

## Abstract

The overall aim of this thesis was to explore the reported use of coping strategies in connection with dental treatment among adult patients with dental anxiety and regular or irregular dental care.

The specific aims of the four papers were (I) to develop a questionnaire for assessing coping strategies in the dental treatment situation and to evaluate its psychometric properties; (II) to further investigate and evaluate the newly constructed Dental Coping Strategy Questionnaire (DCSQ-15); (III) to investigate the relationship between the use of dental coping strategies in DCSQ-15, emotional distress and sociodemographic factors; (IV) to generate a conceptual framework explaining the main concerns of patients with dental anxiety who, despite their fear, participate in regular dental treatment, in order to acquire a deeper understanding of what they do to manage the dental-treatment situation.

This thesis has a mixed-method design containing both quantitative and qualitative research components, i.e. both cross-sectional questionnaire surveys and qualitative in-depth interviews. The overall findings showed that adult patients with dental anxiety and regular dental attendance use more adaptive coping strategies.

In Paper I, the Dental Coping Strategy Questionnaire (DCSQ-20) instrument showed sound psychometric properties and good reliability with four factors of coping strategies labeled Self-efficacy statements, Distraction and distancing, Catastrophizing and Praying and despair. Catastrophizing and Praying and despair were significantly higher correlated with dental anxiety and were rated significantly higher among irregular attendees. Gender (male) and having high levels of dental anxiety, Catastrophizing and Praying and despair were predictive of irregular dental care.

Paper II focused on adaptive coping and a new instrument, the DCSQ-15, was constructed from the DCSQ-20, displaying five factors of coping strategies labeled Self-efficacy, Self-distraction, Distancing, Praying and Optimism. The factors of Praying and Optimism were significantly higher correlated with dental anxiety and were assessed significantly higher and lower, respectively by patients with irregular dental care. Gender (male), having a high level of dental anxiety and using little Optimism were predictive of irregular dental care.

In Paper III, the results showed that the level of general anxiety and depression was significantly higher among irregular attendees, who also showed lower levels of adaptive coping strategies. Gender (male), high levels of dental anxiety and general anxiety and the non-use of the coping strategy of Optimism were predictive of irregular dental care.

In Paper IV, a grounded theory study, the main concern of the fearful patients who participated in dental care was identified as “making dental care possible – a mutual affair”, comprising the close and trust-filled interplay between the patient and the dental staff that makes dental care possible, and four additional categories with coping strategies were identified.

The conclusions were that regular attendees reported greater use of adaptive coping strategies and that the use of optimistic thinking was predictive of regular dental care. Risk factors for irregular dental care were being of male gender, having high levels of dental or general anxiety and relying on the maladaptive coping strategy of Praying, as well as catastrophic thinking.

It is suggested in Paper IV, that the patients logical argumentation with themselves, social support, feelings of control during treatment and trust-filled interplay between the patient and the dental staff are of great importance in making dental care possible and maintaining regular dental care among patients with dental anxiety.

## Swedish summary – sammanfattning på svenska

Det övergripande syftet med studien var att utvärdera den självrapporterade användningen av copingstrategier i samband med tandvårdsbehandling hos vuxna patienter med tandvårdsrädsla och regelbunden eller oregelbunden tandvård.

De specifika syftena i de fyra artiklarna var; (I) att utveckla ett frågeformulär, för att uppskatta användningen av copingstrategier i samband med tandbehandlingar och att utvärdera formulärets psykometriska egenskaper; (II) att vidare utforska och utvärdera den nya konstruktionen av Dental Coping Strategy Questionnaire, DCSQ-15; (III) att undersöka relationen mellan användningen av copingstrategier i DCSQ-15 och emotionella problem så som ångest och depression, och sociodemografiska faktorer; (IV) att generera en begreppsram som förklarar den viktigaste anledningen till hur patienter med tandvårdsrädsla klarar av att upprätthålla regelbunden tandvård trots sin rädsla för tandvård.

Denna avhandling innefattar en "mixed method design" med både kvantitativa och kvalitativa forskningsmetoder så som enkätstudier och kvalitativa djupintervjuer.

De övergripande resultaten visade att vuxna patienter med tandvårdsrädsla och regelbunden tandvård använde sig av mer adaptiva copingstrategier.

I artikel I, visade instrumentet Dental Coping Strategy Questionnaire (DCSQ-20) sunda psykometriska egenskaper och god reliabilitet med fyra copingfaktorer namngivna efter sina egenskaper; Egna utfästelser för att stå ut, Distraction och distansering, Katastrofering, och Bön och förtvivlan. Katastrofering och Bön och förtvivlan var signifikant högre korrelerade med graden av tandvårdsrädsla och användes oftare av personer med oregelbunden tandvård.

Riskfaktorer för oregelbunden tandvård var kön (att vara man), hög grad av tandvårdsrädsla, och mer frekvent användning av strategierna Katastrofering och Bön och förtvivlan.

I artikel II, låg fokus på de mer adaptiva copingstrategierna och ett nytt instrument Dental Coping Strategy Questionnaire DCSQ-15 extraherades från DCSQ-20, där fem copingfaktorer framträdde; Egna utfästelser för att stå ut, Självdistraction, Distansering, Optimism och Bön. Bön och Optimism korrelerade signifikant med graden av tandvårdsrädsla, där Bön användes mer av patienter med oregelbunden tandvård medan Optimism var förknippat med regelbunden tandvård. Riskfaktorer för oregelbunden tandvård var kön (att vara man), hög nivå av tandvårdsrädsla och liten användning av Optimism, dvs. få tankar på framtiden och brist på utmaning av sin rädsla.

I artikel III, visade resultaten att nivån av generell ångest och depression var signifikant högre hos patienter med oregelbunden tandvård som också uppvisade mindre frekvent användning av adaptiva copingstrategier. Riskfaktorer för oregelbunden tandvård var kön (att vara man), hög nivå av tandvårdsrädsla och generell ångest, och liten användning av copingstrategin Optimism.

I artikel IV, vilket var en grounded theory studie, framträdde den viktigaste anledningen till regelbunden tandvård som "en gemensam angelägenhet" dvs. att ansträngningar måste göras från båda håll vilket innefattar ett nära och förtroendefyllt samspel mellan patienten och tandvårdsteamet. Fyra copingkategorier identifierades; den mentala brottningsmatchen, tillitsfullt samspel med tandvårdspersonalen, strävan efter kontroll, och söka och erhålla socialt stöd.

Konklusionerna av studierna var att patienter med tandvårdsrädsla och regelbunden tandvård rapporterar frekventare användning av adaptiva copingstrategier och att ett optimistiskt tänkande är förutsäggande för regelbunden tandvård. Riskfaktorer för oregelbunden tandvård var att vara av manligt kön, ha hög nivå av tandvårdsrädsla, ha generell ångest, och frekventare användning av den maladaptiva copingstrategin Bön, så väl som ett mer frekvent katastroftänkande. Vidare är ett förtroendefyllt samspel mellan patienten och tandvårdsteamet viktigt för upprätthållandet av regelbunden tandvård.

# Table of contents

<b>ABSTRACT</b> .....	<b>1</b>
<b>SWEDISH SUMMARY – SAMMANFATTNING PÅ SVENSKA</b> .....	<b>2</b>
<b>TABLE OF CONTENTS</b> .....	<b>3</b>
<b>ORIGINAL PAPERS</b> .....	<b>5</b>
<b>ABBREVIATIONS</b> .....	<b>6</b>
<b>INTRODUCTION</b> .....	<b>7</b>
DENTAL FEAR, ANXIETY AND PHOBIA .....	7
<i>Fear</i> .....	7
<i>Anxiety</i> .....	7
<i>Phobia</i> .....	8
<i>Dental anxiety and phobia</i> .....	8
<i>Different levels of dental anxiety</i> .....	8
<i>Prevalence</i> .....	9
<i>Age, gender and socio-economic factors</i> .....	9
<i>Etiology</i> .....	10
<i>Consequences, maintenance and impact</i> .....	14
<i>Treatment of dental anxiety and phobia</i> .....	16
COPING AND STRESS .....	17
<i>Stress</i> .....	17
<i>Coping</i> .....	18
THE RATIONALE FOR THIS THESIS .....	22
<b>AIMS OF THE THESIS</b> .....	<b>23</b>
SPECIFIC AIMS .....	23
<b>MATERIALS AND METHODS</b> .....	<b>24</b>
DESIGN .....	24
PARTICIPANTS AND PROCEDURE .....	25
<i>Papers I-II</i> .....	25
<i>Paper III</i> .....	25
<i>Paper IV</i> .....	26
THE QUANTITATIVE RESEARCH COMPONENTS .....	27
<i>Measurements and instruments</i> .....	27
<i>Statistical analyses</i> .....	29
THE QUALITATIVE RESEARCH COMPONENT .....	30
<i>Grounded theory</i> .....	30
<i>Data analysis</i> .....	31

ETHICAL CONSIDERATIONS .....	31
<b>RESULTS .....</b>	<b>31</b>
PAPER I .....	32
PAPER II.....	33
PAPER III.....	34
PAPER IV .....	35
<b>DISCUSSION .....</b>	<b>36</b>
METHODOLOGICAL DISCUSSION .....	37
<i>Construction of a new instrument – the DCSQ.....</i>	<i>37</i>
<i>Sample and inclusion criteria.....</i>	<i>39</i>
<i>Psychometric instruments .....</i>	<i>40</i>
<i>Statistical methods.....</i>	<i>40</i>
<i>Grounded theory.....</i>	<i>41</i>
GENERAL DISCUSSION .....	42
<i>Maladaptive coping strategies.....</i>	<i>42</i>
<i>General anxiety and depression.....</i>	<i>43</i>
<i>Gender.....</i>	<i>43</i>
<i>Adaptive coping strategies .....</i>	<i>44</i>
<i>A new vicious cycle for patients with dental anxiety and regular dental care behavior .....</i>	<i>45</i>
LIMITATIONS.....	47
STRENGTHS .....	48
IMPLICATIONS FOR FUTURE RESEARCH .....	49
<b>CONCLUSIONS .....</b>	<b>50</b>
<b>ACKNOWLEDGEMENTS.....</b>	<b>51</b>
<b>GRANTS.....</b>	<b>52</b>
<b>REFERENCES.....</b>	<b>53</b>
<b>PAPERS I - IV</b>	
<b>APPENDICES</b>	

## Original papers

The thesis is based on the following papers, referenced in the text by Roman numerals I-IV.

- I Bernson JM, Elfström ML, Berggren U. Self-reported dental coping strategies among fearful adult patients: preliminary enquiry explorations. *Eur J Oral Sci* 2007; 115: 484–490.
- II Bernson JM, Elfström ML, Hakeberg M. Adaptive coping strategies among adults with dental fear. Further development of a new version of the Dental Coping Strategy Questionnaire. *Acta Odont Scand* 2012; 70: 414-420.
- III Bernson JM, Elfström ML, Hakeberg M. Dental coping strategies, general anxiety and depression among adult patients with dental anxiety but with different dental attendance patterns (submitted for publication).
- IV Bernson JM, Hallberg LR-M, Elfström ML, Hakeberg M. Making dental care possible – a mutual affair. A grounded theory relating to adult patients with dental fear and regular dental treatment. *Eur J Oral Sci* 2011; 119: 373–380.

The papers are printed with the permission of the publishers.

## Abbreviations

DAS	Dental Anxiety Scale
DCSQ-20	Dental Coping Strategy Questionnaire, 20 items
DCSQ-15	Dental Coping Strategy Questionnaire, 15 items
DFRTC	Dental Fears Research and Treatment Clinic in Gothenburg
DFS	Dental Fear Survey
HADS	Hospital Anxiety and Depression Scale
HADS-A	Hospital Anxiety and Depression Scale – Anxiety
HADS-D	Hospital Anxiety and Depression Scale – Depression
OR	Odds Ratio

## Introduction

Despite increased knowledge about dental anxiety and major advances in dentistry in reception, treatment methods and anesthetics, the treatment situation is still a scary experience for many people. To manage the dental treatment situation, individuals with dental anxiety have to deal with severe stress in relation to treatment. To deal with the severe stress, different coping strategies are used; this involves different ways of thinking and behaving in relation to the dental treatment situation in order to reduce the perceived stress. Dental anxiety among adults has often been shown to be a prolonged and chronic condition and it has been associated with poorer oral health, poorer health-related quality of life, psychosomatic problems and psychosocial conditions (Armfield, Stewart, & Spencer, 2007; Berggren, 1984; Mehrstedt, John, Tonnie, & Micheelis, 2007).

### *Dental fear, anxiety and phobia*

It is difficult to distinguish between fear and anxiety in general and, clinically, there are no distinct boundaries between dental fear and dental anxiety. The concepts of dental fear and dental anxiety are therefore often used interchangeably and this is also the case in the present work with regard to dental fear reactions.

### Fear

General fear has been described as an immediate alarm reaction to a simultaneous perceived threat and, when the threat is gone, the fear decays. Fear involves strong escapist action tendencies and a surge in the sympathetic branch of the nervous system. The panic attack, which is fear at the wrong time when there is nothing to be afraid of, is related to fear (Barlow & Durand, 2012).

### Anxiety

In anxiety, fear is central, but the anxious fear response is more extensive and represents a subjective state of feeling characterized by negative emotions and catastrophic thinking in response to an, often hypothetical, future threat. The perceived feelings are that one is unable to predict or control upcoming events and the physiological response is characterized by tension with muscle tension and an elevated heart rate. Anxious fear is irrational and the fear response is seen to be non-adaptive (Barlow & Durand, 2012).

Anxiety is both an emotion and a specific type of disorder. Anxiety is often divided into a state or trait dimension. State anxiety refers to the level of anxiety one experiences at a given time. Trait anxiety refers to the stable characteristic of an individual to experience anxiety over time (Jones & Bright, 2001 pp. 89-107). Anxiety can range from constructive forms that elevate performance, as with performance anxiety, to anxiety

disorders, where the individual suffers from a level of anxiety that interferes with the ability to function normally. The most common anxiety disorders are specific phobias, of which dental phobia is counted as one. Other anxiety disorders include social anxiety disorder, panic disorder, generalized anxiety disorder, obsessive-compulsive disorder and posttraumatic stress disorder (Barlow & Durand, 2012).

## Phobia

A specific phobia is an irrational fear of a particular object or situation that markedly interferes with an individual's ability to function. According to the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2000) and the International Statistical Classification of Diseases and Related Health Problems (World Health Organization, 2009), specific phobia is described, in order to meet several criteria, as an excessive, persistent and unreasonable fear, where the exposure to the phobic stimulus almost invariably provokes an immediate anxiety response. In most cases, the phobic situation is avoided or endured with intense anxiety or distress. The avoidance, anxious anticipation or distress interferes significantly with the person's normal routine, occupational functioning, social activities or relationships, or there is marked distress about having the phobia. Among individuals under the age of 18, the duration must have been at least six months and, finally, the phobic fear is not better accounted for by other mental disorders.

## Dental anxiety and phobia

Dental anxiety and dental phobia may be triggered by both the presence and the anticipation of the specific object or situation. Examples of specific objects and situations that may trigger dental fear, anxiety and phobia include fear of pain, injections, being suffocated, being shut in or being out of control. They also include social interaction with dental staff and the phobia could be related to a fear of social situations. Dental phobia often results in the complete avoidance of dental care (Berggren, 1984), but, as seen in the description of a phobia above, this is not a criterion for a phobia.

There are different opinions about whether dental phobia should be classified as a specific phobia in itself (de Jongh et al., 1998), or whether it should be clustered with blood injury phobia (Fredriksson, Annas, Fischer, & Wik, 1996). Since the dental situation is frequently complex and often includes injections, pain and social interaction, it is feasible that dental phobia will co-vary with several other types of phobia, because it has been shown that people who suffer from one phobia tend to have multiple phobias (Hofmann, Lehman, & Barlow, 1997).

## Different levels of dental anxiety

Avoidance of dental care is usually a strong predictor of high dental anxiety, but there is clinically great variability in the degree of avoidance behavior. In Milgrom's attempt to describe different attendance patterns within patients with different levels of dental



anxiety, four types of patient category were discussed (Milgrom, Weinstein, & Getz, 1995); 1/ Patients with low to moderate dental anxiety, who have regular dental care; 2/ Patients with moderate to high dental anxiety, who attend regular dental care despite their fear, with great resistance and considerable effort, characterized by Milgrom et al. as “goers but haters”; 3/ Patients with high dental anxiety that could border on dental phobia who partly avoid dental care. They often attend emergency treatment, and sometimes conventional dental care, but on an irregular basis; 4/ Patients with dental phobia and a full avoidance behavior of dental care, i.e. they do not attend dental care at all. Because of their great vulnerability, patients in Groups 1 and 2 could risk becoming more anxious and may then change their visiting patterns to irregular dental care. The factors that could influence treatment behavior have not been fully clarified, but they are discussed in more detail below in the paragraphs on etiology and maintenance, stress and coping.

## Prevalence

Dental anxiety constitutes one of the most common fears/anxiety and phobias in the industrialized world today and about half the population experiences some degree of dental anxiety from low to high, while the prevalence of severe dental anxiety is estimated to range from approximately 3% to 20% in the adult population (Armfield, Spencer, & Stewart, 2006; do Nascimento, da Silva Araujo, Gusmao, & Cimoos, 2011; Hakeberg, Berggren, & Carlsson, 1992; Locker, Liddell, & Burman, 1991; Milgrom, Fiset, Melnick, & Weinstein, 1988; Oosterink, de Jongh, & Hoogstraten, 2009; Schwarz & Birn, 1995), depending on measurement methods and sample selections. Epidemiological studies have shown that about 70% of individuals with dental anxiety attend regular dental care despite their anxiety (Armfield et al., 2007; Hagglin, Berggren, Hakeberg, & Ahlqwist, 1996; Hakeberg et al., 1992; Vassend, 1993), and that 2-3% of the population in Scandinavia report irregular dental care, usually implying severe dental anxiety or dental phobia (Hakeberg et al., 1992; Moore, 1993; Vassend, 1993). Although significant changes to the practice of dentistry have been made, there is evidence that the level of severe dental anxiety has not decreased significantly over the past few decades (Hakeberg et al., 1992; Hugoson et al., 1995; T. A. Smith & Heaton, 2003).

## Age, gender and socio-economic factors

It has been shown that dental anxiety correlates with age, gender and, in some studies, socioeconomic factors. The onset of dental anxiety is mostly seen during childhood, but there are studies reporting that 15-27% of the population with dental anxiety become anxious as adults (Locker, Liddell, Dempster, & Shapiro, 1999; Milgrom, Fiset et al., 1988; Öst, 1987). According to several studies, dental anxiety peaks in early adulthood and declines with age (Hagglin, Berggren, Hakeberg, Hallstrom, & Bengtsson, 1999; Hakeberg et al., 1992; Thomson, Locker, & Poulton, 2000).

Women are more likely to report high level of dental anxiety than men and many studies have found dental anxiety to be approximately twice as common in women (Hakeberg et al., 1992; Holtzman, Berg, Mann, & Berkey, 1997; Moore, Birn, Kirkegaard, Brodsgaard, & Scheutz, 1993; Pohjola, Lahti, Vehkalahti, Tolvanen, & Hausen, 2007; Skaret, Raadal,

Kvale, & Berg, 2003). However, there are some studies that report no sex differences with regard to severe dental anxiety (Fredriksson et al., 1996; Locker & Liddell, 1991; Oosterink et al., 2009). Women with dental anxiety have also in some studies been reported to attend dental care on a regular basis more frequently, while men appear to run a greater risk of having irregular dental care (Milgrom et al., 1995; Sohn & Ismail, 2005).

Some studies report significant higher correlations between socio-economic status and dental anxiety with regard to social class, income and education among adult patients. Armfield et al. found that high income was associated with a lower prevalence of dental anxiety and that unemployed individuals had the highest level of dental anxiety, while those who worked full time had the lowest level of dental anxiety (Armfield et al., 2006). Firat et al. reported that high education was associated with lower levels of dental anxiety (Firat, Tunc, & Sar, 2006), but most studies do not confirm these relationships (Hagglin, Hakeberg, Ahlqwist, Sullivan, & Berggren, 2000; Hakeberg et al., 1992; Kanegane, Penha, Borsatti, & Rocha, 2003; Locker & Liddell, 1991; Milgrom, Fiset et al., 1988; Skaret, Raadal, Berg, & Kvale, 1998). However, in a study of children and adolescents with dental fear and dental behavior management problems, Gustafsson et al. reported that they more frequently lived in families with a low socio-economic status and more frequently had parents that no longer lived together (Gustafsson, Arnrup, Broberg, Bodin, & Berggren, 2007). This may imply that many factors could play a part in the dental fear process.

## Etiology

Individuals with dental anxiety do not constitute a homogeneous group and there is great variability in age of onset as well as in triggering and concomitant factors (Berggren, 1984; Locker, Thomson, & Poulton, 2001). Many factors interact in the development of dental fear; a number of exogenous and endogenous components have been proposed (Berggren, Carlsson, Hakeberg, Hagglin, & Samsonowitz, 1997; Locker, Liddell, Dempster et al., 1999; Locker, Poulton, & Thomson, 2001; Weiner & Sheehan, 1988) and both conditioned and cognitive elements may operate in the process of dental anxiety.

Exogenous components involve direct or indirect learning from adverse experiences and negative environmental influences. Endogenous components involve factors that are more genetically determined and physiological in nature, where dental fear could be part of more complex psychological disorders and a personality that may increase the vulnerability to dental fear (Armfield, 2006; Locker, Poulton et al., 2001; Oosterink, de Jongh, Hoogstraten, & Aartman, 2008). A proposal for a schematic layout of these factors is shown in Table 1.

*Table 1. Etiology of dental anxiety*

Etiological components	Elements of the etiological components	Specific examples
Exogenous components	Direct learning	Traumatic dental experiences, for example, loud noises, strong smell, feelings of being closed in, helplessness, lack of control, violation of personal space of face and mouth, pain, inadequate response from dental staff. Other traumatic experiences, for example in connection with health care.
	Indirect learning	Vicarious learning – for example, transfer of dental fear from parents or friends to the patient Negative information – from family, friends and the media
	Environmental factors	The dental staff Attitudes and perceptions in the family and society Lack of social support
Endogenous components	Psychological disorders	Other strong fears, anxiety disorders (e.g. phobias), mood disorders, other severe psychological disorders
	Individual factors	Personality (e.g. traits, temperament, the individual's way of reacting emotionally), heredity, life experiences, education, problem solving skills, social skills

*The cognitive vulnerability model of the etiology of fear*

To obtain a better understanding of the development of dental anxiety, the cognitive vulnerability model of the etiology of fear proposes that the origins of specific fears are based on the way an individual perceives a particular experience rather than the experience per se (K. H. Abrahamsson, U. Berggren, L. Hallberg, & S. G. Carlsson, 2002a; Armfield, 2006; de Jongh, Muris, Ter Horst, & Duyx, 1995). Cognitions are related to experiences and perceptions, where perceptions are subjective and experiences are more objective in nature. Perceptions of the world are based on an understanding of sensory information derived from particular experiences and the perceptions are also influenced by a combination of individuals' personality traits and a person's lifetime experiences (Armfield, 2006). Patients' differences in experience of the dental treatment situation could therefore be due to different cognitions of the situation. The anxiety that is evoked could in turn be progressively built up not only by a series of events but also by negative expectations about such events or about dentistry. Many studies have looked for cognitive aspects of dental anxiety, where the patient's perception of dentist's behavior and patients' beliefs regarding lack of power, control and trust have been found to be related to dental anxiety (Abrahamsson, Berggren, Hakeberg, & Carlsson, 2003; Abrahamsson, Hakeberg, Stenman, & Ohrn, 2006; de Jongh, Muris, Schoenmakers, & ter Horst, 1995; Johansson, Berggren, Hakeberg, & Hirsch, 1993; Kent, 1985; Kvale et al., 1997). Armfield showed that perceptions of the dental experience as being

uncontrollable, unpredictable, dangerous and disgusting are primary determinants of dental anxiety (Armfield, 2010).

### *Exogenous components*

In direct learning, see Table 1, pain is often described as playing a central part in the etiology of dental fear (Abrahamsson, Berggren, & Carlsson, 2000; Berggren, 1984; Hakeberg & Cunha, 2008; Heft, Meng, Bradley, & Lang, 2007; Klingberg, 1995; Skaret & Soevdsnes, 2005). In an Australian study, it was found that almost 70% of the patients with a high level of dental anxiety had previously experienced intense or sharp pain during the dental treatment compared with 38% who had no or little dental anxiety (Armfield, 2010). As proposed in Table 1, there are possible traumatic experiences other than pain. However, not everyone that has traumatic experiences in connection with dental treatment develops dental anxiety or dental phobia.

Many individuals with dental fear have no recollection whatsoever of having had traumatic dental experiences. This could be due to non-remembrance of the conditioning stimuli or indirect learning by modeling or negative information transmission of the fear. In a retrospective study, Locker et al. reported that a family history of dental anxiety was found to correlate with the onset of dental anxiety in childhood but not adolescent or adult onset (Locker, Liddell, Dempster et al., 1999) and there are studies that indicate a transfer of the dental anxiety, especially from mothers to children (Enkling, Marwinski, & Jhren, 2006; Klingberg, Berggren, Carlsson, & Noren, 1995; ter Horst & de Wit, 1993). In line with this, Öst et al. reported that modeling and negative information are associated with the early onset of specific phobias (Ost, 1987). Earlier exposure to physical or psychological abuse, for example, being a refugee from a war-torn country, could lead to discomfort, fear and anxiety in the dental treatment situation. There is also a clear link between sexual abuse and dental anxiety (Stalker, Russell, Teram, & Schachter, 2005; Walker, Milgrom, Weinstein, Getz, & Richardson, 1996; Willumsen, 2001).

The interplay between the patient and the dental staff is probably also of considerable importance both in the development of dental anxiety and for the treatment outcome (Sondell & Soderfeldt, 1997). The patients' evaluation of the dentist has been shown to be a strong predictor of the level of dental fear, especially negative dentist behavior (Abrahamsson et al., 2003; Abrahamsson et al., 2002a; Eli, Uziel, Baht, & Kleinhauz, 1997). The communication involves interpersonal skills from both sides. Interpersonal skill could be seen as a multidimensional domain with behavioral, cognitive, emotional and communicative aspects. In a qualitative study by Kulich et al. (Kulich, Berggren, & Hallberg, 2003) where the dentist-patient interaction was explored, it was found that the dentist's professional and interpersonal skills, comprising a holistic perception and an understanding of the patient was important in the patient-centered consultation. Further, the dentist's ability to perceive the verbal and non-verbal cues from the patients was important. The dentist needs to win the patients' trust and confidence. Patients need to obtain confirmation, information and knowledge about the treatment and have a sense of control, for example to be able to interrupt the treatment, if necessary (Stalker et al., 2005).

Finally, social support appears effectively to reduce the negative emotions caused by dental fear and lack of social support could affect the development of dental anxiety (K. H. Abrahamsson, U. Berggren, L. R. Hallberg, & S. G. Carlsson, 2002b; Hakeberg et al., 1992).

### *Endogenous components*

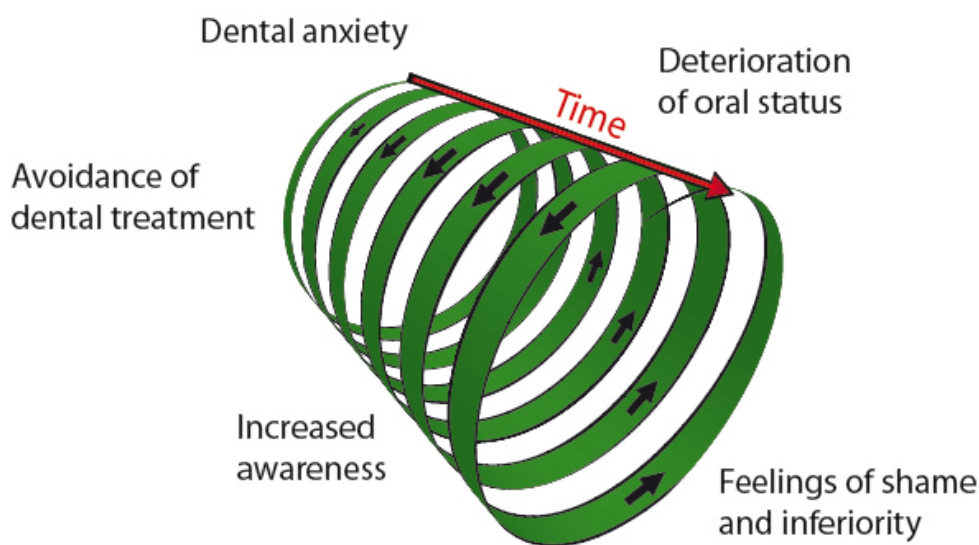
Recent studies have reported that dental anxiety is related to general anxiety and depression (Boman, Lundgren, Berggren, & Carlsson, 2010; Pohjola, Mattila, Joukamaa, & Lahti, 2011; Stenebrand, Boman, & Hakeberg, 2012) and to high levels of general fearfulness (Abrahamsson et al., 2000; Locker, 2003; Moore, Brodsgaard, & Birn, 1991) and that patients with dental anxiety are more likely to be diagnosed with one or more psychological disorders (Locker, Poulton et al., 2001; Roy-Byrne, Milgrom, Khoon-Mei, Weinstein, & Katon, 1994). In a sample of patients with severe dental anxiety, who were referred to the Dental Fears Research and Treatment Clinic in Gothenburg (DFRTC), Berggren et al. showed that 93% reported at least one extreme fear in addition to their dental fear and that almost 50% reported five or more extreme fears (Berggren, 1992).

Dental anxiety has been associated with personality factors such as neuroticism and introversion and temperament factors. In a study of middle-aged to elderly women, Hägglin et al. showed that the chronicity of dental fear was associated with higher neuroticism, lower extraversion and more psychiatric impairment (Hagglin et al., 2001). Lundgren et al. reported that emotionality correlated positively with dental anxiety, general fears and general psychological distress among adult patients with dental phobia (Lundgren, Elfstrom, & Berggren, 2007). In some studies, childhood fear has been found to be associated with temperamental aspects (Klingberg & Broberg, 1998; Liddell, 1990). Arnrup et al. demonstrated an association between dental fear and temperamental factors, such as higher levels of shyness and internalizing behaviors among uncooperative children with dental fear, and concluded that dental fear could be a part of the problem but also that impulsivity and negative emotionality discriminate these children from ordinary child patients in dentistry (Arnrup, Broberg, Berggren, & Bodin, 2002). There are also studies that indicate the possibility of heritability of specific fears and phobias. A phobic predisposition and a stimulus-specific genetic factor are implicated (Barlow & Durand, 2012; Ray et al., 2010; Öhman, 1993). Other factors within a person that could affect the development of dental anxiety are for example life experiences, education, problem solving skills and social skills (R.S Lazarus & Folkman, 1984).

To summarize the etiological process, the development of dental anxiety appears to depend on various factors and these factors can interact with one another to create more complex structures in the etiology and maintenance of dental fear. Moreover, the individual's traditional and cultural origin could play an important role in the occurrence and extent of dental anxiety (Berggren, Pierce, & Eli, 2000; Folayan, Idehen, & Ojo, 2004; Oosterink, de Jongh, & Aartman, 2008; Schwarz, & Birn, 1995).

## Consequences, maintenance and impact of dental anxiety

Individuals that are suffering from dental anxiety often report negative consequences and manifestations related to physiological, psychological and social aspects of their life. The development and maintenance of dental fear could be described as a vicious circle with a time axis, where factors of psychological, physiological and social components interact and over time lead to psychological, somatic and social changes. The first model of the vicious circle was presented by Berggren (Berggren, 1984) in 1984 and it has been explored still further by Hakeberg 1992 (Hakeberg, 1992), de Jong (de Jongh, Schutjes, & Aartman, 2011) and Armfield (Armfield et al., 2007), among others, where the time axis and cognitive aspects are incorporated in the model.



*Figure 1. The vicious cycle according to Berggren 1984 and Hakeberg 1992, describing the development and maintenance of dental anxiety among patients with dental phobic avoidance behavior.*

The explanation of the model is that the avoidance of dental care due to severe dental anxiety or phobia often leads to deterioration in oral health. This is followed by an increased awareness of a growing need for dental care and an incapability to accept dental treatment. This in turn could create feelings of shame, guilt and inferiority, subsequently reinforcing fear, increasing anxiety and resulting in the further avoidance of dental care. Furthermore, this may lead to social isolation. If the spiral is not broken, the dental anxiety, avoidance behavior, deterioration of oral health, and psychosocial consequences will continue and develop. The vicious cycle model explains how patients with phobic avoidance behavior maintain dental anxiety but not why dental anxiety is maintained in patients who receive regular dental care. Patients with regular dental care show a more restricted effect of dental anxiety and a wider spectrum with regard to health and psychosocial consequences.

When De Jong et al. further explored the vicious circle model, it was shown empirically that the avoidance of dental care played a role in the maintenance and exacerbation of dental fear and was associated with deterioration in oral health and the patients' experiences of fear of a negative evaluation from the dentist and society (de Jongh et al., 2011). There is a gradient relationship suggested indicating that, the higher the level of dental anxiety, the longer the time of avoidance (Locker et al., 1991). Several studies carried out on samples of dentally anxious individuals show that those with irregular dental care have a poorer dental status in overall terms, with a higher frequency of caries, apical periodontitis, proximal periodontitis, more missing teeth and root remnants than those receiving regular dental care (Abrahamsson, Berggren, Hakeberg, & Carlsson, 2001; Agdal, Raadal, Skaret, & Kvale, 2008; Berggren & Meynert, 1984; Boman et al., 2010; Hakeberg, Berggren, Carlsson, & Grondahl, 1993). In addition, this creates more problems in connection with the deterioration in oral health status, such as toothache, gingivitis and chewing problems (Milgrom, Fiset et al., 1988). Schuller et al. showed in a study that, the greater the dental anxiety, the fewer functional teeth, which reflects both the number of filled and sound teeth to chew with and the esthetic appearance (Schuller, Willumsen, & Holst, 2003). In a study by Hägglin, it was shown that individuals with dental anxiety and regular dental care, compared with those with irregular dental care, had more teeth, which were less frequently decayed and more often restored (Hagglin et al., 2000).

Deterioration in oral health status is significantly associated with social impairment and negative social consequences. Not only the oral health but also the entire health and quality of life are affected (Agdal, Raadal, Ost, & Skaret, 2011; Hagglin et al., 2000; Locker, 2003). Effects associated with dental anxiety are problems with unemployment, increased medication, abuse of alcohol and tranquilizers, more psychosomatic disorders, increased sick leave from work, low self-confidence and self-esteem, and problems with social contacts (Berggren & Carlsson, 1986; Berggren & Meynert, 1984; Boman et al., 2010; Cohen, Fiske, & Newton, 2000; Hakeberg et al., 1993; Locker, 2003). Due to poor oral health and the inability to handle regular dental care, many patients experience feelings of inferiority, embarrassment, higher stress levels and dissatisfaction with life (Mehrstedt et al., 2007; Moore, Brodsgaard, & Rosenberg, 2004).

In a study by Wide Boman et al., patients with extreme dental anxiety reported negative emotions, with feelings of anger, shame and depression. They also reported negative social consequences associated with intimate relationships, family and friend relationships and relationships in working life. These associations were even stronger for patients with higher levels of general anxiety and depression (Boman et al., 2010). A recent study in Finland concludes that dental fear among adult patients was associated with general anxiety disorders and with comorbidity with anxiety and depression disorders (Pohjola et al., 2011). Abrahamsson et al. reported higher levels of depression among patients with dental anxiety that had irregular dental treatment than among patients who managed the treatment despite their anxiety (Abrahamsson et al., 2003).

Dental phobic patients with irregular dental care appear to have a more negative thinking pattern and more negative and catastrophic cognitions than patients with dental anxiety and regular dental care. They also appear to have a greater belief in these thoughts but a poorer ability to control or suppress them (Berggren, Hakeberg, &

Carlsson, 2000; de Jongh, Muris, ter Horst, Van Zuuren, & De Wit, 1994; Willumsen, Vassend, & Hoffart, 2001b). De Jong reported a gradient in the number of negative cognitions and dental anxiety; the more negative cognitions, the greater the dental anxiety (de Jongh et al., 1994).

Physiological effects associated with negative thoughts and anticipatory anxiety in relation to future treatment include the arousal of the autonomic nervous system with increased heart activity, perspiration, muscle tension, nausea, gagging and fainting (Armfield, 2010; de Jongh et al., 1994; Wardle, 1984). During dental treatment, many studies have reported physiological effects such as higher levels of heart activity and muscle tension for these patients with dental anxiety (Lundgren, Berggren, & Carlsson, 2001, 2004).

## Treatment of dental anxiety and dental phobia

People who seek special treatment for dental anxiety have often developed a dental phobic avoidance behavior and, as a result of this, a deterioration in oral status. Almost all clinical studies of the effect of the treatment of dental anxiety are performed on selected samples of patients seeking special care because of dental fear and avoidance. However, as described earlier, the majority of people with dental anxiety attends dental care on a regular basis and is then treated by their general dentists. In general practices, it appears that the patients are treated successfully and sometimes become less fearful thanks to a skilled dental team. The treatment can then be characterized by the dental team's supportive behavior, attitude and communication and by, for example, efforts to reduce pain and give the patient the ability to control the treatment (Friedman & Wood, 1998; Milgrom, Getz, & Weinstein, 1988; Wardle, 1983).

In specialist clinics for dental fear treatment, various treatment methods are used. Different psychological therapies are used in the treatment of dental anxiety and phobia, but the most commonly used is behavioral therapy, including systematic desensitization and cognitive behavioral therapy (Berggren & Linde, 1984; Getka & Glass, 1992; Haukebo et al., 2008). There are also various relaxation methods, such as applied relaxation (Ost, 1987). In addition to psychological therapies, there are pharmacological therapies, such as sedation with benzodiazepines or nitrous oxide sedation, intravenous sedation or general anesthesia (Berggren & Linde, 1984; ter Horst & de Wit, 1993; Weinstein, Milgrom, & Ramsay, 1988). An alternative to psychological or pharmacological methods is conventional adapted dental treatment within the dental team.

Behavioral treatment techniques and systematic desensitization in particular have been found to be more effective compared with premedication with benzodiazepines and general anesthesia both in the short term and over longer periods (Hakeberg, Berggren, & Carlsson, 1990; Hakeberg et al., 1993). In a study in which the outcome of cognitive therapy, applied relaxation and conventional pharmacological sedation was compared, it was shown that all three methods were associated with improvements in terms of dental fear and dental treatment progression (Willumsen, Vassend, & Hoffart, 2001a). According to a newly performed Health Technology Assessment report, there is support for the hypothesis that behavioral therapy produces a clinically relevant reduction in



dental anxiety and improves the acceptance of conventional dental treatment in a short- and long-term perspective (Wide Boman et al., 2012).

## *Coping and stress*

### Stress

The term “stress” has become established in the last few decades. The definition of stress has developed over time and, in recent years, more consideration has been taken of the processes involved. Lazarus and Folkman define in their transactional theory, stress as “a relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being”. Stress here is viewed as a complex, multivariate process with a large number of potential influences including the environment, personality factors, the way people appraise the environment, the ways in which people cope and the ways all these influences change over time. This approach to stress means that the way a stress-evoking situation, i.e. a stressor, is experienced may vary greatly between two individuals experiencing the same stressor (R.S Lazarus & Folkman, 1984).

Stress has an adverse impact on cognitive functioning and many studies suggest that stressed or anxious people perform cognitive tasks differently compared with non-anxious people. Some studies suggest that both attentional and memorial cognitive processes could be affected by stress or anxiety (Eysenck, 1997). People react differently to stress and many different factors have been investigated in relation to stress. Three broad categories have been classified by Cooper and Payne (Cooper & Payne, 1988): genetic (e.g. gender, physique and age), acquired (e.g. social class, education and social support) and dispositional (e.g. coping style, negative affectivity, Type A and other personality variables) factors. Genetic and dispositional factors are seen to be generally stable traits or characteristics of the individual, while acquired factors can change during a person’s lifetime. However, these factors could interact and social support, for example, which is seen as an acquired factor, could have both dispositional and genetic components.

The nervous system is very complex, as it contains different functional systems and these systems are parts of an integrated whole and do not act independently. Under threat, the sympathetic nervous system is instantly activated by noradrenalin as a neurotransmitter, with branches to every organ or gland in the body. Simultaneously, there is a release of adrenalin from the sympathetic-adrenal-medullar system to prepare the body for fight or flight. The frequent activation of the human stress response system can lead to the dysregulation of responses so that the body’s response system becomes a threat to health and well being, via the sympathetic nervous system that, for example, regulates the cardiovascular and immune system (Jones & Bright, 2001 pp. 65-87).

In general vulnerability models (Barlow & Durand, 2012), several factors interact in order for a person to develop stress, anxiety or phobia, for example. A traumatic conditioning experience (direct or indirect) often plays a role in this process. Fear is

more likely to develop if the person has an inherited generalized biological vulnerability to objects or situations that have always been dangerous to the human race (e.g. heights, snakes, spiders) and a low threshold for specific defensive reactions (e.g. vasovagal response). Further, additional vulnerability factors include the person having a specific psychological vulnerability to an object or situation (e.g. heritability of individual specific phobias), which could develop into a more generalized psychological vulnerability about future contact with the object or situation that it will occur or happen again. The person then has a belief that the world is dangerous and out of control and that things could go wrong based on earlier experiences. Social and cultural factors are also strong determinants in the process of stress due to other life events. This generalized vulnerability model is consistent with the cognitive vulnerability model, described previously in the etiology section by Armfield (Armfield, 2006), and the vicious circle by Berggren (Berggren, 1984), where the origins of specific fears are described as being based on the way an individual perceives a particular experience rather than the experience per se. In the maintenance of fear and anxiety, additional emotional complications could occur, such as emotional disorders.

## Coping

Dental treatment involves physical, psychological and social stressors for people who suffer from dental anxiety. To manage or cope with the dental treatment situation, patients have to deal with the stress both before (anticipatory anxiety) and during treatment. There are a variety of potential stressors, such as pain, treatment procedures, and the dental clinic environment, in connection with dental treatment. Patients also need to develop and maintain relationships with the dental staff. Coping refers to the efforts in behaviors and thoughts that are used to manage the stress. Much coping research has been derived from the framework of stress and coping formulated by Lazarus and Folkman (Folkman, 1997; Folkman & Lazarus, 1988; R. S. Lazarus, 1966, 1993, 2000; R.S Lazarus & Folkman, 1984), which is regarded as the most authoritative theoretical framework in the field. In their transactional approach, coping is defined as a process of “constantly changing cognitive and behavioral efforts to manage specific external and/ or internal demands that are appraised as taxing or exceeding the resources of the person” (R.S Lazarus & Folkman, 1984).

### *The coping process*

At an early stage, Lazarus and Folkman argued that the strain people experience as stressful had a psychological dimension and they used the term “cognitive appraisal” to describe the person’s evaluative assessment of situations (R. S. Lazarus, 1966; R.S Lazarus & Folkman, 1984). Cognitive appraisals or perceptions of the situation are instant processes of which individuals are not aware, which are designed to sort the significance of everyday impressions. The individual’s coping response is based on his or her appraisal of the situation and the feelings evoked. Two types of appraisals are described, primary and secondary. Primary appraisal is the process whereby the person evaluates the stressor in terms of potential harm, loss, threat or challenge. Secondary appraisal is the process whereby the person evaluates his or her coping options, i.e. what can be done to overcome or prevent harm or improve benefits. Appraisals appear

to be closely linked to affective reactions, such as fear and sadness, which could in turn help to motivate action-taking (R. S. Lazarus, 2000; A. C. Smith & Lazarus, 1990). For example, when a person with dental anxiety who avoids dental treatment due to the anxiety gets toothache, feelings of fear, anger, frustration and shame may occur. The person's appraisal of the situation is that he or she must do something to reduce the fear and anxiety in order to obtain dental care and thus overcome toothache. One coping response could be to talk to someone who understands the feelings in connection with dental anxiety, to ease the emotional burden and to be able to take action to achieve help to make an appointment at the dentist, for example. This example illustrates the fact that coping is oriented towards the situational context, because the coping effort is directed towards another person in the environment. In the process of coping, coping can change within its context and here, for example, the reaction of the person giving social support shapes the event that follows. The transactional process therefore involves the interaction between individual coping efforts and the external situation itself over time.

### *Coping strategies*

Coping strategies are seen as conscious techniques, thoughts and behaviors that are used to deal with a stressful situation (R.S Lazarus & Folkman, 1984). A coping strategy that is, for example, designed to obtain emotional support may therefore include different support-seeking behaviors aimed at friends and the dentistry team, as well as different supportive self-talking methods or thoughts. Coping strategies should be distinguished from automatic behavior, such as routines and automatic modes to adapt to situations, because adapting by coping strategies always involves stress-induced reactions. Nor should coping strategies be confused with defense mechanisms, because defense mechanisms are more or less unconscious behaviors (Cramer, 2000). Finally, coping strategies should not be confused with the outcome of stress and coping (physical, psychological and social), such as physical arousal with higher levels of stress hormones, problems with concentration, anxiety, depression, decreased ability to work or study, or problems in relationships with other people (R. S. Lazarus, 1993; R.S Lazarus & Folkman, 1984).

The efforts of managing stress also include coping strategies that do not work or are directed at avoiding or minimizing stressors, as well as mastering them. Coping strategies can be both adaptive and non-adaptive, depending on the situation and function of the strategy. In real-life situations, people may use a range of different coping strategies at the same or different times. The strategies that are good or bad will depend on the situation and may change over time with the situation. The outcome of the strategy is therefore dependent not simply on the strategy that is used but also on the effectiveness of the strategy within the situation (R.S Lazarus & Folkman, 1984).

### *Coping resources*

The individual's coping resources play an important part in the process of coping; they play important roles in determining the coping response, as well as appraisals, effects evoked in the situation and the outcome of the process. Coping resources and constraints against utilizing coping resources can be found both in the individual and in

the environment. Individual factors could include health, energy, life experience, education, beliefs about control, problem-solving skills and social skills. Individual factors could also include fundamental commitments and existential beliefs that help to motivate the individual. Examples of environmental factors include the availability of social support, material resources and attitudes in the society towards people with dental anxiety (R. S. Lazarus, 1993).

### *Classification of coping strategies*

Several attempts have been made to group or classify coping strategies in order to make them more understandable, but there are no clear boundaries between different classifications. The well-known “problem-focused” and “emotion-focused” division is mainly based on an interpretation of the function of the different coping strategies (R. S. Lazarus, 2000). Other classifications are approach versus avoidance and active versus passive coping. In approach-oriented coping, the strategy is to approach the problem but not directly to solve it. The main function of avoidance-oriented coping is to get away from the problem by using intellectual or behavioral distancing. Active coping includes problem-solving strategies or social support, for example, while passive coping could contain strategies such as intellectual distancing and wishful thinking (Jones & Bright, 2001 pp. 133-153).

### *Coping styles*

Coping styles differ from coping strategies in that styles are behaviors that are stable across different situations, more or less regardless of situational characteristics or the degree of stress. A coping style is a reflection of personality. An example of a coping style is an undifferentiated friendly or hostile manner in interaction with other people. However, coping style measures appear to be poor predictors of the actual coping process (R.S Lazarus & Folkman, 1984), but there is some research that advocates the value of the trait approach to the study of coping (Carver, Scheier, & Weintraub, 1989; Costa, Somerfield, & McCrae, 1996; Parker & Endler, 1992).

### *Findings of coping research*

There is substantial evidence to suggest that coping strategies mediate between the confrontation with stressful situations and the consequences for health and well-being (de Ridder & Schreurs, 2001; R.S Lazarus & Folkman, 1984; Penley, Tomaka, & Wiebe, 2002). Stressors that are appraised as threats or harmful losses are often associated with negative psychological and physical adjustments, while stressors that are appraised as challenges are associated with more positive adjustments (Roesch, Weiner, & Vaughn, 2002). When stressors are appraised as controllable events, individuals often experience positive changes followed by adversarial growth (Linley & Joseph, 2004). Among strategies, problem-focused coping has been associated with beneficial health outcomes and adversarial growth, while emotion-focused, avoidance-oriented and passive strategies are associated with more negative health outcomes (Penley et al., 2002). However, emotion-focused coping, such as emotional social support, has been

associated with adversarial growth (Linley & Joseph, 2004).

Only a few studies have been conducted of coping strategies in connection with dental care. In a study by Ylöstalo et al. (Ylostalo, Ek, & Knuuttila, 2003) designed to capture dental health behavior among young Finnish adults, it was shown that both active coping and dispositional optimism were related to different dental health behaviors and that active coping mediated between dispositional optimism and health. Abrahamson et al. have conducted two qualitative studies to explore and describe dental phobic patients' view of their dental anxiety and experiences of dental care. The analysis showed that the stressors here were appraised as an existential threat with two dimensions, "threat of violation" and "threat of loss of autonomy and independence", and that there are several psychological and social factors that interact in determining how dental phobic individuals cope with their fear. The patients used both avoidance and suppression, as well as problem-solving strategies (Abrahamsson et al., 2002a; Abrahamsson et al., 2002b).

### *Criticisms of coping research*

There is criticism relating to research on coping and, in particular, what coping refers to (de Ridder, Depla, Severens, & Malsch, 1997) and the fact that varying, unclear definitions may jeopardize the validity and interpretation of the research and make clinical applications difficult. A great deal of criticism has also been leveled at the poor psychometric quality of coping measures in terms of validity and reliability (de Ridder et al., 1997; Parker & Endler, 1992) and especially at the difficulty involved in reproducing the factor structure of coping measures derived within the transactional framework (Folkman & Lazarus, 1988; Parker, Endler, & Bagby, 1993). It has been argued that many psychometric problems reflect underlying conceptual confusion (de Ridder et al., 1997).

A more clinically oriented criticism is that the predominant use of general coping scales to assess coping strategies produces results that are too broad and may be difficult to interpret in the clinical setting (de Ridder & Schreurs, 1996). In fact, when a widespread general coping scale was compared with a condition-specific measurement of coping strategies, it was found that condition-specific measurements had better reliability and validity (Elfstrom, Ryden, Kreuter, Taft, & Sullivan, 2005). Further, condition-specific measurements of coping strategies can predict psychological and physical aspects of self-rated health over time (Kennedy, Lude, Elfstrom, & Smithson, 2012; Kennedy, Lude, Elfstrom, & Smithson, 2011). These results imply that coping strategies of relevance to dental anxiety should be assessed with a measurement that is adapted to the dental setting.

## *The rationale for this thesis*

Very little work has been devoted to coping strategies and dental anxiety. Dental anxiety and dental phobia have a substantial impact on an individual's life. Not only because of the risk of deterioration in oral health, with pain and dysfunction due to the avoidance of dental care, but the anxiety itself may impair the individual's health-related quality of life, with consequences such as general anxiety and social dysfunction. A better understanding of coping strategies could lead to significant improvements in the treatment of dental anxiety in general and specialist practices, dental service utilization and oral health.

## **Aims of the thesis**

The overall aim of this thesis was to explore the reported use of dental coping strategies among adult patients with dental anxiety and regular or irregular dental visiting habits.

### *Specific aims*

#### **Paper I**

The general aim of this study was to develop a questionnaire for assessing coping strategies in the dental treatment situation and to evaluate its psychometric properties in a sample of adult, highly fearful patients with regular or irregular dental care behavior. Specific aims were to evaluate the internal structure and reliability of the scale and to assess whether different coping strategies in regular and irregular attendees were risk factors for regular/irregular dental care. It was hypothesized that patients with regular dental care would exhibit a greater number of adaptive coping strategies and fewer maladaptive coping strategies.

#### **Paper II**

The aim of this study was to further investigate the newly constructed DCSQ-15 questionnaire to focus on more adaptive coping strategies in the dental treatment situation and to evaluate its psychometric properties in a sample of adult, dentally anxious patients with regular or irregular dental care.

#### **Paper III**

The aim of this study was to investigate the relationship between dental coping strategies in the DCSQ-15 and emotional factors, such as general anxiety and depression, while controlling for sociodemographic factors, in a sample of adult, dentally anxious patients with regular or irregular dental care.

#### **Paper IV**

The aim of this grounded theory study was to generate a conceptual framework explaining the main concerns of patients with dental anxiety who despite their fear, participate in regular dental treatment, in order to acquire a deeper understanding of what they do to manage the dental treatment situation.

## Materials and methods

### *Design*

In this thesis, a mixed-method design was used (Morse, 2009). The core component is quantitative, with cross-sectional, comparative and descriptive designs, with a supplementary qualitative component with in-depth interviews.

The quantitative research component in Papers I, II and III aims to develop and evaluate a new coping instrument and to explore its relationship to other instruments measuring dental fear, general anxiety, depression and background data. In Paper IV, the quantitative components are aimed at describing the interview persons, according to background data.

The qualitative research component in Paper IV aims to reveal and understand the way adult patients with dental fear use coping strategies in connection with dental treatment.

*Table 2. Design and data collection methods used in Paper I – IV.*

Paper	Design	Data collection method	Instruments	Number of items
I	Cross-sectional, comparative, descriptive	Questionnaires	DCSQ-20 DAS DFS	20 4 20
II	Cross-sectional, comparative, descriptive	Questionnaires	DCSQ-15 DAS DFS	15 4 20
III	Cross-sectional, comparative, descriptive	Questionnaires	DCSQ-15 DAS HADS	15 4 14
IV	Cross-sectional, descriptive	Qualitative in-depth interviews, Questionnaire	DAS	4



## *Participants and Procedure*

### Papers I-II

The participants in Papers I and II were two groups of patients regularly attending dental care or avoiding dental care. The first group – regular attendees – consisted of 94 consecutive patients who regularly attended dental services at three public dental service clinics in Gothenburg. A convenience sample of seven different dentists at the three clinics recruited patients and collected data. Patients were included if (i) they had self-reported experiences of high dental anxiety and also (ii) were judged by their dentist to suffer from high dental anxiety. The second group – irregular attendees – comprised 77 consecutively selected patients without regular dental care, who applied for treatment at the Dental Fears Research and Treatment Clinic in Gothenburg (DFRTC). All irregular attendees had refused conventional dental treatment due to dental anxiety and stated that they had not seen a dentist for regular care during at least the previous 3 years.

Prior to the present investigation, a pilot study was performed including 50 consecutively selected patients at the DFRTC. The Dental Coping Strategy Questionnaire (DCSQ), then included 21 items. An item analysis showed an acceptable variation and distribution of scores among items. However, one item was excluded due to low ratings and poor variation of responses.

The 20-item Dental Coping Strategy Questionnaire (DCSQ-20) was used in the first study. In the second study, five items related to catastrophizing thoughts were removed from the DCSQ-20 to form the new instrument with 15 items, the DCSQ-15, and the DCSQ-15 was used in Paper II.

The patients were asked to participate in the study in conjunction with their first visit to the clinics. After giving written informed consent, the patients provided background information about gender, age and regular or irregular dental care. Both groups completed the questionnaires before seeing the dentist.

### Paper III

The participants consisted of two groups of adult patients with dental anxiety. The first group of patients, 141 regular attendees, was consecutively selected from Public Dental Clinics in the region of Västra Götaland, Sweden. Patients were included if (i) they had self-reported experiences of high dental anxiety and also (ii) were judged by their dentist to suffer from high dental anxiety. All the patients had undergone regular dental care during the last three-year period, i.e. dental examinations at least once every two-year period, three times in succession. The distribution of the participants from different parts of the region was 64 patients from a large city area, 27 patients from a medium-sized town and 50 patients from rural areas.

The second group of patients, 263 irregular attendees, was consecutively selected from the DFRTC. All the patients in this group had refused conventional dental treatment due to dental anxiety and stated that they had not been treated regularly for the past three years at the very least.

The patients gave their written informed consent before answering the questionnaires. The procedure was that regular attendees were asked to participate in the study in conjunction with a visit to the clinics. The irregular attendees were asked to participate in the study in conjunction with their intake examination at the DFRTC. All patients in both groups stated that they understood Swedish well enough to answer the questionnaires. After giving written informed consent, the patients provided background information and answered the questionnaires.

## Paper IV

The study sample consisted of 14 patients, strategically selected from nine different dentists representing both public and private dental services. The inclusion criteria were that the patients attended regular dental treatment, reported experiences of high levels of dental anxiety and were judged by their ordinary dentist to suffer from high levels of dental anxiety. The exclusion criteria were language difficulties and significant psychiatric problems or diagnoses, other than dental phobia. Self-reported dental anxiety was assessed using Corah's Dental Anxiety Scale (Corah, 1969; Corah, Gale, & Illig, 1978), designed to evaluate overall dental anxiety. Gender, age and DAS scores were given as a description of the study sample, which consisted of seven women, mean age  $\pm$  SD: 47.7  $\pm$  15.4 yr (range 24-65 yr), and seven men, mean age  $\pm$  SD: 53.4  $\pm$  11.8 (range 39-69 yr). The patients had a DAS score (mean  $\pm$  SD) of 13.6  $\pm$  3.9 (range 5-19). These background data were collected before the interviews started. Data were collected between March 2009 and April 2010.

Interviews with each participant were conducted by the first author and took place at the institution in a room outside the treatment clinic and lasted for approximately 25-60 min (mean = 37 min). In order to optimize variations in data, the selection of participants was initially open. The interviews were held in a conversational style with a few questions formulated in advance, such as: "What do you do/think about during dental treatment to manage or endure the situation?" This question was followed by relevant probing and follow-up questions. The interviews were audio-taped and transcribed verbatim for consecutive analysis. The emerging preliminary results of the analysis directed the data that were needed next and theoretical sampling aiming at saturating emerging categories by additional information was carried out. The interviews were analyzed consecutively by the first author (J.B.), with supervision from the second author (L.H.). Before each interview, the patient was informed verbally and in writing about the purpose of the study and its confidentiality.

## *The quantitative research components*

### Measurements and instruments

**Background data** were collected through questions in the intake examination for the patients seeking treatment at the DFRTC or by questions in addition to the questionnaires or interviews for the patients at the public or private dental services. Sociodemographic characteristics were age and gender and, in Paper III, also educational level. The educational level was rated as follows: (1) nine-year elementary education or less, (2) secondary education and/or vocational training, (3) higher education.

**Dental coping strategies** were measured by two newly constructed questionnaires; the 20-item Dental Coping Strategy Questionnaire (DCSQ-20) and the 15-item Dental Coping Strategy Questionnaire (DCSQ-15).

#### *DCSQ-20*

The DCSQ-20 (Appendix A) was constructed to investigate the presence and use of coping strategies among the study groups. The DCSQ-20 was developed from the Coping Strategy Questionnaire (CSQ) (Rosenstiel & Keefe, 1983), one of the most widely used measures of coping strategies. The CSQ was originally constructed to study cognitive and behavioral coping strategies in patients with chronic low back pain. There are similarities between chronic pain and dental anxiety where both chronic pain and dental anxiety are viewed as two protracted chronic conditions common to persons dealing with treatment demands. Further, being in pain often involves anxiety and fear (Clyde & Williams, 2007). The original 48-item CSQ includes 8 different coping strategy subscales, each consisting of 6 items. Subjects rate each item depending on how often they use a particular strategy when they experience pain on a 7-point Likert scale, where 0 indicates never, 3 indicates sometimes and 6 indicates always.

The CSQ was shortened and adapted to the dental situation based on a review of reference literature on dental cognitions and pain (Berggren, 1986; Berggren et al., 1997; Litt, 1996) and on interview studies with dental phobic patients (Abrahamsson et al., 2002a; Abrahamsson et al., 2002b). Items from two subscales, "increasing activity level" and "increasing pain behavior", were excluded because these strategies were deemed not to apply to the dental treatment situation. For the remaining 6 subscales, the most suitable items were selected and rephrased to apply to dental fear. Three additional items were added specific to the dental situation. These items mirrored two of the original coping subscales. After a pilot study the 20-item Dental Coping Strategy Questionnaire was developed. The response scale format of the DCSQ-20 involves a 0- to 6-point Likert scale, where 0 indicates never and 6 indicate always. However in our analysis we have used the scale 1 to 7.

### *DCSQ-15*

The DCSQ-15 (Appendix B) was a further development of the DCSQ-20 (Bernson, Elfstrom, & Berggren, 2007). To create the reduced DCSQ-15, five items (6, 13, 14, 17 and 18) from the DCSQ-20 were removed. These items were related to catastrophizing thoughts and were believed not to assess a coping strategy per se. The response scale format from the DCSQ-20 was kept.

***Dental anxiety*** was measured by two well-established instruments, the Dental Anxiety Scale (DAS) and the Dental Fear Survey (DFS).

### *DAS*

The DAS was presented by Corah in 1969 (Corah, 1969) and has been the most widely used instrument for measuring dental anxiety, primarily in epidemiological surveys but also in clinical trials for screening purposes. In several previous studies, the instrument has been shown to have good reliability and validity (Berggren & Carlsson, 1984; Schuurs & Hoogstraten, 1993). The scale is designed to evaluate overall dental fear and it measures reactions to four imagined dental treatment situations. Each situation is assessed on a scale from calm (with a score of 1) to terrified (with a score of 5). Ratings are added up to give a total score ranging from 4 to 20. Population normative mean scores have been reported to be between 8 and 9, and a DAS score of  $\geq 12$  or 13 has often been used as the criterion for high dental fear but also a score of  $\geq 15$  (Berggren & Carlsson, 1984; Corah et al., 1978; Locker et al., 1991; Locker, Liddell, & Shapiro, 1999). Due to ceiling effects, the DAS is less valuable when it comes to differentiating between patients with extreme dental fear (Berggren, 1987; Berggren & Carlsson, 1985) and it does not directly measure dimensions of patients' beliefs or attitudes to dentists and dentistry (Berggren, 1987; Kunzelmann & Dunninger, 1990).

### *DFS*

The DFS was first presented in 1973 by Kleinknecht et al. (Kleinknecht & Bernstein, 1978; Kleinknecht, Klepac, & Alexander, 1973). The DFS has been widely used to measure aspects of dental fear and a number of studies have documented acceptable reliability and validity for the instrument (Kvale et al., 1997; Schuurs & Hoogstraten, 1993). Factor analyses of the scale have revealed three distinct dimensions of dental fear; anticipated anxiety, autonomic arousal and fear of specific objects or situations (Kleinknecht, Thorndike, McGlynn, & Harkavy, 1984; McGlynn, McNeil, Gallagher, & Vrana, 1987). The DFS contains 20 items with a score level from a low intensity of reaction (with a score of 1) to a high intensity of reaction (with a score of 5) and they are added together to produce a score ranging from 20 to 100. Patients with severe dental fear obtain total scores of  $> 65$  (Hakeberg & Berggren, 1997; Kleinknecht et al., 1984; McGlynn et al., 1987). According to Hakeberg and Berggren (Hakeberg & Berggren, 1997) in their work on identifying dimensions of the scale to mirror severe dental anxiety and dental phobia, the DFS measures five different dimensions of dental anxiety among dental phobic patients: avoidance behavior; physiologic arousal; anticipatory

anxiety; fear of needles and fear of drilling. In Paper I, the first three-factor model has been used and, in Paper II, the five dimensions of the scale were used.

## *HADS*

**General anxiety and depression** were measured by the Hospital Anxiety and Depression Scale (HADS) developed by Zigmond and Snaith in 1983 (Zigmond & Snaith, 1983). The HADS is a well known and reliable instrument for identifying anxiety disorders and depression (Bjelland, Dahl, Haug, & Neckelmann, 2002; Herrmann, 1997). The scale was developed for screening for clinically significant anxiety and depression in medical and psychiatric patients. The items focus on cognitive and emotional aspects of general anxiety and depression. The scale consists of 14 items on a four-point scale, range 0-3, forming the two subscales of anxiety (HADS-A) and depression (HADS-D) and giving total scores varying from 0-21 on each subscale. A higher score is indicative of more distress. The HADS is a reliable and valid measurement of the presence and severity of general anxiety and depression. A score of 0 to 7 for either subscale can be regarded as being in the normal range, a score of 11 or higher indicates the probable presence of a mood disorder and a score of between 8 and 10 is suggestive of the presence of the respective state (Bjelland et al., 2002; Herrmann, 1997).

## Statistical analyses

The collected data were analyzed using SPSS (Statistical Package for the Social Sciences, version 12.0 – 17.0). A p-value of 0.05 was taken as the level of statistical significance, but adjustments have been made for multiple comparisons.

Descriptive statistics, the chi-square test, Fisher's exact test, the t-test and analysis of variance were used to summarize sociodemographic characteristics and to describe coping strategies, dental fear, anxiety and depression. Pearson's correlation coefficient was calculated to determine the strength of relationships between selected variables. The correlation matrix of the DCSQ-20 and DCSQ-15 was decomposed using a principal components analysis. Factors were orthogonally rotated (Varimax rotation with Kaiser's normalization) to maximize the statistical separation of the DCSQ-20 and DCSQ-15 into subscales. An inspection of these analyses with regard to eigenvalues and scree plots led to a decision relating to the number of factors that were going to be retained. Subscale (factor) labels were selected to reflect their origin in the CSQ as well as their item content. Cronbach's alpha coefficient was used to estimate the internal consistency reliability of the multi-item subscales derived from the factor analysis.

In Papers I to III, factors were subsequently included in a logistic regression model to evaluate their ability to predict dental care behavior (avoidance vs. regular dental care). The test statistic Nagelkerke's  $R^2$  was used to estimate the amount of variability accounted for by the logistic models.

In Paper III, a power calculation was performed before the study started and in conjunction with the formal application to the Ethical Review Board. The following assumptions were made: an alpha value of 0.05, a statistical power of  $\geq 80\%$  and a mean detectable difference between groups of 0.4 using the mean item score of DCSQ-15. The analysis indicated a total group of 240 patients; i.e. 120 per group.

## *The qualitative research component*

### Grounded theory

In Study IV, the interviews were analyzed using the constant comparative method of grounded theory, an inductive method aimed at studying psychosocial processes, discovering existing problems and investigating how people handle situations (B. Glaser & Strauss, 1967; B. G. Glaser, 1978).

Grounded theory has its roots in sociology and symbolic interactionism (Blumer, 1969) and it was developed as a result of collaboration between two sociologists, Barney G Glaser and Anselm L Strauss, and introduced in their book *The discovery of grounded theory* in 1967 (B. Glaser & Strauss, 1967). Grounded theory research is aimed at understanding how people define, through social interaction, their own reality. The researcher's task is to discover and conceptualize the essence of these complex interactional processes, to generate a conceptual framework and a theory explaining the main concern of the process or problem and the way people involved manage this (B. Glaser & Strauss, 1967; B. G. Glaser, 1978; L. R.-M. Hallberg, 2006).

Over the years, grounded theory has developed in several directions, probably due to different ontological and epistemological positions (Charmaz, 2006; L. R.-M. Hallberg, 2006; Morse, 2009), such as Strauss and Corbin's reformulated grounded theory (Strauss & Corbin, 1990, 1998) and Charmaz's constructivist version of grounded theory (Charmaz, 1995, 2000).

In spite of this, the method still contains a number of common fundamental strategies. These fundamental features include the simultaneous collection and analysis of data and the constant comparison of data. It also includes memo writing during the entire analysis and theoretical sampling, where data analysis sets the direction for further data collection. Finally, the data collection proceeds until the saturation of information is reached (Charmaz, 2006; B. Glaser & Strauss, 1967; Morse, 2009; Strauss & Corbin, 1998). According to Glaser and Strauss (B. Glaser & Strauss, 1967), the quality criteria of a grounded theory study could be summarized as fit, work, relevance and modifiability. Fit means that the emerging categories and theory should be able to explain the data on which they are based. Work means that the categories and theory provide an explanation of the studied phenomenon. The results are relevant when they provide explanations of the actual problem and modifiability applies when it can be modified by additional data or changed conditions.

Qualitative methods are often used to bring more knowledge into new or already known areas where the issues that are studied are difficult to capture with quantitative methods. Very little qualitative research has been done within the research area of dental anxiety and dental coping strategies and the qualitative interview study described here highlights the problem of stress and coping during treatment from the patient's perspective. An exploratory and inductive study of this kind could provide a complementary perspective on the ways of coping that patients use and thereby contribute to the further understanding of the coping strategies that could be adapted to master dental anxiety.

## Data analysis

The classic version of grounded theory was used in this study (B. Glaser & Strauss, 1967). First, in this constant comparative analysis method, open inductive coding was performed to analyze the transcribed interview protocols. This coding involved the analytical process of identifying substantive codes in the data and gathering codes that reappeared into subcategories. Significant subcategories were then clustered into categories that reflected the meaning of data on a more abstract level. In the constant comparative process, data were compared with data, subcategory with subcategory and category with category. Each category was saturated with information and its subcategories were identified in the data. A core category, central to the data, was identified, explaining the main concern in the studied area.

This in turn formed the emerging theoretical framework, where the next step in the analysis was to explore relationships between the core category and the subcategories, using theoretical abstraction to explain how the main concern was managed. In theoretical sampling by both going back to previously collected data and conducting additional interviews, the categories were described and refined. Memo writing was performed during the entire analysis and contained preliminary assumptions, ideas and theoretical reflections that were used in the analysis process. During each step of the analysis, the researchers constantly moved between inductive and deductive thinking, i.e. drawing conclusions based on either a series of events that repeat or already known facts.

Data collection and data analysis were carried out in parallel and the procedure was continued until no additional data were found that further developed the properties and relationships of the category, i.e. saturation was reached. In the present study, saturation was reached after the collection and analysis of 14 interviews.

The researchers strove to avoid being consciously governed by their own prestructured understanding and to maintain a self-reflecting attitude to ways in which the research process could be influenced and how this, in turn, could influence the researcher (Malterud, 2001). The reflexive analysis in this study contained continuous discussions between the authors, two of whom, the second author (LH) and the third author (ME), had no professional experience of dentistry.

## *Ethical considerations*

The studies included here have been approved by the Regional Ethics Committee in Gothenburg (Papers I and II R 291-98, Paper III Dnr: 613-08 and Paper IV Dnr: 795-08). The patients were informed verbally, and in writing, about the purpose of the studies and all the patients gave their written informed consent before enrolment. The patients were guaranteed confidentiality and anonymity in the presentation of study results. The participants were assured that they could withdraw from the study at any time, without having to explain the reason for withdrawal. They were also assured that withdrawing from the study would not influence their future dental care. In Paper IV, preparations were made to provide professional support for the informant if the interview raised questions of such a sensitive nature that he or she needed to discuss them in more detail. This did not occur.

## Results

All the results accounted for in this section are statistically significant, unless otherwise stated.

### *Paper I*

A new measure of coping strategies related to dental treatment, the 20-item version of the Dental Coping Strategy Questionnaire DCSQ-20, was developed. The instrument consisted of twenty items, forming four different factors of coping strategies, labeled “self-efficacy”, “distraction and distancing”, “catastrophizing” and “praying and despair”, see Table 3. The four-factor structure fulfilled the criteria required in multi-item analysis for item scaling and reliability and, according to performed principal components analysis, the factors were distinctly separated and independent.

*Table 3. Description and examples of items in the four coping strategies in DCSQ-20.*

<b>Factor</b>	<b>Number of items</b>	<b>Factor content</b>	<b>Example of item</b>
Self-efficacy	6	The person’s beliefs about his/her own ability to perform a specific behavior.	I tell myself to be strong enough to stand it, despite the fear.
Distraction and distancing	7	The person attempts to distract him/herself from the treatment or emotionally distance him/herself from the treatment.	I count to myself, sing for myself or try to play mental games with myself to keep my mind off the treatment.
Catastrophizing	4	The person performs catastrophizing thoughts and negative self-statements.	I worry all the time whether my fear will go away.
Praying and despair	3	The person prays to a higher power or to a higher being; the feeling is that there is nothing else he/she can do about the situation.	I pray that the treatment soon will be over.

When comparing irregular attendees with regular attendees, it was shown that the group of irregular attendees had higher levels of dental anxiety according to the DAS



and DFS, were younger and that the proportion of men was higher. The coping strategies of “catastrophizing” and “praying and despair” were also rated more highly among irregular attendees. When entering the four factors, gender, age and the DAS into a logistic regression model to predict irregular dental care behavior, it was shown that the strongest predictor was dental anxiety (DAS) (OR=5.3), followed by gender (men) (OR=4.4). The coping strategies of “praying and despair” and “catastrophizing” were also predictors of irregular attendance (OR=2.5 and 2.4 respectively).

## *Paper II*

In this study, the DCSQ-20 was shortened into a new instrument, the DCSQ-15, by excluding items reflecting catastrophic thoughts. The new instrument consisted of fifteen items, forming five different factors of coping strategies labeled “self-efficacy”, “self-distraction”, “distancing”, “praying” and “optimism”, see Table 4. The five-factor structure acceptably fulfilled the criteria required in multi-item analysis for item scaling and, according to performed principal components analysis, the factors were relatively separated and independent.

*Table 4. Description and examples of items in the four coping strategies in the DCSQ-15.*

<b>Factor</b>	<b>Number of items</b>	<b>Factor content</b>	<b>Example of item</b>
Self-efficacy	4	The person uses beliefs about his/her own ability to perform a specific behavior.	I tell myself not to be afraid.
Self-distraction	4	The person attempts to distract him/herself from the treatment.	I think about people I like to be with.
Distancing	3	The person attempts emotionally to distance him/herself from the treatment	I try to feel distant from the treatment, almost as if I were somewhere else.
Praying	2	The person prays to a higher power or to a higher being; the feeling is that there is nothing else he/she can do about the situation.	I pray that the fear will disappear.
Optimism	2	The person challenges the fear and thinks about life after treatment.	I try to think years ahead, about what everything will be like after the treatment.

When comparing irregular attendees with regular attendees according to the DCSQ-15, it was shown that the coping strategy of “praying” was rated more highly among irregular attendees, while “optimism” was rated more highly among regular attendees.

When using a five-dimension model of the DFS according to Hakeberg and Berggren (Hakeberg & Berggren, 1997), it was shown that four of the five dimensions were rated more highly among irregular attendees, i.e. “avoidance behavior”, “physiologic arousal”, “anticipatory anxiety” and “fear of drilling”, but not “fear of needles”.

To predict irregular dental behavior, the five factors, together with gender, age and the DAS, were entered into a logistic regression. The strongest predictor was shown to be gender (men) (OR=8.8). Dental anxiety (DAS) and the coping strategy of “optimism” were also predictors (OR=1.6 and 0.7, respectively). Risk factors for irregular dental care were therefore being male, having a high level of dental anxiety and using little optimism.

### *Paper III*

The results of the study showed that emotional conditions such as anxiety and depression were associated with the reported dental coping strategies in the DCSQ-15. As in Studies I and II, but now with a different sample, women predominated in both groups. The proportion of men was higher among irregular attendees and the patients were younger in this group compared with regular attendees.

The level of anxiety (DAS), general anxiety (HADS-A) and depression (HADS-D) was higher in the irregular group. Regular attendees used more of the coping strategies of “optimism” and “self-efficacy”. The coping strategies of “praying”, “self-distraction” or “distancing” were not used more significantly by either of the two groups.

There were higher correlations between general anxiety and all the dental coping strategies in the regular group. Depression was positively correlated to general anxiety and “praying” in both groups.

In the logistic regression analysis to predict dental care habits, it was shown that the reported use of optimistic thinking was predictive of regular dental care (OR=0.65), while gender (being a man)(OR=2.2) and having high levels of dental anxiety (DAS)(OR=1.3) and high levels of general anxiety (HADS-A)(OR=1.1) predicted irregular dental care.

In order to reveal possible interactions between genders, dental anxiety, general anxiety and the DCSQ factor of Optimism, these terms were included in a multivariate analysis. However, none of the interactions was statistically significant, and thus not included in the final model.

## Paper IV

In this qualitative analysis of interviews, a conceptual framework was generated. The main concern for patients who, despite their dental anxiety, regularly consulted their dentist was identified as “making dental care possible – a mutual affair”. This means that efforts from both sides, the patients and the dental staff, must be made for the authorization of an interaction. Four additional categories explained how patients handled their fear and how dental care became possible. The four categories each have several subcategories or coping strategies, see Figure 2.

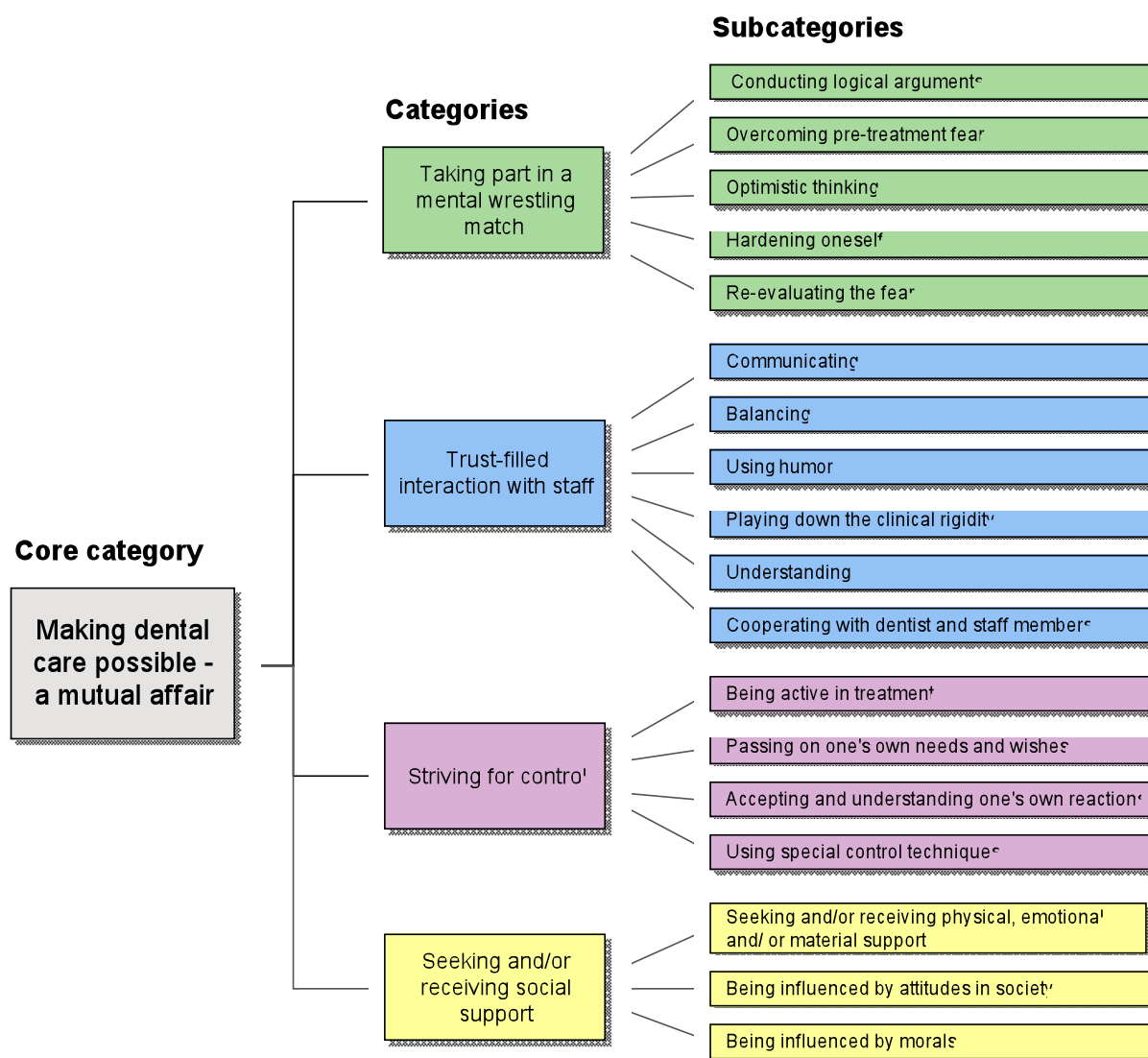


Figure 2. A schematic layout revealing the main concern (core category) and the ways to handle the situation (categories) and the coping strategies used (subcategories) for patients who, despite their dental anxiety, regularly consult their dentists.

Before and during the treatment, the patient takes part in a “mental wrestling match” in order to overcome his or her anticipatory dental anxiety, find arguments to explain why dental care is important and to be able to interact with the dental staff. Important here is the ability to conduct logical argumentation with oneself and to think optimistically about one's capability to undergo and alter the situation. This also includes optimistic thoughts about the future, how it will feel when the treatment is over.

In the “trust-filled interaction” during treatment, the interplay affects both parties and includes communication to create a good and lasting relationship for dental treatment, for the moment and for the future. The communication is facilitated if it is characterized by attention, empathy and understanding. It requires a balance between nearness and distance and professional and personal treatment. Furthermore, humor could be used to lighten the atmosphere, to ease the fear and make contact with each other. It could also help to bring down the “clinical rigidity”.

Patients describe their “striving for control” of treatment and of their own reactions during treatment. Ways of achieving control could include being able to express one's own needs and wishes, or the dentist preparing the patients for different treatment procedures and for forthcoming treatment. In order to ease the strain and anxiety during treatment, different control techniques, such as breathing techniques, could be used.

“Social support” creates a feeling of not being alone. The support could work in different ways, such as having someone who listens and understands, someone who helps to contact the dental clinic to make an appointment, or someone who gives financial help. The influence of a positive social environment or attitudes and morals in society could help patients to go regularly to the dentist.

# Discussion

## *Methodological discussion*

The purpose of the thesis was to explore the use of dental coping strategies among adult patients with dental anxiety and regular or irregular dental care. Since there was no existing coping instrument adapted to the dental treatment situation, the decision was made to develop a new instrument to study coping strategies in connection with dental treatment. It was also decided to conduct an interview study to obtain a deeper understanding of the studied problem.

Accordingly, the present thesis relies on both quantitative and qualitative methods. A cross-sectional study design was used in Papers I to III. Cross-sectional studies are descriptive studies at a certain time, designed to draw inferences about possible relationships and to describe risk indicators but not the causality of factors and outcome. To find the reason for a trend, longitudinal studies are needed and this means that specific directions of the relationships between coping strategies and treatment habits require further study.

In Paper IV, grounded theory was used with a view to producing a theoretical model of individual perspectives of a given phenomenon. Qualitative data are non-numerical and cannot be used as descriptive statistics, but they explore in depth the informants' experiences of their dynamic reality. Consequently, the results in Paper IV should be regarded as suggestions for the further development of measurements of coping strategies.

## Construction of a new instrument – the DCSQ

### *Origin: CSQ*

The construction of the new instrument originated from an established, well-known coping instrument, the Coping Strategy Questionnaire (CSQ) (Rosenstiel & Keefe, 1983), originally constructed to study cognitive and behavioral coping strategies in connection with low back pain and one of the most frequently used measurements of coping in chronic pain patients (Jensen, Turner, Romano, & Karoly, 1991). In contrast to many other coping instruments, the CSQ clearly measures coping strategies rather than coping styles. Furthermore, constructing and validating a completely new instrument would take many years (Streiner & Norman, 2008). In the discussion about using the CSQ, attention was paid to similarities between chronic low back pain and dental anxiety, where both conditions are often thought to be protracted and chronic and being in pain often involves anxiety and fear.

Rosenstiel and Keefe started the development process of the CSQ, with a review of the literature relating to coping with chronic pain. From this review, eight main coping strategies, six cognitive and two behavioral, were identified. The strategies were named

Diverting Attention, Reinterpreting Pain Sensations, Coping Self-Statements, Ignoring Pain Sensations, Praying or Hoping, Catastrophizing, Increased Behavioral Activities and Increasing Pain Behavior. Six representative items were then generated for each coping strategy. The respondents rated each item on a seven-point scale to indicate the frequency with which each strategy was used when pain was experienced, where 0 meant never, 3 sometimes and 6 always. The CSQ also contains 2 single-item effectiveness ratings of control of pain and the ability to reduce pain. These questions were not included in the factor construction of the CSQ (Rosenstiel & Keefe, 1983) and the items were not used in the DCSQ.

Considerable research has focused on the interpretation of the CSQ subscales using factor analysis studies and, as a result, there are revised and shortened versions of the CSQ (Hastie, Riley, & Fillingim, 2004; Irachabal, Koleck, Rasclé, & Bruchon-Schweitzer, 2008; Utne et al., 2009). Many studies of both the original version and the revised versions have revealed an unstable factor structure, possibly because of the rational construction of the CSQ or because of potential differences in constellations of coping strategies among people with different disorders. However, in studies with large samples and typical pain complaints, the results have shown factor structures with many similarities to the original factor structure of the CSQ and with good internal consistency, thereby supporting the validity of the instrument. This suggests that the CSQ may be applicable across a diverse range of populations (Burckhardt & Henriksson, 2001; Robinson et al., 1997; Swartzman, Gwadry, Shapiro, & Teasell, 1994; Tuttle, Shetty Jr, & DeGood, 1991).

### *DCSQ-20*

In the construction of the Dental Coping Strategy Questionnaire (DCSQ), items that appeared to fit the dental treatment situation were chosen from the CSQ. The decision to include these items was based on a review of reference literature on dental cognition and pain (Berggren, 1986; Berggren et al., 1997; Litt, 1996) and on interview studies with dental phobic patients (Abrahamsson et al., 2002a; Abrahamsson et al., 2002b). Six of the eight original coping strategies from the CSQ were retained, but the number of items was reduced. The behavioral strategies of Increased Behavioral Activities and Increasing Pain Behavior were excluded, because they were deemed not to apply to the dental treatment situation. Three additional items specific to the dental situation were added. These items related to the desire to listen to music during treatment, not to reveal the fear to other people and worrying whether the fear would ever pass. The 7-point Likert scale was retained. The DCSQ thus contained 21 items. The CSQ instrument that was used was a Swedish translated version (L. R. Hallberg & Carlsson, 1998). Because the Swedish translation procedures had not included a backward translation, the items that were used for the DCSQ were re-translated into English by a bilingual researcher to verify its compatibility with the original version of the CSQ. A pilot study comprising 50 consecutively selected patients from the DFRTC was conducted. An item analysis revealed an acceptable variation and distribution of scores among items. However, patient ratings for four items were relatively low and showed little variation. A decision was made to retain three of these items in the main study, while one item, "I see it (dental anxiety) as a challenge and don't let it bother me", was excluded. In addition to poor variation in responses, this item was assessed to be difficult for fearful

patients to recognize and endorse. The new instrument with 20 items, the DCSQ-20, was constructed and used in the first study (Paper I).

### *DCSQ-15*

In Study II, the focus lay on adaptive coping and a decision was made to exclude items containing catastrophic thoughts. In several studies comprising the CSQ instrument, catastrophic thinking has been related to helplessness and poorer levels of adjustment (Dozois, Dobson, Wong, Hughes, & Long, 1996; Spinhoven, Ter Kuile, Linssen, & Gazendam, 1989; Turner & Clancy, 1986). Although catastrophizing is a central part of the fear and anxiety process, it is not, according to a more conservative definition of coping strategies (Cramer, 1998), seen as an adaptive coping strategy or a coping strategy at all. The possibility that catastrophic behavior, in contrast to catastrophic thinking, could be an attempt to obtain support or assistance from others has been discussed. In modern coping research, coping strategies are seen as conscious techniques, thoughts and behaviors aimed at managing, correcting or mastering the problem (Cramer, 1998). It is therefore difficult to see how catastrophic thinking as a coping strategy could represent an effort-filled response to obtain support or assistance from others. However, the use of adaptive coping strategies could facilitate the cognitive modification of catastrophic thinking. As a result, five items (6, 13, 14, 17, 18) related to catastrophic thoughts were excluded from the DCSQ-20 to create the instrument with 15 items, the DCSQ-15.

### Sample and inclusion criteria

The participants in this thesis represent two groups of dental care patients. The first group consisted of patients attending dental care on a regular basis. The inclusion criteria for this group in all the studies were (i) that the patients self-reported experiencing a high level of dental anxiety and (ii) that they were judged by their dentists to suffer from a high level of dental anxiety. The dentists' subjective assessments of their patients were used. In connection with information about the studies, the dentists had received training on dental anxiety etiology and characteristics through lectures or seminars.

The second group comprised patients who applied for treatment, because of a high level of dental anxiety, at the DFRTC. These patients had not been treated regularly for at least three years. Moreover, this group self-reported a high level of dental anxiety in the intake examination. Studies I to III were conducted according to normal clinical routines and it was not possible to obtain a detailed description of patients who did not agree to participate in the study or were excluded for different reasons. To be sure that the patients fulfilled the criteria of being irregular attendees, they answered the questionnaires consecutively before seeing the dentist or the psychologist, or starting any treatment at the clinic. The selection of the irregular sample could imply differences in comparison with the whole population of non-attendees and the sample here in Studies I to III may have more severe problems in terms of both oral and psychological status. If there is a difference, it makes the contrast between our two attendance groups sharper than if the sample came from a randomized sample of the whole population and

thereby helps us to detect the important factors that may determine dental treatment habits. On the other hand patients that seeks treatment at the DFRTC may have a different or more positive attitude to undergo dental treatment than a randomized sample.

## Psychometric instruments

Two well-known instruments were used to measure dental fear, namely Corah's Dental Anxiety Scale (DAS) and the Dental Fear Survey (DFS). The Hospital Anxiety and Depression Scale (HADS) was used to measure levels of general anxiety and depression. These psychometric instruments have been extensively used and previously tested for both reliability and validity (Bjelland et al., 2002; Corah, 1969; Herrmann, 1997; Kvale et al., 1997; Moore et al., 1991; Neverlien, 1990; Schuurs & Hoogstraten, 1993).

In this work, the DAS was preferred for estimating overall dental anxiety, as it is a short, straightforward and widely used instrument. A high level of dental anxiety has been categorized in different ways in the literature with cut-off scores of DAS, for example (Berggren & Carlsson, 1984; Corah et al., 1978; Locker et al., 1991; Locker, Liddell, & Shapiro, 1999; Milgrom et al., 1995). In this thesis, the level of dental anxiety, according to the DAS, was used as a description of the studied individuals' level of dental fear. No cut-off score was used for inclusion criteria. The reason for this was to obtain a sample with the broadest possible experience of dental anxiety and coping. It is also difficult to capture every case of dental anxiety with a scale such as the DAS or DFS, when the anxiety is moderate, for example (Moore et al., 1993). A single question, assessing the individual's estimate of his or her own dental anxiety, was therefore used to screen for high dental anxiety. This question was judged to be sensitive enough to identify both fearful patients with a history of avoidance and patients who managed dental care. To validate the dichotomized yes/no dental anxiety question, the dentist's subjective assessment of the patient's level of dental anxiety was used, if, during treatment, he or she perceived the patient to be suffering from a high level of dental fear. A single question to estimate a patient's level of dental anxiety has been proved useful in other studies as well (Hagglin et al., 1999; Moore et al., 1993).

As seen in the results of Studies I and II, the mean value of the DAS was 13.2 among the regular attendees and 16.6 among the irregular attendees. In Study III, which contained a larger sample, the mean values of the DAS were similar. This indicates a high level of dental anxiety, according to the DAS, within both groups but not in all individuals according to the standard deviation of the means. However, all the patients in these studies answered yes when asked if they were highly anxious about going to the dentist and were judged by their dentists to suffer from a high level of dental anxiety.

## Statistical methods

In this thesis, standard statistical methods have been used for the quantitative analysis. In order to reveal the factor structure of the DCSQ, we applied an exploratory approach. We used a principal component analysis in Studies I and II to (i) evaluate the number of items and (ii) reveal the underlying factor structure with respect to coping dimensions.



A decision was made, based on clinical experience and theoretical considerations, to retain the factor of Praying and Optimism, despite the fact that each factor contained only two items. Optimism had emerged as a new factor and both Optimism and Praying were rated significantly more highly among regular and irregular attendees respectively, see Paper II. To achieve a more stable factor structure, these factors need to be extended to include more items in future versions of the instrument (Streiner & Norman, 2008). The studies in Papers I to III should be regarded as the first steps in the exploration of a new instrument. A future study with a reconstructed DCSQ and a larger study sample could be explored in more detail, with a confirmatory factor analysis or structural equation modeling analysis.

## Grounded theory

Grounded theory was chosen for the collection and analysis of the in-depth interviews. Grounded theory has its roots in symbolic interactionism and is mainly an inductive method, but it also has a deductive touch. Grounded theory aims to generate theory or theoretical frameworks, explaining the data and what is going on in the studied area. In social science and public health research, GT is often used to improve the understanding of phenomena about which little is yet known. The method could also be used to obtain a new or deeper view of previously studied issues (Dellve, Abrahamsson, Trulsson, & Hallberg, 2002). Dental anxiety has been extensively investigated during the last few decades, mainly by using quantitative methods. The present qualitative study was preceded by quantitative studies and carried out in order to obtain a deeper understanding of the way individuals with dental anxiety manage regular dental care. In this study, GT produced a theoretical model of the individuals' perspectives of the given phenomenon (regular attendance) and the strategies they use to cope with the problem (dental anxiety) in the distinct context (in connection with dental treatment).

Qualitative research is primarily subjective in its approach to understanding human behavior and reasons that govern behavior, in contrast to quantitative research that has a more objective approach. The researcher has to consider his/her own preconception when planning and conducting a qualitative study. Most researchers focus on the studied area, but they should not start the study with a preconceived theory in mind (Strauss & Corbin, 1998). It is important to avoid being consciously governed by one's own prestructured understanding and to maintain a self-reflecting attitude to the research process. This includes the researcher's attitude in attending systematically to the knowledge construction and understanding how, as a researcher, it is possible to influence the process and, in turn, how the process may influence the researcher during the entire research process. Different researchers might access different representations of a situation and this could increase their understanding of complex phenomena and show different aspects of validity that are equal. In the reflexive discussion between the authors of this paper, two of the four authors had no professional experience of dentistry and therefore had fewer preconceptions. A discussion between multiple researchers might strengthen the design, implementation and result of a qualitative study and preconceptions are not regarded as bias unless the researcher fails to mention them (Malterud, 2001).

Qualitative results are not discussed in terms of generalizability but in terms of transferability, by looking for recurring patterns and common features (Lincoln & Guba, 1985).

## *General discussion*

The overall aim of this thesis was to explore the reported use of dental coping strategies among adult patients with dental anxiety and regular or irregular dental visiting habits. Specific aims were also to investigate the possible relationships between dental coping strategies and emotional factors such as general anxiety and depression while controlling for sociodemographic factors, and to generate a conceptual framework explaining the main concern for patients with dental anxiety who despite their fear, participate in regular dental treatment.

The results of the studies indicated that the use of the coping strategy of Optimism was predictive of regular dental care, whereas being a male, having high levels of dental anxiety and general anxiety, having catastrophic thoughts and using more of the coping strategy of Praying might be risk factors for irregular dental care. Moreover, it is suggested that the interplay between the patient and the dental care providers, social support, patients logical argumentation with themselves, and feelings of control during treatment is of great importance in making dental care possible and maintaining regular dental care among adult patients with dental anxiety.

Coping strategies are viewed as mediating factors with regard to outcome in the transactional theory of stress and coping (R.S Lazarus & Folkman, 1984). This is a possible key concept in health psychology and related disciplines and serves as a framework for understanding adaptive and maladaptive processes. The use of maladaptive coping strategies refers to coping that fails to regulate distress or manage the underlying problem (Strentz & Auerbach, 1988; Vitaliano, DeWolfe, Maiuro, Russo, & Katon, 1990), while using adaptive coping strategies refers to situations in which there is a fit between the controllability of the stressful situation and the choice of coping strategy (Park, Folkman, & Bostrom, 2001). In the context of dental anxiety, adaptive coping strategies could be seen as those coping behaviors that promote the keeping up with regular dental treatment, whereas, in this context, maladaptive coping strategies means those coping behaviors that hamper regular dental care.

### Maladaptive coping strategies

The overall results of maladaptive coping strategies in this thesis were that irregular dental care was associated with the coping strategies of Praying and despair (Paper I), and Praying (Paper II). In addition, catastrophic thinking, when viewed as a coping strategy, was linked with irregular dental care (Paper I). All these results are consistent with previous findings that dental phobic patients with irregular dental care have more negative thinking patterns, with catastrophic and negative cognitions and more negative beliefs and self-statements about themselves (Abrahamsson et al., 2001; Abrahamsson et al., 2002a; de Jongh, Muris, Schoenmakers et al., 1995).

Praying has also been found to be a maladaptive coping strategy in studies of general pain, where it has been associated with more disability and higher levels of distress (Andersson, 2008; Ashby & Lenhart, 1994). Catastrophizing refers to an exaggerated negative orientation towards the stimulus and the experience of it, such as pain or dental anxiety. In many pain studies, catastrophic thinking has been related to helplessness, which in turn relates to poorer levels of adjustment (Dozois et al., 1996; Spinhoven et al., 1989; Turner & Clancy, 1986). The development and use of maladaptive dental coping strategies could be due to personal vulnerability, negative beliefs and negative self-statements, together with other factors, such as general anxiety and depression (Abrahamsson et al., 2002a; Armfield, 2006; Boman et al., 2010).

## General anxiety and depression

In Study III, the reported levels of general anxiety and depression were significantly higher among irregular attendees and general anxiety was shown to be a predictor of irregular dental care, which indicates considerable comorbidity in the irregular group with regard to dental and general anxiety. This comorbidity has been shown in several previous studies among adults, adolescents and children (Boman et al., 2010; Klingberg et al., 1995; Stenebrand et al., 2012). Depression was moderately correlated with general anxiety and with the coping strategy of Praying. Higher levels of depression may result when the negative consequences of dental anxiety, such as deterioration in oral health and social and emotional problems, affect a greater part of the patient's life (Boman et al., 2010). This indicates that dental anxiety could be part of more complex psychologic disorders and that individual vulnerability to anxiety, depression or other mental health problems may play a role in the development and maintenance of dental anxiety.

## Gender

One of the risk factors for irregular dental care in this thesis was being male. Many studies show that women more frequently report dental anxiety than men and obtain higher levels on dental anxiety scales (Hakeberg et al., 1992; Holtzman et al., 1997; Locker, Liddell, & Shapiro, 1999; Moore et al., 1993; Skaret et al., 2003). In Study III in this thesis, there were no significant differences between the genders in terms of the level of dental and general anxiety. When comparing the groups of regular and irregular attendees, it was shown that there were significantly more men in the irregular group compared with the regular group. It has been reported that women with dental anxiety more frequently attend dental care on a regular basis, while men appear to run a greater risk of having irregular dental care (Milgrom et al., 1995; Sohn & Ismail, 2005). The reason for that could be that it may be more socially acceptable for women to report fear and anxiety and therefore seek remedies for dental anxiety, while men with dental anxiety could more frequently end up displaying phobic avoidance behavior because of the social pattern. In a qualitative study by Abrahamsson et al., it has been suggested that men are more ashamed of their dental anxiety and that this may result in the avoidance of dental care (Abrahamsson et al., 2002a). However, the result in this thesis

that being of male gender predicted irregular dental care may be due to a sample selection procedure, e.g. the consecutive design of the study.

## Adaptive coping strategies

Optimism appears to play an important role in coping with dental anxiety and, in Studies II and III, access to optimism was a predictor of regular dental care. In Paper IV, the patients talked about the importance of optimistic thinking before and during treatment. Optimism could reflect both a personality trait that is more stable over time and a state depending on the situation and the people involved (Scheier & Carver, 1985). The DCSQ-15 is designed to capture situational optimism, but it may also have aspects of optimism that are personality reflections. The reason why optimism predicts regular dental care may be that optimistic thinking helps patients to confront the feared situation by challenging negative assumptions and catastrophic thinking. This is in line with the cognitively and behaviorally oriented interventions in Cognitive Behavioral Therapy (CBT) (O'Donohue & Fisher, 2008; Roth & Fonagy, 2005), where the use of the coping strategy of Optimism could be the alternative optimistic thought that may help patients to explore the opposite of dental phobic avoidance.

In fear-avoidance models (R.S Lazarus & Folkman, 1984; Parker & Endler, 1996; Suls & Fletcher, 1985), coping responses in terms of confrontation and avoidance are discussed. Optimism could be seen as an approaching coping strategy where the patients' own confidence and capacity to alter the situation could be mirrored, whereas Praying could be an example of an avoidant coping strategy reflecting the patients' way of adding the ability and power to handle the problem through a higher power, outside themselves. In a study by Solberg et al optimism was positively associated with broad measures of engagement coping, and with problem-focused coping (Solberg Nes & Segerstrom, 2006). Furthermore, optimism predicted more problem-focused coping with controllable stressors and more emotion-focused coping with uncontrollable stressors. Thus, optimism predicted active attempts to both change and accommodate to stressful situations. Optimistic thinking could be an adaptive strategy in both the short and the long term and it has been associated with many different positive health outcomes, such as improved immunologic function (Brennan & Charnetski, 2000; Ebrecht et al., 2004), while Praying is more closely connected to maladaptive adjustment, especially in the long run in chronic conditions where it has been associated with more disability and higher levels of anxiety and depression (Ashby & Lenhart, 1994).

In this thesis, the coping strategy of Self-efficacy was also found to represent adaptive coping, which was more frequently used by regular attendees. Self-efficacy reflects a person's belief in his/her own ability to control his or her own behavior and thoughts and it could reflect an approaching way of coping (Bandura, 1977). It can also mirror an optimistic view of an individual's capacity to deal with stress and solve the problem. A person's sense of self-efficacy can play a major role in approaching goals, tasks and challenges, such as dental treatment. Interestingly, the two items in the coping strategy of Optimism in the DCSQ-15 derive from the coping strategy of Self-efficacy in the DCSQ-20.

The use of Self-distraction and Distancing could mirror the fact that regular attendees have different and perhaps more varied ways of handling the fear situation than patients with irregular dental care. In Study II, in the group of regular attendees, distancing statements were significantly more highly correlated with the level of dental anxiety and fear of the drill. Both Self-distraction and Distancing could be seen as different types of avoidance coping. Avoidance coping could be adaptive for some patients in some situations, but, in the long run, the outcome of using these coping strategies could also produce maladaptive consequences.

In the qualitative interview study, Paper IV, several possible adaptive coping strategies were suggested, such as conducting logical arguments, using humor and passing on one's needs and wishes. Moreover, the interplay between the patient and the dental staff was of great importance in making dental care possible and could serve as a risk indicator for irregular dental care if it does not work.

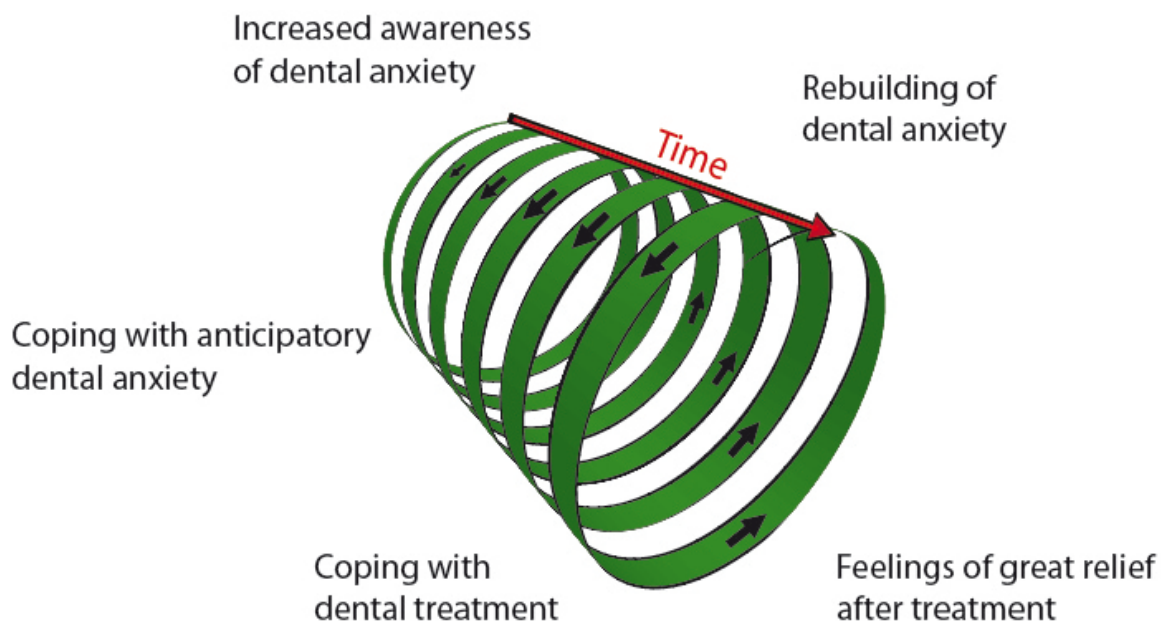
### A new vicious cycle for patients with dental anxiety and regular dental care behavior

The aim in Paper IV was to generate a conceptual framework that explained the main concerns of patients with dental anxiety that, despite their fear, participate in regular dental treatment. This resulted in a better understanding of what patients do to manage the dental treatment situation. To illustrate how these patients with dental anxiety and regular dental care handle regular dental treatment a new vicious circle is proposed here, paraphrasing the models presented by Berggren 1984 and Hakeberg 1992 (Berggren, 1984; Hakeberg, 1992), see Figure 3.

According to the interviews in Paper IV, the patients describe an **increased awareness of dental anxiety** all the time during the cycle. Some patients remember why and where they became dentally anxious, while other patients have no memory and often state that they have always been afraid of going to the dentist. According to Abrahamsson et al., the patients with regular attendance appear to have fewer feelings of shame and inferiority compared with patients with irregular dental care (Abrahamsson et al., 2001). However, because of the increased awareness of dental anxiety and the impact that anxiety could have on quality of life, feelings of shame and inferiority could occur among these patients as well. The oral health status often deteriorates to a lesser degree compared with patients with irregular dental care, which indicates a less radical treatment procedure among regular attendees (Abrahamsson et al., 2001; Hagglin et al., 2000).

Thoughts of upcoming dental treatment occupy the patients' minds long before treatment and patients describe psychosomatic symptoms such as irritability, nausea, tension and insomnia (Berggren et al., 1997; Berggren, Pierce et al., 2000; Ost & Hugdahl, 1985). To **cope with the anticipatory anxiety**, the patients in Paper IV talk about conducting mental wrestling matches with themselves to overcome the anticipatory dental anxiety. This mental wrestling could also be described as ambivalence in coping, where there is a conflict between using active problem-solving strategies and an avoidance behavior (Abrahamsson et al., 2002b). The wrestling contains contradictory feelings of anxiety and a conviction that dental care is necessary.

Patients describe coping with the problem by conducting logical argumentation and using optimistic thinking, which strengthen the results of Optimism as an adaptive coping strategy in Papers II and III. This could also result in a re-evaluation of dental anxiety. The patients say that they are influenced by social support, morals and social norms and Vassend et al. proposed that social norms might have a strong impact on dental care behavior (Vassend, 1993). Factors that could influence this coping process are the patient's motivation, the ability to conduct logical arguments, the ability to think optimistically and the social context (Abrahamsson et al., 2002b).



*Figure 3. A proposal of a new vicious cycle describing the maintenance of dental anxiety among patients with dental anxiety and regular dental visiting habits.*

In **coping with dental anxiety during dental treatment**, the patients attend regular dental care but with a great effort. The mental wrestling match continues during the interplay with the dental team and in the patients' understanding and handling of their own thoughts and reactions. Compared with irregular attendees, the patients have more varied ways of handling the stress, as shown in Studies I to III, for example, by using more of the coping strategies in the DCSQ. By going for treatment regularly, the patients keep the level of anxiety slightly lower and find it easier to have better control of the treatment and the physical response and to obtain a distance to the treatment. The trust-filled interplay between the patient and the dental team is central to the treatment. This interplay affects both parties and includes verbal and non-verbal communication containing respect, attention, empathy and understanding, as well as a balance between nearness and distance and professional and personal treatment. In

communication with the dental staff, including not only the dentist but also the dental nurse, dental hygienist and receptionists, the patients talk about the use of humor as an adaptive strategy to reduce the clinical rigidity and make it easier to talk about their dental anxiety. The staff and their ability to spread kindness, harmony and trust influence the atmosphere at the clinic. The patient's sense of control is important, especially when it comes to being active in treatment and being listened to. This in turn creates compliance and cooperation on the part of the patient.

Many factors could influence a person's coping behavior; they include life experiences, education, the person's personality, social support and attitudes in society towards people with dental anxiety. The dental team is an important coping resource in helping the patients to find and maintain adaptive coping strategies that may keep the dental anxiety at a manageable level and make regular dental care possible to maintain.

The patients say that they experience **great relief after treatment**. They express feelings of being exhausted but having achieved a goal. Sometimes after treatment, the patients reward themselves for managing the treatment, with a "fika" (coffee and cake) or by buying something, for example. However, this feeling of relief is not the same one that dental phobic patients experience when they cancel, stay away, or completely avoid dental treatment. The maintenance of dental phobia is then discussed as being due to operant conditioning in which the avoidance serves to reinforce the phobia (Mowrer, 1960). This could be illustrated by a study by Locker that showed that the higher the level of dental anxiety, the longer the time of avoidance (Locker et al., 1991). On the other hand, the relief for the regular attendees after treatment results in a short-term reduction in dental anxiety, but after a while, it builds up again.

**The dental anxiety is built up again** with increased awareness of dental anxiety as a result. This could have a negative impact on daily social life. It was shown that patients with avoidance behavior reported significantly more frequently that dental anxiety and poor oral health had a negative influence on work and social life. The level of general emotional distress was also higher within this group compared with patients with dental anxiety and regular dental care habits (Abrahamsson et al., 2001). It is probable that patients with dental anxiety and regular care experience a more negative impact on daily life than non-anxious patients (Ng & Leung, 2008). By attending dental care regularly, the patients keep the extent of the following dental treatment at a moderate level and may maintain acceptable dental health. Milgrom defined these patients, who attend dental care with great resistance and considerable effort, as "goers but haters" (Milgrom et al., 1995).

There is a possibility that by using adaptive coping the vicious cycle will transform to a more virtuous cycle, where dental anxiety subsides and it becomes easier to maintain regular dental care.

## *Limitations*

There are a number of limitations to the generalizability of the results in this thesis. Coping with dental anxiety involves complex multifactorial processes, in which several factors could interact. This complexity and the cross-sectional study design preclude any

causal inferences between coping strategies and dental anxiety. Our results indicate, however, that coping strategies may be important in the process of dental anxiety and the way people handle that anxiety.

The samples in Studies I to III was relatively small and urban. The studies need to be replicated with larger, more representative samples. Moreover, the selection of patients included may be improved while using more strict criteria and possibly other psychometric instruments

The factors of Optimism and Praying in the DCSQ-15 each contained only two items and need to be extended to include more items to obtain more psychometric stability and a more secure base for theoretical interpretation. The DCSQ-15 as a whole also needs to be extended with more adaptive coping strategies adapted to the dental treatment situation; the results of the interview study in Paper IV could provide guidance for work of this kind.

Three of the items in the DCSQ-15 had high loadings on more than one factor, but, as the instrument is under development, it is too early to draw any conclusions about these three items. The DCSQ-15 therefore needs to be extended and reconstructed with more adaptive coping strategies and further explored and replicated in multivariate and longitudinal studies within different populations to verify its validity and reliability. The exact relationships between coping strategies and emotional distress are also unclear because of the cross-sectional study design, so the relationships could also be further explored in longitudinal studies.

## *Strengths*

The DCSQ-20 and DCSQ-15 are the first dental anxiety-related measures developed specifically to assess dental coping strategies and these strategies provide more relevant information about the coping process in connection with dental anxiety than a general coping measurement.

The instruments appear to be well accepted by the respondents, as illustrated by the high response rates and few missing values that confirm their function and usability. Studies I, II and III comprise respondents with both regular and irregular dental care, whereas few studies have been performed of individuals with dental anxiety and regular dental care. This study design, with both regular and irregular attendance patterns, creates a greater ability to generalize the results.

The grounded theory study generated a conceptual framework that was based on facts that were grounded in empirical data from patients who suffered from dental anxiety and explained the phenomenon of regular dental care.

The mixed-method design, with both quantitative and qualitative studies, generates a better understanding of the way patients with dental anxiety and regular dental care use coping strategies in connection with dental treatment, which may be of value in developing treatment strategies for phobic patients or helping patients to maintain regular dental habits. Patients with dental anxiety and regular dental care may risk developing dental phobia and this knowledge may help both the patients and the dental team to prevent a development of this kind.



## *Implications for future research*

Further multivariate and longitudinal studies are needed to explore and elucidate in greater detail the relationships between coping strategies and dental anxiety.

There is also a need to develop, reconstruct and possibly extend the DCSQ-15 to include more adaptive coping strategies.

Further investigations of the interaction between the patient and the dental care providers in the dental team could provide insights into the way the dental team could facilitate the patients' use of adaptive strategies such as optimism.

Finally, what will emerge when comparing dental coping strategies between patients with dental anxiety and the normal population or other more specific populations?

## Conclusions

The results of this thesis may be of importance and may prove useful to dental care providers, in both general and special practices, when treating patients with dental anxiety. However, it is important to remember that every patient is unique and no two individuals diagnosed with dental anxiety will experience and handle the condition in the same way.

The main conclusions from the thesis are that:

- \* Using optimism as a coping strategy is closely linked with keeping up regular dental care.

- \* Risk factors for irregular dental care are being of male gender, having high levels of dental or general anxiety and relying on the maladaptive coping strategy of Praying, as well as catastrophic thinking.

- \* It is suggested that the patients logical argumentation with themselves, social support, feelings of control during treatment and trust-filled interplay between the patient and the dental staff are of great importance in making dental care possible and maintaining regular dental care among patients with dental anxiety.

## Acknowledgements

Firstly, I would like to express my warmest gratitude to all the patients who generously participated in the studies and shared their experiences, thoughts and emotions in relation to dental treatment with me.

I also wish to express my sincere gratitude to all the dentists working at the public dental service clinics in Västra Götaland and at the Clinic of Oral Medicine who helped me with the questionnaires and with recruiting the patients for the interviews.

*Special thanks go to:*

Professor Ulf Berggren, deceased in May 2009, my first main supervisor and co-author, who admitted me to the doctoral program. With his considerable expertise, he was always very inspiring and encouraging.

Professor Magnus Hakeberg, my main supervisor and co-author during the last years, for your excellent and encouraging supervision and guidance through the field of dental anxiety research and statistics.

Dr Magnus Elfström, my supervisor and co-author for the whole thesis, for sharing your top-class knowledge of psychology and for your great commitment and interesting and constructive discussions.

Professor Lillemor Hallberg, my supervisor and co-author, for your excellent guidance and support throughout my qualitative study.

Clinical director Per-Olof Rödström, Clinic of Oral Medicine in Gothenburg, for giving me the opportunity to study for a PhD.

Research coordinator Birgitta Ahlström, for skillful support and encouragement.

My colleagues at the Department of Behavioral and Community Dentistry, for encouragement, care and help.

My colleagues and friends on the doctoral program, for stimulating discussions and for laughter and fun.

My colleagues and friends at the Clinic of Oral Medicine, for support and understanding.

Sigrid Bernson and Elin Bernson, my beloved daughters, for love, joy and understanding and for professional help with transcriptions of interviews and data processing.

My beloved husband, Christer Bernson, for all your love, understanding and support and for standing by my side.

I am also very grateful to all my loving friends outside the university, for making life fun and joyful. I am very happy you are still there.

## **Grants**

This thesis was made possible by economic support from the Research and Development Council of the Counties of Gothenburg and Södra Bohuslän, the Gothenburg Dental Society, Sigge Person's and Alice Nyberg's Foundation for Odontological Research and the Swedish Research Council, grants 14703 and 14704.

## References

- Abrahamsson, K. H., Berggren, U., & Carlsson, S. G. (2000). Psychosocial aspects of dental and general fears in dental phobic patients. *Acta Odontol Scand*, *58*(1), 37-43.
- Abrahamsson, K. H., Berggren, U., Hakeberg, M., & Carlsson, S. G. (2001). Phobic avoidance and regular dental care in fearful dental patients: a comparative study. *Acta Odontol Scand*, *59*(5), 273-279.
- Abrahamsson, K. H., Berggren, U., Hakeberg, M., & Carlsson, S. G. (2003). The importance of dental beliefs for the outcome of dental-fear treatment. *Eur J Oral Sci*, *111*(2), 99-105. doi: 016 [pii]
- Abrahamsson, K. H., Berggren, U., Hallberg, L., & Carlsson, S. G. (2002a). Dental phobic patients' view of dental anxiety and experiences in dental care: a qualitative study. *Scand J Caring Sci*, *16*(2), 188-196. doi: 083 [pii]
- Abrahamsson, K. H., Berggren, U., Hallberg, L. R., & Carlsson, S. G. (2002b). Ambivalence in coping with dental fear and avoidance: a qualitative study. *J Health Psychol*, *7*(6), 653-664. doi: 7/6/653 [pii] 10.1177/1359105302007006869
- Abrahamsson, K. H., Hakeberg, M., Stenman, J., & Ohrn, K. (2006). Dental beliefs: evaluation of the Swedish version of the revised Dental Beliefs Survey in different patient groups and in a non-clinical student sample. *Eur J Oral Sci*, *114*(3), 209-215. doi: EOS358 [pii] 10.1111/j.1600-0722.2006.00358.x
- Agdal, M. L., Raadal, M., Ost, L. G., & Skaret, E. (2011). Quality-of-life before and after cognitive behavioral therapy (CBT) in patients with intra-oral injection phobia. *Acta Odontol Scand*. doi: 10.3109/00016357.2011.635600
- Agdal, M. L., Raadal, M., Skaret, E., & Kvale, G. (2008). Oral health and oral treatment needs in patients fulfilling the DSM-IV criteria for dental phobia: Possible influence on the outcome of cognitive behavioral therapy. *Acta Odontol Scand*, *66*(1), 1-6. doi: 787857600 [pii] 10.1080/00016350701793714
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders : DSM-IV-TR*. Washington, DC: American Psychiatric Association.
- Andersson, G. (2008). Chronic pain and praying to a higher power: useful or useless? *J Relig Health*, *47*(2), 176-187. doi: 10.1007/s10943-007-9148-8
- Armfield, J. M. (2006). Cognitive vulnerability: a model of the etiology of fear. *Clin Psychol Rev*, *26*(6), 746-768. doi: S0272-7358(06)00051-1 [pii] 10.1016/j.cpr.2006.03.007
- Armfield, J. M. (2010). Towards a better understanding of dental anxiety and fear: cognitions vs. experiences. *Eur J Oral Sci*, *118*(3), 259-264. doi: EOS740 [pii] 10.1111/j.1600-0722.2010.00740.x
- Armfield, J. M., Spencer, A. J., & Stewart, J. F. (2006). Dental fear in Australia: who's afraid of the dentist? *Aust Dent J*, *51*(1), 78-85.
- Armfield, J. M., Stewart, J. F., & Spencer, A. J. (2007). The vicious cycle of dental fear: exploring the interplay between oral health, service utilization and dental fear. *BMC Oral Health*, *7*, 1. doi: 1472-6831-7-1 [pii] 10.1186/1472-6831-7-1
- Arnrup, K., Broberg, A. G., Berggren, U., & Bodin, L. (2002). Lack of cooperation in pediatric dentistry--the role of child personality characteristics. *Pediatr Dent*, *24*(2), 119-128.
- Ashby, J. S., & Lenhart, R. (1994). Prayer as a coping strategy for chronic pain patients. *Rehabilitation Psychology*, *39*(3), 205-209. doi: 10.1037/h0080317

- Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychol Rev*, 84(2), 191-215.
- Barlow, D. H., & Durand, V. M. (2012). *Abnormal psychology : an integrative approach*. Belmont, CA: Wadsworth Cengage Learning.
- Berggren, U. (1984). *Dental fear and avoidance : a study of etiology, consequences and treatment*. Göteborg.
- Berggren, U. (1986). [Fear of dental care--background and manifestation]. *Tandlakartidningen*, 78(18), 933-939.
- Berggren, U. (1987). Reduction of fear and anxiety in adult fearful patients. *Int Dent J*, 37(2), 127-136.
- Berggren, U. (1992). General and specific fears in referred and self-referred adult patients with extreme dental anxiety. *Behav Res Ther*, 30(4), 395-401. doi: 0005-7967(92)90051-H [pii]
- Berggren, U., & Carlsson, S. G. (1984). Psychometric measures of dental fear. *Community Dent Oral Epidemiol*, 12(5), 319-324.
- Berggren, U., & Carlsson, S. G. (1985). Usefulness of two psychometric scales in Swedish patients with severe dental fear. *Community Dent Oral Epidemiol*, 13(2), 70-74.
- Berggren, U., & Carlsson, S. G. (1986). Qualitative and quantitative effects of treatment for dental fear and avoidance. *Anesth Prog*, 33(1), 9-13.
- Berggren, U., Carlsson, S. G., Hakeberg, M., Hagglin, C., & Samsonowitz, V. (1997). Assessment of patients with phobic dental anxiety. *Acta Odontol Scand*, 55(4), 217-222.
- Berggren, U., Hakeberg, M., & Carlsson, S. G. (2000). Relaxation vs. cognitively oriented therapies for dental fear. *J Dent Res*, 79(9), 1645-1651.
- Berggren, U., & Linde, A. (1984). Dental fear and avoidance: a comparison of two modes of treatment. *J Dent Res*, 63(10), 1223-1227.
- Berggren, U., & Meynert, G. (1984). Dental fear and avoidance: causes, symptoms, and consequences. *J Am Dent Assoc*, 109(2), 247-251.
- Berggren, U., Pierce, C. J., & Eli, I. (2000). Characteristics of adult dentally fearful individuals. A cross-cultural study. *Eur J Oral Sci*, 108(4), 268-274.
- Bernson, J. M., Elfstrom, M. L., & Berggren, U. (2007). Self-reported dental coping strategies among fearful adult patients: preliminary enquiry explorations. *Eur J Oral Sci*, 115(6), 484-490. doi: EOS496 [pii] 10.1111/j.1600-0722.2007.00496.x
- Bjelland, I., Dahl, A. A., Haug, T. T., & Neckelmann, D. (2002). The validity of the Hospital Anxiety and Depression Scale. An updated literature review. *J Psychosom Res*, 52(2), 69-77. doi: S0022399901002963 [pii]
- Blumer, H. (1969). *Symbolic interactionism: perspective and method*. New Jersey: Prentice-Hall.
- Boman, U. W., Lundgren, J., Berggren, U., & Carlsson, S. G. (2010). Psychosocial and dental factors in the maintenance of severe dental fear. *Swed Dent J*, 34(3), 121-127.
- Brennan, F. X., & Charnetski, C. J. (2000). Explanatory style and Immunoglobulin A (IgA). *Integr Physiol Behav Sci*, 35(4), 251-255.
- Burckhardt, C. S., & Henriksson, C. (2001). The Coping Strategies Questionnaire - Swedish version: Evidence of reliability and validity in patients with fibromyalgia. *Scandinavian Journal of Behaviour Therapy*, 30(3), 97-107.
- Carver, C. S., Scheier, M. F., & Weintraub, K. J. (1989). Assessing Coping Strategies: A Theoretically Based Approach. *Journal of Personality and Social Psychology*, 56(2), 267-283.

- Charmaz, K. (1995). Grounded theory. In J. A. Smith, R. Harré & L. v. Langenhove (Eds.), *Rethinking methods in psychology* (pp. 27-49). London: Sage.
- Charmaz, K. (2000). Grounded theory. Objectivist and constructivist method. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 509-536). Thousand Oaks, Calif.: Sage.
- Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. London: Sage.
- Clyde, Z., & Williams, A. (2007). The psychological management of persistent (chronic) pain. In P. Kennedy (Ed.), *Psychological management of physical disabilities: a practitioners guide* (pp. 80-103). London: Routledge.
- Cohen, S. M., Fiske, J., & Newton, J. T. (2000). The impact of dental anxiety on daily living. *Br Dent J*, 189(7), 385-390.
- Cooper, C. L., & Payne, R. L. (1988). *Causes, coping and consequences of stress at work*. Chichester: Wiley.
- Corah, N. L. (1969). Development of a dental anxiety scale. *J Dent Res*, 48(4), 596.
- Corah, N. L., Gale, E. N., & Illig, S. J. (1978). Assessment of a dental anxiety scale. *J Am Dent Assoc*, 97(5), 816-819.
- Costa, P. T., Jr., Somerfield, M. R., & McCrae, R. R. (1996). Personality and coping: A reconceptualization. In M. Zeidner & N. S. Endler (Eds.), *Handbook of coping: Theory, research, applications* (pp. 44-61). New York: Wiley.
- Cramer, P. (1998). Coping and defense mechanisms: What's the difference? *J Pers*, 66(6), 919-946.
- Cramer, P. (2000). Defense mechanisms in psychology today. Further processes for adaptation. *Am Psychol*, 55(6), 637-646.
- de Jongh, A., Bongaarts, G., Vermeule, I., Visser, K., De Vos, P., & Makkes, P. (1998). Blood-injury-injection phobia and dental phobia. *Behav Res Ther*, 36(10), 971-982. doi: S0005-7967(98)00064-3 [pii]
- de Jongh, A., Muris, P., Schoenmakers, N., & ter Horst, G. (1995). Negative cognitions of dental phobics: reliability and validity of the dental cognitions questionnaire. *Behav Res Ther*, 33(5), 507-515. doi: 000579679400081T [pii]
- de Jongh, A., Muris, P., Ter Horst, G., & Duyx, M. P. M. A. (1995). Acquisition and maintenance of dental anxiety: The role of conditioning experiences and cognitive factors. *Behaviour Research and Therapy*, 33(2), 205-210.
- de Jongh, A., Muris, P., ter Horst, G., Van Zuuren, F. J., & De Wit, C. A. (1994). Cognitive correlates of dental anxiety. *J Dent Res*, 73(2), 561-566.
- de Jongh, A., Schutjes, M., & Aartman, I. H. (2011). A test of Berggren's model of dental fear and anxiety. *Eur J Oral Sci*, 119(5), 361-365. doi: 10.1111/j.1600-0722.2011.00843.x
- de Ridder, D., Depla, M., Severens, P., & Malsch, M. (1997). Beliefs on coping with illness: a consumer's perspective. *Soc Sci Med*, 44(5), 553-559. doi: S0277953696000858 [pii]
- de Ridder, D., & Schreurs, K. (1996). Coping, social support and chronic disease: A research agenda. *Psychology, Health and Medicine*, 1(1), 71-82.
- de Ridder, D., & Schreurs, K. (2001). Developing interventions for chronically ill patients: is coping a helpful concept? *Clin Psychol Rev*, 21(2), 205-240. doi: S0272-7358(99)00046-X [pii]
- Dellve, L., Abrahamsson, K. H., Trulsson, U., & Hallberg, L. (2002). Grounded theory in public health research. In L. R. M. Hallberg (Ed.), *Qualitative methods in public*

- health research : theoretical foundations and practical examples* (pp. 137-169). Lund: Studentlitteratur.
- do Nascimento, D. L., da Silva Araujo, A. C., Gusmao, E. S., & Cimoies, R. (2011). Anxiety and fear of dental treatment among users of public health services. *Oral Health Prev Dent*, 9(4), 329-337. doi: 22656 [pii]
- Dozois, D. J., Dobson, K. S., Wong, M., Hughes, D., & Long, A. (1996). Predictive utility of the CSQ in low back pain: individual vs. composite measures. *Pain*, 66(2-3), 171-180. doi: 0304-3959(96)03058-8 [pii]
- Ebrecht, M., Hextall, J., Kirtley, L. G., Taylor, A., Dyson, M., & Weinman, J. (2004). Perceived stress and cortisol levels predict speed of wound healing in healthy male adults. *Psychoneuroendocrinology*, 29(6), 798-809. doi: 10.1016/S0306-4530(03)00144-6 S0306453003001446 [pii]
- Elfstrom, M. L., Ryden, A., Kreuter, M., Taft, C., & Sullivan, M. (2005). Relations between coping strategies and health-related quality of life in patients with spinal cord lesion. *J Rehabil Med*, 37(1), 9-16. doi: CVA70JQU490CFTUH [pii] 10.1080/16501970410034414
- Eli, I., Uziel, N., Baht, R., & Kleinhauz, M. (1997). Antecedents of dental anxiety: learned responses versus personality traits. *Community Dent Oral Epidemiol*, 25(3), 233-237.
- Enkling, N., Marwinski, G., & Jöhren, P. (2006). Dental anxiety in a representative sample of residents of a large German city. *Clin Oral Investig*, 10(1), 84-91. doi: 10.1007/s00784-006-0035-6
- Eysenck, M. W. (1997). *Anxiety and cognition : a unified theory*. Hove: Psychology Press.
- Firat, D., Tunc, E. P., & Sar, V. (2006). Dental anxiety among adults in Turkey. *J Contemp Dent Pract*, 7(3), 75-82. doi: 1526-3711-325 [pii]
- Folayan, M. O., Idehen, E. E., & Ojo, O. O. (2004). The modulating effect of culture on the expression of dental anxiety in children: a literature review. *Int J Paediatr Dent*, 14(4), 241-245. doi: 10.1111/j.1365-263X.2004.00563.x IPD563 [pii]
- Folkman, S. (1997). Positive psychological states and coping with severe stress. *Soc Sci Med*, 45(8), 1207-1221. doi: S0277953697000403 [pii]
- Folkman, S., & Lazarus, R. S. (1988). *Manual for the Ways of Coping Questionnaire: research edition*. Palo Alto: Consulting Psychologists Press.
- Fredriksson, M., Annas, P., Fischer, H., & Wik, G. (1996). Gender and age differences in the prevalence of specific fears and phobias. *Behav Res Ther* 34(1), 33-39.
- Friedman, N., & Wood, G. J. (1998). An evaluation of the iatrosedative process for treating dental fear. *Compend Contin Educ Dent*, 19(4), 434-436, 438, 440-432.
- Getka, E. J., & Glass, C. R. (1992). Behavioral and cognitive-behavioral approaches to the reduction of dental anxiety. *Behavior Therapy*, 23(3), 433-448.
- Glaser, B., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Chicago: Alding Publishing Company.
- Glaser, B. G. (1978). *Theoretical sensitivity : advances in the methodology of grounded theory*. Mill Valley, Calif.: Sociology Press.
- Gustafsson, A., Arnrup, K., Broberg, A. G., Bodin, L., & Berggren, U. (2007). Psychosocial concomitants to dental fear and behaviour management problems. *Int J Paediatr Dent*, 17(6), 449-459. doi: IPD883 [pii] 10.1111/j.1365-263X.2007.00883.x
- Hagglin, C., Berggren, U., Hakeberg, M., & Ahlqwist, M. (1996). Dental anxiety among middle-aged and elderly women in Sweden. A study of oral state, utilisation of dental services and concomitant factors. *Gerodontology*, 13(1), 25-34.



- Hagglin, C., Berggren, U., Hakeberg, M., Hallstrom, T., & Bengtsson, C. (1999). Variations in dental anxiety among middle-aged and elderly women in Sweden: a longitudinal study between 1968 and 1996. *J Dent Res*, 78(10), 1655-1661.
- Hagglin, C., Hakeberg, M., Ahlqwist, M., Sullivan, M., & Berggren, U. (2000). Factors associated with dental anxiety and attendance in middle-aged and elderly women. *Community Dent Oral Epidemiol*, 28(6), 451-460.
- Hagglin, C., Hakeberg, M., Hallstrom, T., Berggren, U., Larsson, L., Waern, M. (2001). Dental anxiety in relation to mental health and personality factors. A longitudinal study of middle-aged and elderly women. *Eur J Oral Sci*, 109(1), 27-33.
- Hakeberg, M. (1992). *Dental anxiety and health : a prevalence study and assessment of treatment outcomes*. Göteborg.
- Hakeberg, M., & Berggren, U. (1997). Dimensions of the Dental Fear Survey among patients with dental phobia. *Acta Odontol Scand*, 55(5), 314-318.
- Hakeberg, M., Berggren, U., & Carlsson, S. G. (1990). A 10-year follow-up of patients treated for dental fear. *Scand J Dent Res*, 98(1), 53-59.
- Hakeberg, M., Berggren, U., & Carlsson, S. G. (1992). Prevalence of dental anxiety in an adult population in a major urban area in Sweden. *Community Dent Oral Epidemiol*, 20(2), 97-101.
- Hakeberg, M., Berggren, U., Carlsson, S. G., & Grondahl, H. G. (1993). Long-term effects on dental care behavior and dental health after treatments for dental fear. *Anesth Prog*, 40(3), 72-77.
- Hakeberg, M., & Cunha, L. (2008). Dental anxiety and pain related to dental hygienist treatment. *Acta Odontol Scand*, 66(6), 374-379. doi: 902480525 [pii] 10.1080/00016350802415175
- Hallberg, L. R., & Carlsson, S. G. (1998). Anxiety and coping in patients with chronic work-related muscular pain and patients with fibromyalgia. *Eur J Pain*, 2(4), 309-319. doi: eu980082 [pii]
- Hallberg, L. R.-M. (2006). The "core category" of grounded theory: making constant comparisons. *International Journal of Qualitative Studies on Health and Well-being*, 1(3), 141-148.
- Hastie, B. A., Riley, J. L., 3rd, & Fillingim, R. B. (2004). Ethnic differences in pain coping: factor structure of the coping strategies questionnaire and coping strategies questionnaire-revised. *J Pain*, 5(6), 304-316. doi: 10.1016/j.jpain.2004.05.004 S1526590004008235 [pii]
- Haukebo, K., Skaret, E., Ost, L. G., Raadal, M., Berg, E., Sundberg, H. (2008). One- vs. five-session treatment of dental phobia: a randomized controlled study. *J Behav Ther Exp Psychiatry*, 39(3), 381-390. doi: S0005-7916(07)00060-2 [pii] 10.1016/j.jbtep.2007.09.006
- Heft, M. W., Meng, X., Bradley, M. M., & Lang, P. J. (2007). Gender differences in reported dental fear and fear of dental pain. *Community Dent Oral Epidemiol*, 35(6), 421-428. doi: COM344 [pii] 10.1111/j.1600-0528.2006.00344.x
- Herrmann, C. (1997). International experiences with the Hospital Anxiety and Depression Scale--a review of validation data and clinical results. *J Psychosom Res*, 42(1), 17-41. doi: S0022399996002164 [pii]
- Hofmann, S. G., Lehman, C. L., & Barlow, D. H. (1997). How specific are specific phobias? *J Behav Ther Exp Psychiatry*, 28(3), 233-240. doi: S0005-7916(97)00012-8 [pii]
- Holtzman, J. M., Berg, R. G., Mann, J., & Berkey, D. B. (1997). The relationship of age and gender to fear and anxiety in response to dental care. *Spec Care Dentist*, 17(3), 82-87.

- Hugoson, A., Koch, G., Bergendal, T., Hallonsten, A. L., Slotte, C., Thorstensson, B. (1995). Oral health of individuals aged 3-80 years in Jonkoping, Sweden in 1973, 1983, and 1993. II. Review of clinical and radiographic findings. *Swed Dent J*, 19(6), 243-260.
- Irachabal, S., Koleck, M., Rasclé, N., & Bruchon-Schweitzer, M. (2008). [Pain coping strategies: French adaptation of the coping strategies questionnaire (CSQ-F)]. *Encephale*, 34(1), 47-53. doi: S0013-7006(07)00021-8 [pii] 10.1016/j.encep.2006.11.002
- Jensen, M. P., Turner, J. A., Romano, J. M., & Karoly, P. (1991). Coping with chronic pain: a critical review of the literature. *Pain*, 47(3), 249-283.
- Johansson, P., Berggren, U., Hakeberg, M., & Hirsch, J. M. (1993). Measures of dental beliefs and attitudes: their relationships with measures of fear. *Community Dent Health*, 10(1), 31-39.
- Jones, F., & Bright, J. (2001). *Stress : myth, theory and research*. Harlow: Pearson Education.
- Kanegane, K., Penha, S. S., Borsatti, M. A., & Rocha, R. G. (2003). [Dental anxiety in an emergency dental service]. *Rev Saude Publica*, 37(6), 786-792. doi: S0034-89102003000600015 [pii]
- Kennedy, P., Lude, P., Elfstrom, M. L., & Smithson, E. (2012). Appraisals, coping and adjustment pre and post SCI rehabilitation: a 2-year follow-up study. *Spinal Cord*, 50(2), 112-118. doi: sc2011127 [pii] 10.1038/sc.2011.127
- Kennedy, P., Lude, P., Elfstrom, M. L., & Smithson, E. F. (2011). Psychological contributions to functional independence: a longitudinal investigation of spinal cord injury rehabilitation. *Arch Phys Med Rehabil*, 92(4), 597-602. doi: S0003-9993(10)00955-X [pii] 10.1016/j.apmr.2010.11.016
- Kent, G. (1985). Cognitive processes in dental anxiety. *Br J Clin Psychol*, 24 ( Pt 4), 24 ( Pt 24).
- Kleinknecht, R. A., & Bernstein, D. A. (1978). The assessment of dental fear. *Behavior Therapy*, 9, 626-634.
- Kleinknecht, R. A., Klepac, R. K., & Alexander, L. D. (1973). Origins and characteristics of fear of dentistry. *J Am Dent Assoc*, 86(4), 842-848.
- Kleinknecht, R. A., Thorndike, R. M., McGlynn, F. D., & Harkavy, J. (1984). Factor analysis of the dental fear survey with cross-validation. *J Am Dent Assoc*, 108(1), 59-61.
- Klingberg, G. (1995). *Dental fear and behavior management problems in children : a study of measurement, prevalence, concomitant factors, and clinical effects*. Swedish dental journal, Stockholm.
- Klingberg, G., Berggren, U., Carlsson, S. G., & Noren, J. G. (1995). Child dental fear: cause-related factors and clinical effects. *Eur J Oral Sci*, 103(6), 405-412.
- Klingberg, G., & Broberg, A. G. (1998). Temperament and child dental fear. *Pediatr Dent*, 20(4), 237-243.
- Kulich, K. R., Berggren, U., & Hallberg, L. R. (2003). A qualitative analysis of patient-centered dentistry in consultations with dental phobic patients. *J Health Commun*, 8(2), 171-187. doi: RBJG9KACY6CN0WCY [pii]
- Kunzelmann, K. H., & Dunninger, P. (1990). Dental fear and pain: effect on patient's perception of the dentist. *Community Dent Oral Epidemiol*, 18(5), 264-266.
- Kvale, G., Berg, E., Nilsen, C. M., Raadal, M., Nielsen, G. H., Johnsen, T. B. (1997). Validation of the Dental Fear Scale and the Dental Belief Survey in a Norwegian sample. *Community Dent Oral Epidemiol*, 25(2), 160-164.
- Lazarus, R. S. (1966). *Psychological stress and the coping process*. New York,.

- Lazarus, R. S. (1993). Coping theory and research: past, present, and future. *Psychosom Med*, 55(3), 234-247.
- Lazarus, R. S. (2000). Toward better research on stress and coping. *Am Psychol*, 55(6), 665-673.
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal and coping*. New York: Springer.
- Liddell, A. (1990). Personality characteristics versus medical and dental experiences of dentally anxious children. *J Behav Med*, 13(2), 183-194.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, Calif.: Sage.
- Linley, P. A., & Joseph, S. (2004). Positive Change Following Trauma and Adversity: A Review. *Journal of Traumatic Stress*, 17(1), 11-21.
- Litt, M. D. (1996). A model of pain and anxiety associated with acute stressors: distress in dental procedures. *Behav Res Ther*, 34(5-6), 459-476. doi: 0005-7967(96)00015-0 [pii]
- Locker, D. (2003). Psychosocial consequences of dental fear and anxiety. *Community Dent Oral Epidemiol*, 31(2), 144-151. doi: 028 [pii]
- Locker, D., Liddell, A., & Burman, D. (1991). Dental fear and anxiety in an older adult population. *Community Dent Oral Epidemiol*, 19(2), 120-124.
- Locker, D., Liddell, A., Dempster, L., & Shapiro, D. (1999). Age of onset of dental anxiety. *J Dent Res*, 78(3), 790-796.
- Locker, D., Liddell, A., & Shapiro, D. (1999). Diagnostic categories of dental anxiety: a population-based study. *Behav Res Ther*, 37(1), 25-37. doi: S0005-7967(98)00105-3 [pii]
- Locker, D., & Liddell, A. M. (1991). Correlates of dental anxiety among older adults. *J Dent Res*, 70(3), 198-203.
- Locker, D., Poulton, R., & Thomson, W. M. (2001). Psychological disorders and dental anxiety in a young adult population. *Community Dent Oral Epidemiol*, 29(6), 456-463. doi: 290607 [pii]
- Locker, D., Thomson, W. M., & Poulton, R. (2001). Onset of and patterns of change in dental anxiety in adolescence and early adulthood: a birth cohort study. *Community Dent Health*, 18(2), 99-104.
- Lundgren, J., Berggren, U., & Carlsson, S. G. (2001). Psychophysiological reactions in dental phobic patients during video stimulation. *Eur J Oral Sci*, 109(3), 172-177.
- Lundgren, J., Berggren, U., & Carlsson, S. G. (2004). Psychophysiological reactions in dental phobic patients with direct vs. indirect fear acquisition. *J Behav Ther Exp Psychiatry*, 35(1), 3-12. doi: 10.1016/j.jbtep.2003.12.002 S0005791604000023 [pii]
- Lundgren, J., Elfstrom, M. L., & Berggren, U. (2007). The relationship between temperament and fearfulness in adult dental phobic patients. *Int J Paediatr Dent*, 17(6), 460-468. doi: IPD880 [pii] 10.1111/j.1365-263X.2007.00880.x
- Malterud, K. (2001). Qualitative research: Standards, challenges and guidelines. *The Lancet*, 358, 483-488.
- McGlynn, F. D., McNeil, D. W., Gallagher, S. L., & Vrana, S. (1987). Factor structure, stability, and internal consistency of the dental fear survey. *Behavioral Assessment*, 9(1), 57-66.
- Mehrstedt, M., John, M. T., Tonnie, S., & Micheelis, W. (2007). Oral health-related quality of life in patients with dental anxiety. *Community Dent Oral Epidemiol*, 35(5), 357-363. doi: COM376 [pii] 10.1111/j.1600-0528.2007.00376.x

- Milgrom, P., Fiset, L., Melnick, S., & Weinstein, P. (1988). The prevalence and practice management consequences of dental fear in a major US city. *J Am Dent Assoc*, *116*(6), 641-647.
- Milgrom, P., Getz, T., & Weinstein, P. (1988). Recognizing and treating fears in general practice. *Dent Clin North Am*, *32*(4), 657-665.
- Milgrom, P., Weinstein, P., & Getz, T. (Eds.). (1995). *Treating fearful dental patients: A patient management handbook* (2 ed.). Seattle: University of Washington.
- Moore, R., Birn, H., Kirkegaard, E., Brodsgaard, I., & Scheutz, F. (1993). Prevalence and characteristics of dental anxiety in Danish adults. *Community Dent Oral Epidemiol*, *21*(5), 292-296.
- Moore, R., Brodsgaard, I., & Birn, H. (1991). Manifestations, acquisition and diagnostic categories of dental fear in a self-referred population. *Behav Res Ther*, *29*(1), 51-60.
- Moore, R., Brodsgaard, I., & Rosenberg, N. (2004). The contribution of embarrassment to phobic dental anxiety: a qualitative research study. *BMC Psychiatry*, *4*, 10. doi: 10.1186/1471-244X-4-10 1471-244X-4-10 [pii]
- Morse, J. M. (2009). *Developing grounded theory: the second generation*. Walnut Creek, California: Left coast press, inc.
- Mowrer, O. H. (1960). *Learning theory and behavior*. New York: Wiley.
- Neverlien, P. O. (1990). Normative data for Corah's Dental Anxiety Scale (DAS) for the Norwegian adult population. *Community Dent Oral Epidemiol*, *18*(3), 162.
- Ng, S. K., & Leung, W. K. (2008). A community study on the relationship of dental anxiety with oral health status and oral health-related quality of life. *Community Dent Oral Epidemiol*, *36*(4), 347-356.
- O'Donohue, W. T., & Fisher, J. E. (2008). *Cognitive behavior therapy : applying empirically supported techniques in your practice*. Hoboken, N.J.: John Wiley & Sons.
- Oosterink, F. M., de Jongh, A., & Aartman, I. H. (2008). What are people afraid of during dental treatment? Anxiety-provoking capacity of 67 stimuli characteristic of the dental setting. *Eur J Oral Sci*, *116*(1), 44-51. doi: EOS500 [pii] 10.1111/j.1600-0722.2007.00500.x
- Oosterink, F. M., de Jongh, A., & Hoogstraten, J. (2009). Prevalence of dental fear and phobia relative to other fear and phobia subtypes. *Eur J Oral Sci*, *117*(2), 135-143. doi: EOS602 [pii] 10.1111/j.1600-0722.2008.00602.x
- Oosterink, F. M., de Jongh, A., Hoogstraten, J., & Aartman, I. H. (2008). The Level of Exposure-Dental Experiences Questionnaire (LOE-DEQ): a measure of severity of exposure to distressing dental events. *Eur J Oral Sci*, *116*(4), 353-361. doi: EOS542 [pii] 10.1111/j.1600-0722.2008.00542.x
- Ost, L. G. (1987). Applied relaxation: description of a coping technique and review of controlled studies. *Behav Res Ther*, *25*(5), 397-409. doi: 0005-7967(87)90017-9 [pii]
- Ost, L. G., & Hugdahl, K. (1985). Acquisition of blood and dental phobia and anxiety response patterns in clinical patients. *Behav Res Ther*, *23*(1), 27-34. doi: 0005-7967(85)90139-1 [pii]
- Park, C. L., Folkman, S., & Bostrom, A. (2001). Appraisals of controllability and coping in caregivers and HIV+ men: testing the goodness-of-fit hypothesis. *J Consult Clin Psychol*, *69*(3), 481-488.
- Parker, J. D. A., & Endler, N. S. (1992). Coping with coping assessment: A critical review. *European Journal of Personality*, *6*(5), 321-344. doi: 10.1002/per.2410060502

- Parker, J. D. A., & Endler, N. S. (1996). Coping and defense: A historical overview. In M. Zeidner & N. S. Endler (Eds.), *Handbook of coping : theory, research, applications* (pp. 3-23). New York: Wiley.
- Parker, J. D. A., Endler, N. S., & Bagby, R. M. (1993). If It Changes, It Might Be Unstable: Examining the Factor Structure of the Ways of Coping Questionnaire. *Psychological Assessment, 5*(3), 361-368.
- Penley, J. A., Tomaka, J., & Wiebe, J. S. (2002). The Association of Coping to Physical and Psychological Health Outcomes: A Meta-Analytic Review. *Journal of Behavioral Medicine, 25*(6), 551-603.
- Pohjola, V., Lahti, S., Vehkalahti, M. M., Tolvanen, M., & Hausen, H. (2007). Association between dental fear and dental attendance among adults in Finland. *Acta Odontol Scand, 65*(4), 224-230. doi: 781732258 [pii] 10.1080/00016350701373558
- Pohjola, V., Mattila, A. K., Joukamaa, M., & Lahti, S. (2011). Anxiety and depressive disorders and dental fear among adults in Finland. *Eur J Oral Sci, 119*(1), 55-60. doi: 10.1111/j.1600-0722.2010.00795.x
- Ray, J., Boman, U. W., Bodin, L., Berggren, U., Lichtenstein, P., & Broberg, A. G. (2010). Heritability of dental fear. *J Dent Res, 89*(3), 297-301. doi: 0022034509356918 [pii] 10.1177/0022034509356918
- Robinson, M. E., Riley, J. L., 3rd, Myers, C. D., Sadler, I. J., Kvaal, S. A., Geisser, M. E. (1997). The Coping Strategies Questionnaire: a large sample, item level factor analysis. *Clin J Pain, 13*(1), 43-49.
- Roesch, S. C., Weiner, B., & Vaughn, A. A. (2002). Cognitive approaches to stress and coping. *Current Opinion in Psychiatry, 15*(6), 627-632.
- Rosenstiel, A. K., & Keefe, F. J. (1983). The use of coping strategies in chronic low back pain patients: relationship to patient characteristics and current adjustment. *Pain, 17*(1), 33-44. doi: 0304-3959(83)90125-2 [pii]
- Roth, A., & Fonagy, P. (2005). *What works for whom? : a critical review of psychotherapy research*. New York: Guilford.
- Roy-Byrne, P. P., Milgrom, P., Khoon-Mei, T., Weinstein, P., & Katon, W. (1994). Psychopathology and psychiatric diagnosis in subjects with dental phobia. *Journal of Anxiety Disorders, 8*(1), 19-31.
- Scheier, M. F., & Carver, C. S. (1985). Optimism, coping, and health: assessment and implications of generalized outcome expectancies. *Health Psychol, 4*(3), 219-247.
- Schuller, A. A., Willumsen, T., & Holst, D. (2003). Are there differences in oral health and oral health behavior between individuals with high and low dental fear? *Community Dent Oral Epidemiol, 31*(2), 116-121. doi: 026 [pii]
- Schuurs, A. H., & Hoogstraten, J. (1993). Appraisal of dental anxiety and fear questionnaires: a review. *Community Dent Oral Epidemiol, 21*(6), 329-339.
- Schwarz, E., & Birn, H. (1995). Dental anxiety in Danish and Chinese adults--a cross-cultural perspective. *Soc Sci Med, 41*(1), 123-130. doi: 0277953694002885 [pii]
- Skaret, E., Raadal, M., Berg, E., & Kvale, G. (1998). Dental anxiety among 18-yr-olds in Norway. Prevalence and related factors. *Eur J Oral Sci, 106*(4), 835-843.
- Skaret, E., Raadal, M., Kvale, G., & Berg, E. (2003). Gender-based differences in factors related to non-utilization of dental care in young Norwegians. A longitudinal study. *Eur J Oral Sci, 111*(5), 377-382. doi: 072 [pii]
- Skaret, E., & Soevdsnes, E. K. (2005). Behavioural science in dentistry. The role of the dental hygienist in prevention and treatment of the fearful dental patient. *Int J Dent Hyg, 3*(1), 2-6. doi: IDH109 [pii] 10.1111/j.1601-5037.2004.00109.x

- Smith, A. C., & Lazarus, R. S. (1990). Emotion and adaption. In L. A. Pervin (Ed.), *Handbook of personality : theory and research* (pp. 609-637). New York: Guilford Press.
- Smith, T. A., & Heaton, L. J. (2003). Fear of dental care: are we making any progress? *J Am Dent Assoc*, *134*(8), 1101-1108.
- Sohn, W., & Ismail, A. I. (2005). Regular dental visits and dental anxiety in an adult dentate population. *J Am Dent Assoc*, *136*(1), 58-66; quiz 90-51.
- Solberg Nes, L., & Segerstrom, S. C. (2006). Dispositional optimism and coping: A meta-analytic review. *Personality and Social Psychology Review*, *10*(3), 235-251.
- Sondell, K., & Soderfeldt, B. (1997). Dentist-patient communication: a review of relevant models. *Acta Odontol Scand*, *55*(2), 116-126.
- Spinhoven, P., Ter Kuile, M. M., Linssen, A. C., & Gazendam, B. (1989). Pain coping strategies in a Dutch population of chronic low back pain patients. *Pain*, *37*(1), 77-83.
- Stalker, C. A., Russell, B. D., Teram, E., & Schachter, C. L. (2005). Providing dental care to survivors of childhood sexual abuse: treatment considerations for the practitioner. *J Am Dent Assoc*, *136*(9), 1277-1281.
- Stenebrand, A., Boman, U. W., & Hakeberg, M. (2012). Dental anxiety and symptoms of general anxiety and depression in 15-year-olds. *Int J Dent Hyg*. doi: 10.1111/j.1601-5037.2012.00551.x
- Strauss, A. L., & Corbin, J. (1990). *Basics of qualitative research : grounded theory procedures and techniques*. Newbury Park, Calif.: Sage.
- Strauss, A. L., & Corbin, J. (1998). *Basics of qualitative research: Grounded theory procedures and techniques (2nd ed.)*. Thousand Oaks, CA: Sage.
- Streiner, D. L., & Norman, G. R. (2008). *Health measurements scales, a practical guide to their development and use* (4 ed.). New York: Oxford University Press.
- Strentz, T., & Auerbach, S. M. (1988). Adjustment to the stress of simulated captivity: effects of emotion-focused versus problem-focused preparation on hostages differing in locus of control. *J Pers Soc Psychol*, *55*(4), 652-660.
- Suls, J., & Fletcher, B. (1985). The relative efficacy of avoidant and nonavoidant coping strategies: a meta-analysis. *Health Psychology*, *4*(3), 249-288.
- Swartzman, L. C., Gwadry, F. G., Shapiro, A. P., & Teasell, R. W. (1994). The factor structure of the coping strategies questionnaire. *Pain*, *57*(3), 311-316.
- ter Horst, G., & de Wit, C. A. (1993). Review of behavioural research in dentistry 1987-1992: dental anxiety, dentist-patient relationship, compliance and dental attendance. *Int Dent J*, *43*(3 Suppl 1), 265-278.
- Thomson, W. M., Locker, D., & Poulton, R. (2000). Incidence of dental anxiety in young adults in relation to dental treatment experience. *Community Dent Oral Epidemiol*, *28*(4), 289-294.
- Turner, J. A., & Clancy, S. (1986). Strategies for coping with chronic low back pain: relationship to pain and disability. *Pain*, *24*(3), 355-364.
- Tuttle, D. H., Shutty Jr, M. S., & DeGood, D. E. (1991). Empirical dimensions of coping in chronic pain patients: A factorial analysis. *Rehabilitation Psychology*, *36*(3), 179-188.
- Utne, I., Miaskowski, C., Bjordal, K., Cooper, B. A., Valeberg, B. T., & Rustoen, T. (2009). Confirmatory factor analysis of the coping strategies questionnaire-revised in samples of oncology outpatients and inpatients with pain. *Clin J Pain*, *25*(5), 391-400. doi: 10.1097/AJP.0b013e318195ed9b 00002508-200906000-00006 [pii]

- Vassend, O. (1993). Anxiety, pain and discomfort associated with dental treatment. *Behav Res Ther*, 31(7), 659-666. doi: 0005-7967(93)90119-F [pii]
- Vitaliano, P. P., DeWolfe, D. J., Maiuro, R. D., Russo, J., & Katon, W. (1990). Appraised changeability of a stressor as a modifier of the relationship between coping and depression: a test of the hypothesis of fit. *J Pers Soc Psychol*, 59(3), 582-592.
- Walker, E. A., Milgrom, P. M., Weinstein, P., Getz, T., & Richardson, R. (1996). Assessing abuse and neglect and dental fear in women. *J Am Dent Assoc*, 127(4), 485-490.
- Wardle, J. (1983). Psychological management of anxiety and pain during dental treatment. *J Psychosom Res*, 27(5), 399-402.
- Wardle, J. (1984). Dental pessimism: negative cognitions in fearful dental patients. *Behav Res Ther*, 22(5), 553-556. doi: 0005-7967(84)90058-5 [pii]
- Weiner, A. A., & Sheehan, D. V. (1988). Differentiating anxiety-panic disorders from psychologic dental anxiety. *Dent Clin North Am*, 32(4), 823-840.
- Weinstein, P., Milgrom, P., & Ramsay, D. S. (1988). Treating dental fears using nitrous oxide oxygen inhalation and systematic desensitization. *Gen Dent*, 36(4), 322-326.
- Wide Boman, U., Hakeberg, M., Carlsson, V., Eriksson, M., Liljegren, A., Shjögren, P. (2012). Psychological treatment of dental anxiety among adults *HTA-rapport* (Vol. 2012:46). Göteborg: HTA-centrum, Västra Götalands Regionen.
- Willumsen, T. (2001). Dental fear in sexually abused women. *Eur J Oral Sci*, 109(5), 291-296.
- Willumsen, T., Vassend, O., & Hoffart, A. (2001a). A comparison of cognitive therapy, applied relaxation, and nitrous oxide sedation in the treatment of dental fear. *Acta Odontol Scand*, 59(5), 290-296.
- Willumsen, T., Vassend, O., & Hoffart, A. (2001b). One-year follow-up of patients treated for dental fear: effects of cognitive therapy, applied relaxation, and nitrous oxide sedation. *Acta Odontol Scand*, 59(6), 335-340.
- World Health Organization. (2009). *International statistical classification of diseases and related health problems : ICD-10*. Geneva: World Health Organization.
- Ylostalo, P. V., Ek, E., & Knuuttila, M. (2003). Coping and optimism in relation to dental health behaviour--a study among Finnish young adults. *Eur J Oral Sci*, 111(6), 477-482. doi: 083 [pii]
- Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta Psychiatr Scand*, 67(6), 361-370.
- Öhman, A. (1993). Fear and anxiety as emotional phenomena: Clinical phenomenology, evolutionary perspectives, and information-processing mechanisms. In M. Lewis & J. M. Haviland (Eds.), *Handbook of emotions* (pp. 511-536). New York: Guilford Press.
- Öst, L. G. (1987). Age of onset in different phobias. *J of Abnormal Psychology*, 96(3), 223-229.