindness, calmness, and patience, where the communication and interaction skills play a particularly important role ¹⁶⁵. With this in mind it is of utmost importance to prevent pain during dental care procedures. Maybe there is a need for dentists and dental hygienists to learn more about the association between pain experiences, dental treatment and dental anxiety. The dental staff has to ensure that the adolescent dental patients are not exposed to treatment that will evoke pain. Future research of interest may be how different ways of administration of local anaesthesia can alter perception of pain and levels of dental anxiety.

The results of this thesis concludes not only the need of achieving a positive and safe treatment, but also the importance of a good oral health to prevent negative experiences of dental care. The more restorative treatment, the stronger the association was with dental anxiety. Positively, the mean number of filled tooth-surfaces declined during the three decades, which has been found in several publications. More interestingly, dental anxiety showed in the present research a clear declining change over time which has not been reported before in the scientific literature. To further analyse important predictive parameters associated with this decline of dental anxiety, research projects with prospective designs must be initiated

in order to clarify different factors and their respective causative effects on dental anxiety. The thesis has given some insight into which factors are most important, i.e. general fearfulness, pain experiences and individuals' attitudes to dental care. Recently, however, The Swedish National Board reported about social inequalities in dental health among children and young people ¹⁶⁶. The risk of tooth decay, and thus future fillings, is clearly increasing at poorer social and economic conditions. Several Swedish county councils have already drawn up actions where resources are allocated based on the composition of the population in terms of socio-demographic conditions. Knowledge about dental anxiety of adolescents in special groups or populations are scarce in the literature. Directed research projects will be important to illuminate risk factors between dental anxiety and oral health among young individuals living under less affluent conditions ¹⁶⁷.

Within the goal of adolescent dentistry there are two main issues. One is to keep the patient capable of using and willing to use the dental service in the future. The other one is to keep the oral environment healthy ⁴⁴. In order to deal with this, dental care providers and the individuals it may concern should strive towards a positive development.

Summary in Swedish

Svensk sammanfattning

SYFTE: Det övergripande syftet med denna avhandling var att bland 15-åringar undersöka sambanden mellan tandvårdsrädsla, erfarenheter av tandvård, psykosociala faktorer och oral hälsa, samt att analysera förändringar i förekomsten av tandvårdsrädsla över tid. **MATERIAL OCH METOD:** Avhandlingen baseras på två epidemiologiska tvärsnittsstudier i Jönköping. I arbete I, II och III redovisas studier av 221 slumpmässigt utvalda 15-åriga individer. Deltagarna besvarade frågor avseende bakgrundsdata, tandvårdsrädsla, temperament, ångest och depression, generell rädsla samt attityder till tandvård. Arbete IV bygger på Jönköpingsstudierna, från 1973, 1983, 1993, och 2003, där sammanlagt 405 slumpmässigt utvalda 15-åriga individer ingick. Datainsamling gjordes med hjälp av frågeformulär, bestående av bakgrundsdata och tandvårdsrädsla, samt kliniska data. **RESULTAT:** Resultatet i arbete I, II och III visade att 6,5% av ungdomarna rapporterade hög tandvårdsrädsla, där en övervägande andel var flickor. I arbete I visade tandvårdsrädsla samband med tre av temperamenten; emotionalitet, aktivitet och impulsivitet. Rapporterad smärta eller obehagliga upplevelser under tandbehandling var tydliga prediktorer avseende tandvårdsrädsla. I arbete II visade både symtom på ångest och depression samband med tandvårdsrädsla, sedan effekterna av andra potentiella riskfaktorer hade kontrollerats för statistiskt. I arbete III visade tandvårdsrädsla starkt samband med både generell rädsla och med attityder till tandvård, där den starkaste prediktorn för tandvårdsrädsla var generell rädsla. I arbete IV visade en trendanalys en statistiskt säkerställd minskning gällande förekomsten av tandvårdsrädsla, från 38,1% år 1973 till 12,8% år 2003. Ungdomarna med tandvårdsrädsla hade signifikant fler fyllda tandytor än ungdomarna utan tandvårdsrädsla under 30-årsperioden, och år 1973 även mer karies. Det fanns inga sådana skillnader avseende plack och gingivit. **SLUTSATSER:** Resultatet visar att tandvårdsrädsla är relaterat till smärtsamma erfarenheter av tandvård, generell

rädsla, och oral hälsa. Resultatet visar också att tandvårdsrädsla hos 15-åringar har minskat över tid och är vanligare hos flickor. Resultaten pekar på att tandvårdspersonalen har en viktig uppgift i att unga tandvårdspatienter inte utsätts för smärtsam behandling. Framtida forskning av intresse kan vara hur olika sätt att administrera lokalbedövning kan förändra uppfattningen av smärta och nivåer av tandvårdsrädsla.

Nyckelord: *Erfarenheter av tandvård, oral hälsa, prevalens, psykosociala faktorer, tandvårdsrädsla, tvärsnittsstudie, ungdomar*

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Appendix I

Kön

Kvinna

☐

Man

☐

Invandrarbakgrund

Ja

☐

Nej

☐

Mors utbildning

Grundskolan

☐

Gymnasiet

☐

Högskola/Universitet

☐

Fars utbildning

Grundskolan

☐

Gymnasiet

☐

Högskola/Universitet

☐

Är du nöjd eller missnöjd med dina tänders utseende?

Mycket missnöjd

☐

Ganska missnöjd

☐

Varken nöjd eller missnöjd

☐

Ganska nöjd

☐

Mycket nöjd

☐

Hur är din tandhälsa?

- Mycket bra ☐
- Bra ☐
- Dålig ☐
- Mycket dålig ☐

När besökte du tandläkare senast?

- Mindre än 1 år sedan ☐
- 1-2 år sedan ☐
- 3-5 år sedan ☐
- Ännu längre sedan ☐

Smärta vid senaste tandläkarbesöket?

- Nej, ingen smärta ☐
- Ja, lite ☐
- Ja, mycket ☐

Har du under uppväxten haft:

- Ingen smärtsam eller obehaglig tandbehandling ☐
- En smärtsam eller obehaglig tandbehandling ☐
- Flera smärtsamma eller obehagliga tandbehandlingar ☐

Är någon i din familj rädd för att gå till tandläkaren?

- Mor ☐
- Far ☐
- Syskon ☐
- Ingen i familjen är rädd för att gå till tandläkaren ☐

Appendix 2

D F S - Dental Fear Survey

Frågorna i detta formulär berör olika situationer, känslor och reaktioner som kan vara förknippade med tandvård. Ange Dina känslor och reaktioner genom att ringa in den siffra från 1 till 5 som bäst motsvarar Din egen reaktion och uppfattning.

1. Har tandvårdsrädsla någonsin hindrat Dig från att beställa tid hos tandläkare?

| | | | | |
|--------|-------------------------|-----------------|------|----------------------|
| 1 | 2 | 3 | 4 | 5 |
| aldrig | någon en- staka gång | några gånger | ofta | nästan varje gång |

2. Har tandvårdsrädsla någonsin fått Dig att lämna återbud eller utebli från ett planerat tandläkarbesök?

| | | | | |
|--------|-------------------------|-----------------|------|----------------------|
| 1 | 2 | 3 | 4 | 5 |
| aldrig | någon en- staka gång | några gånger | ofta | nästan varje gång |

UNDER BEHANDLING HOS TANDLÄKAREN

3. är mina muskler spända.

| | | | | |
|-----------|------|-------|--------|----------------|
| 1 | 2 | 3 | 4 | 5 |
| inte alls | lite | något | mycket | väldigt mycket |

4. andas jag snabbare än normalt.

| | | | | |
|-----------|------|-------|--------|----------------|
| 1 | 2 | 3 | 4 | 5 |
| inte alls | lite | något | mycket | väldigt mycket |

5. svetts jag.

| | | | | |
|-----------|------|-------|--------|----------------|
| 1 | 2 | 3 | 4 | 5 |
| inte alls | lite | något | mycket | väldigt mycket |

6. känner jag mig illamående och som om jag skulle kunna kräkas.

| | | | | |
|-----------|------|-------|--------|----------------|
| 1 | 2 | 3 | 4 | 5 |
| inte alls | lite | något | mycket | väldigt mycket |

7. slår mitt hjärta snabbare.

| | | | | |
|-----------|------|-------|--------|----------------|
| 1 | 2 | 3 | 4 | 5 |
| inte alls | lite | något | mycket | väldigt mycket |

Det följande är en lista på saker och situationer i anslutning till tandläkarbesök som många människor anser vara ångest- eller skräckframkallande.

ANGE HUR STARK RÄDSLÅ, ÅNGEST ELLER OBEHAG VAR OCH EN AV DESSA SITUATIONER ORSAKAR DIG.

Markera efter nedanstående skala från 1 till 5 genom att sätta ett kryss:

| | | | | |
|-----------|------|-------|--------|----------------|
| 1 | 2 | 3 | 4 | 5 |
| inte alls | lite | något | mycket | väldigt mycket |

| | 1 | 2 | 3 | 4 | 5 |
|--|---|---|---|---|---|
| 8. Att beställa tid | — | — | — | — | — |
| 9. Att komma fram till tandklinik | — | — | — | — | — |
| 10. Att sitta i väntrummet | — | — | — | — | — |
| 11. Att sätta sig i tandläkarstolen | — | — | — | — | — |
| 12. Att känna lukten från tandklinik | — | — | — | — | — |
| 13. Att se tandläkaren komma in i behandlingsrummet | — | — | — | — | — |
| 14. Att se bedövningssprutan | — | — | — | — | — |
| 15. Att känna sticket vid bedövning | — | — | — | — | — |
| 16. Att se borren | — | — | — | — | — |
| 17. Att höra borren | — | — | — | — | — |
| 18. Att känna vibrationerna från borren | — | — | — | — | — |
| 19. Att få tandsten borttagen | — | — | — | — | — |
| 20. Allt som allt, hur rädd är Du för att få tandbehandling | — | — | — | — | — |

Appendix 3

Följande frågor handlar om hur du är som person. Du svarar genom att kryssa för något av alternativen från ”1 = stämmer inte alls” till ”5 = stämmer mycket bra”.

| | Stämmer inte alls | | Stämmer mycket bra | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | | 5 | | |
| 1. Jag är blyg. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Jag har lätt för att gråta. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Jag tycker mycket om att vara med andra människor. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Jag är ständigt i farten och rör mig mycket. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Jag håller på med en uppgift länge för att lösa den. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Jag föredrar att vara ensam framför att vara med andra. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Jag reagerar ofta känslomässigt, dvs. visar ofta glädje, ilska, ledsnad etc. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. När jag gör något, känner jag ofta att jag vill göra något annat istället. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. När jag rör mig, gör jag det oftast långsamt. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. Jag skaffar mig lätt vänner och bekanta. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. Det är full fart på mig så fort jag kommer upp på morgonen. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. Jag tycker att kontakt med andra människor är mer stimulerande än allting annat. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13. Jag beklagar mig ofta eller gråter och visar dåligt humör. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14. Om jag får en svår uppgift överger jag uppgiften ganska snart. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15. Jag har lätt att få kontakt med människor. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. Jag är mycket energisk. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17. Jag kan hålla på med <u>en</u> och samma sak långa stunder. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18. Det tar lång tid för mig att känna mig trygg med andra människor. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 19. Jag blir lätt arg eller ledsen. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 20. Jag ger lätt upp när jag stöter på svårigheter. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 21. Jag föredrar ofta att vara för mig själv. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | | | | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 22. Jag föredrar lugna och stillsamma situationer framför mer rörliga aktiviteter. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 23. När jag inte har någon att umgås med, längtar jag efter sällskap. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 24. Jag reagerar starkt och intensivt när jag är upprörd. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 25. Jag är mycket glad och positiv mot främmande människor. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Appendix 4

HAD - skalan

Dessa frågor har ställts samman för att hjälpa oss att förstå hur du mår. Läs varje påstående och sätt ett tydligt kryss i rutan till vänster om det svar som kommer närmast hur du har känt dig under veckan som gått. Sitt inte och fundera för länge. Det första svar som dyker upp för dig på varje påstående är antagligen riktigare än ett svar du tänkt på länge.

1. Jag känner mig spänd eller "uppskruvad"

- ☐ För det mesta
- ☐ Ofta
- ☐ Då och då
- ☐ Inte alls

2. Jag uppskattar samma saker som förut

- ☐ Precis lika mycket
- ☐ Inte lika mycket
- ☐ Bara lite
- ☐ Knappast alls

3. Jag får en slags känsla av rädsla som om någonting förfärligt håller på att hända

- ☐ Alldeles bestämt och rätt illa
- ☐ Ja, men inte så illa
- ☐ Lite, men det oroar mig inte
- ☐ Inte alls

4. Jag kan skratta och se saker från den humoristiska sidan

- ☐ Lika mycket som jag alltid kunnat
- ☐ Inte riktigt lika mycket
- ☐ Absolut inte så mycket
- ☐ Inte alls

5. Oroande tankar kommer för mig

- ☐ Mycket ofta
- ☐ Ofta
- ☐ Då och då men inte så ofta
- ☐ Bara någon enstaka gång

6. Jag känner mig glad

- ☐ Inte alls
- ☐ Inte ofta
- ☐ Ibland
- ☐ För det mesta

7. Jag kan sitta i lugn och ro och känna mig avspänd

- ☐ Absolut
- ☐ Oftast
- ☐ Inte ofta
- ☐ Inte alls

9. Jag får en känsla av rädsla som om jag hade "fjärilar i magen"

- ☐ Inte alls
- ☐ Någon gång
- ☐ Rätt ofta
- ☐ Mycket ofta

11. Jag känner mig rastlös som om jag måste vara på språng

- ☐ Verkligen mycket
- ☐ En hel del
- ☐ Inte så mycket
- ☐ Inte alls

13. Jag får plötsliga panikkänslor

- ☐ Verkligen ofta
- ☐ Rätt ofta
- ☐ Inte så ofta
- ☐ Inte alls

8. Jag känner mig som om jag gick på "lågt varv"

- ☐ Nästan jämt
- ☐ Mycket ofta
- ☐ Ibland
- ☐ Inte alls

10. Jag har tappat intresset för mitt utseende

- ☐ Absolut
- ☐ Jag bryr mig inte så

mycket om det som jag borde

- ☐ Jag kanske inte bryr mig om det riktigt så som förut
- ☐ Jag bryr mig precis lika mycket om det som förut

12. Jag ser fram emot saker och ting med glädje

- ☐ Lika mycket som förut
- ☐ Något mindre än jag brukade
- ☐ Klart mindre än jag brukade
- ☐ Nästan inte alls

14. Jag kan njuta av en bra bok, ett bra radio eller TV-program

- ☐ Ofta
- ☐ Ibland
- ☐ Inte så ofta
- ☐ Mycket sällan

Appendix 5

GFS – Geer Fear Scale

Hur rädd är Du för följande saker eller situationer? Försök gradera Din rädsla på en skala från 1 (= inte alls rädd) till 7 (= totalt skräckslagen). Ringa in den siffra som bäst beskriver vad Du känner. Skalan i sin helhet betyder:

- 1 = inte alls rädd
- 2 = en aning rädd
- 3 = lite rädd
- 4 = ganska rädd
- 5 = mycket rädd
- 6 = fruktansvärt rädd
- 7 = totalt skräckslagen

| | | | | | | | |
|-------------------------------|---|---|---|---|---|---|---|
| 1. Tandläkarbedövning | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. Vassa föremål | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. Ormar | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. Råttor och möss | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5. Andra injektionsnålar | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6. Blod | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 7. Höjder | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8. Slutna utrymmen (ex. hiss) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9. Spindlar | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 10. Åskväder | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 11. Kyrkogårdar | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 12. Mörka platser | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 13. Främmande hundar | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 14. Insekter som sticks | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

| | | | | | | | |
|---------------------------------------|----------|----------|----------|----------|----------|----------|----------|
| 15. Bilolyckor | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 16. Sällskapsliv | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 17. Öppna platser | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 18. Andra människor | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 19. Smärta | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 20. Kvävning | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 21. Flygresor | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 22. Få kritik | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 23. Vara ensam | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 24. Att göra bort sig | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 25. Sjukdomar | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 26. Gräl i familjen | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 27. Döden | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 28. Att verka dum | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 29. Folksamlingar | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 30. Kontakt med motsatta könet | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Appendix 6

DBS

Påståendena i detta formulär berör olika situationer, känslor och reaktioner, som kan upplevas hos tandläkaren. Skatta Dina känslor och Din uppfattning just nu om dessa påståenden, genom att ringa in den siffra från 5 till 1, som bäst överensstämmer med Din egen uppfattning om tandläkare och tandvård i allmänhet.

1. Tandläkare ogillar när patienter kommer med särskilda önskemål.

| 5 | 4 | 3 | 2 | 1 |
|-------------------------------|-----------------------------|-------------------|------------------------|----------------------|
| stämmer helt och hållet | stämmer ganska mycket | stämmer delvis | stämmer litet grand | stämmer inte alls |

2. Tandläkare är effektiva, men verkar ha så bråttom att jag blir stressad.

| 5 | 4 | 3 | 2 | 1 |
|-------------------------------|-----------------------------|-------------------|------------------------|----------------------|
| stämmer helt och hållet | stämmer ganska mycket | stämmer delvis | stämmer litet grand | stämmer inte alls |

3. Tandläkare förklarar saker och ting på ett oklart sätt.

| 5 | 4 | 3 | 2 | 1 |
|-------------------------------|-----------------------------|-------------------|------------------------|----------------------|
| stämmer helt och hållet | stämmer ganska mycket | stämmer delvis | stämmer litet grand | stämmer inte alls |

4. Tandläkare lyssnar inte ordentligt på vad jag säger.

| 5 | 4 | 3 | 2 | 1 |
|-------------------------------|-----------------------------|-------------------|------------------------|----------------------|
| stämmer helt och hållet | stämmer ganska mycket | stämmer delvis | stämmer litet grand | stämmer inte alls |

5. Tandläkaren gör som han vill oavsett vad jag säger.

| | | | | |
|-------------------------------|-----------------------------|-------------------|------------------------|----------------------|
| 5 | 4 | 3 | 2 | 1 |
| stämmer helt och hållet | stämmer ganska mycket | stämmer delvis | stämmer litet grand | stämmer inte alls |

6. Tandläkare säger saker som gör att jag skäms över hur jag sköter mina tänder.

| | | | | |
|-------------------------------|-----------------------------|-------------------|------------------------|----------------------|
| 5 | 4 | 3 | 2 | 1 |
| stämmer helt och hållet | stämmer ganska mycket | stämmer delvis | stämmer litet grand | stämmer inte alls |

7. Tandläkare föreslår behandlingar som är onödiga.

| | | | | |
|-------------------------------|-----------------------------|-------------------|------------------------|----------------------|
| 5 | 4 | 3 | 2 | 1 |
| stämmer helt och hållet | stämmer ganska mycket | stämmer delvis | stämmer litet grand | stämmer inte alls |

8. Jag tror tandläkaren säger saker bara för att lura mig.

| | | | | |
|-------------------------------|-----------------------------|-------------------|------------------------|----------------------|
| 5 | 4 | 3 | 2 | 1 |
| stämmer helt och hållet | stämmer ganska mycket | stämmer delvis | stämmer litet grand | stämmer inte alls |

9. Tandläkare tar inte min oro och rädsla på allvar.

| | | | | |
|-------------------------------|-----------------------------|-------------------|------------------------|----------------------|
| 5 | 4 | 3 | 2 | 1 |
| stämmer helt och hållet | stämmer ganska mycket | stämmer delvis | stämmer litet grand | stämmer inte alls |

10. Tandläkare trycker ner mig och gör narr av min rädsla.

| | | | | |
|-------------------------------|-----------------------------|-------------------|------------------------|----------------------|
| 5 | 4 | 3 | 2 | 1 |
| stämmer helt och hållet | stämmer ganska mycket | stämmer delvis | stämmer litet grand | stämmer inte alls |

11. Jag oroar mig för om tandläkaren är skicklig och gör ett bra jobb.

| 5 | 4 | 3 | 2 | 1 |
|-------------------------------|-----------------------------|-------------------|------------------------|----------------------|
| stämmer helt och hållet | stämmer ganska mycket | stämmer delvis | stämmer litet grand | stämmer inte alls |

12. Om jag skulle säga att det gör ont tror jag ändå inte att tandläkaren skulle göra något åt det.

| 5 | 4 | 3 | 2 | 1 |
|-------------------------------|-----------------------------|-------------------|------------------------|----------------------|
| stämmer helt och hållet | stämmer ganska mycket | stämmer delvis | stämmer litet grand | stämmer inte alls |

13. När jag sitter i behandlingsstolen känns det som om jag inte får avbryta tandbehandlingen även om jag behöver en paus.

| 5 | 4 | 3 | 2 | 1 |
|-------------------------------|-----------------------------|-------------------|------------------------|----------------------|
| stämmer helt och hållet | stämmer ganska mycket | stämmer delvis | stämmer litet grand | stämmer inte alls |

14. Jag tycker att det känns obehagligt att ställa frågor till tandläkaren.

| 5 | 4 | 3 | 2 | 1 |
|-------------------------------|-----------------------------|-------------------|------------------------|----------------------|
| stämmer helt och hållet | stämmer ganska mycket | stämmer delvis | stämmer litet grand | stämmer inte alls |

15. Tanken på att höra "dåliga nyheter" om mina tänder eller på all den tandvård jag behöver, är fullt tillräckligt för att jag skall utebli eller avbryta en behandling.

| 5 | 4 | 3 | 2 | 1 |
|-------------------------------|-----------------------------|-------------------|------------------------|----------------------|
| stämmer helt och hållet | stämmer ganska mycket | stämmer delvis | stämmer litet grand | stämmer inte alls |