

Development and evaluation of the Jönköping Dental Fear Coping Model: a health professional perspective

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ABSTRACT

Objective: The purpose of this study was to design a structured treatment model focusing on all levels of adult's dental fear, the Jönköping Dental Fear Coping Model (DFCM). The aim was to study the DFCM from a dental health professional perspective.

Material and methods: The DFCM was studied by means of quantitative and qualitative analyses. Nine dental clinics participated in Period I (pre-intervention/standard care), and 133 dental health professionals (dentists, dental hygienists, dental assistants) and 3088 patients were included. After completion of Period I, four of the clinics were randomized to Period II (intervention), beginning with the professionals undergoing DFCM training. Following that, 51 dental health professionals treated 1417 patients according to the DFCM. The other five clinics served as controls.

Results: Half or more of the dental health professionals assessed the model as better than standard care, regarding anamnesis and diagnostics, communication and contact, and understanding of patients and dental fear. The dental health professionals reported higher tension in their fearful patients in Period II compared with Period I, possibly due to their increased awareness of dental fear.

Conclusions: The qualitative data suggest that dental health professionals find the DFCM beneficial in routine dental care. The model promotes a holistic approach to the treatment of adult patients. However, stress among the professionals was not reduced when measured, neither quantitatively nor qualitatively. It is important to evaluate the model in further studies to make it possible to draw generalizable conclusions.

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Introduction

Dental fear is one of the most commonly reported fears or phobias [1]. Despite progress in behavioral dental science during the past 40 years, epidemiological studies on dental fear indicate that between 10 and 27% of patients have moderate to high dental fear [2–4] and 4–6% suffer from more severe, phobic dental fear [2,5].

Feelings of concern, apprehension or fear may lead to several severe consequences for the dental patient: avoidance of dental calls, deterioration of dental status, and feelings of shame and inferiority that may aggravate the fear over time [6–10]. In addition, health professionals in dentistry experience psychological and economic stress when treating fearful patients [11–13], which may influence their interaction with the patient [14,15]. Possible negative consequences may be impaired treatment and care providing by the dental health professionals, leading to increased levels of dental fear among patients. Furthermore, the professionals may be less positive towards treating fearful adult patients.

Fortunately, dental fear sometimes remits but it may also persist or increase [3,16,17]. In the latter scenarios,

psychological and practical problems during dental treatment may occur, not only for the patients but also for the dental health professionals. Important achievements have been made to address these problems: validated screening measures for dental fear [18–20], several anxiety-reducing techniques, *i.a.*, psychological and pharmacological techniques [21–27]. However, due to the heterogeneous nature of dental fear, the diagnostic procedures and categorizations of dental fear are not standardized. One of the few categorizations is based on the origins of dental fear, *endogenous and non-endogenous dental anxiety* [28–30], and another on clinical groups, the *Seattle system* [31]. The latter describes clinical characteristics and treatment options for the different subtypes of dental fear: fear of specific stimuli (drills, needles, smells, etc.), distrust of dental personnel, generalized anxiety, and fear of some medical catastrophe occurring (panic attacks, fainting, etc.). The ability of the Seattle system to diagnose patients with dental anxiety and dental phobia has been validated [32,33]. *Ditt valg* ('Your choice'),¹ a web-based survey, has been developed from the Seattle system to facilitate mutual communication [34,35], with the aim of

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promoting changes in health care behavior in health care and dental care services. The patient responds to statements regarding previous dental experiences, possible reasons for attending/not attending dental appointments, and preferences for further dental treatment. Responding with open comments is also possible.

To create a trustful relationship between dental health professionals and fearful patients, mutual communication is important. The *Motivational Interviewing* (MI) method [36] has been used successfully in dentistry to improve communication skills and treatment acceptance [37]. The use of *open-ended questions, reflective listening, affirmations, and summaries* according to MI is believed to improve mutual communication and thereby improve the taking of the patient's medical history/anamnesis [36].

We believe there is a need for routines for dental health professionals in their interactions with all fearful dental patients, not only the extreme/phobic ones, in order to detect and understand the nature of the fear [38]. In this project, we designed and evaluated the Jönköping Dental Fear Coping Model (DFCM), focusing on dental fear in adults from the perspectives of dental health professionals and patients. To our knowledge, no such model has been described in the literature. In the present study, we focused on the professionals. Our hypotheses were the following: dental health professionals following/working according to the Jönköping DFCM (I) increase their self-perceived competence in treating adult fearful patients and (II) increase their estimated number of adult patients with dental fear.

Materials and methods

The Jönköping DFCM

The Jönköping DFCM was developed for the purpose of reducing stress reactions among dental health professionals and fearful patients in the treatment situation. Besides improving the working environment for the professionals, the purpose of the DFCM is to prevent the onset of fear and reduce manifest dental fear among patients. In this report, we focus on the treatment team; the impact on patients of the DFCM will be analyzed in a forthcoming publication. The model is based on *The Seattle system* [31], *Ditt valg* [34,35], and *Motivational Interviewing* (MI) [36]. A new patient category, *fearless/no fear*, was added to the four existing categories of the Seattle system. The different cards from *Ditt valg*, coded to the diagnostic categories in the Seattle system, provide the dental health professionals with information on how to treat a patient with a particular dental fear profile. The way the professionals were instructed to communicate with the patients was guided by the principles of MI.

The model requires that all new patients respond to an electronic *pre-treatment questionnaire* about dental fear, including one global question 'Are you afraid of going to the dentist?' [39] and a dental fear index, *The Index of Dental Anxiety and Fear* (IDAF-4C+) [18,40]. Patients responding in the affirmative to the global question or to any of the questions in the first module of IDAF-4C+ proceeded to *Ditt valg*, while the non-fearful did not. The questionnaire is completed in the waiting

room prior to the dental examination. An algorithm then summarizes the responses in a Dental Fear Summary (Figure 1), which the health professionals receive before seeing the patient. The Dental Fear Summary provides the health professionals with information about the (1) patient's level of dental fear (none to extreme); (2) the fearful patient's experiences and expectations of the dental treatment (retrieved from *Ditt valg*) [34,35]; and (3) a dental fear category/categories according to the Seattle system [31]. Hence, the dental health professionals are prepared and can use the information about the patient during the appointment. The open-ended questions, reflective listening, affirmations, and summaries according to MI enhance the communication between the patient and the professionals [36].

DFCM training

The model includes a 3-h training session in DFCM, where the theoretical background of the model is explained, combined with practical training.

Content of the DFCM training:

- The etiology and epidemiology of dental fear, including the Seattle system;
- Basics in communication according to MI; and
- Practical training in the DFCM.

Film sequences are used to illustrate examples of negative and positive communication in the dental situation. The practical training includes a role-play session where the dental health professionals test the DFCM.

Evaluation of the Jönköping DFCM

Study design

A prospective intervention study was performed at the Public Dental Service in Region Jönköping County to evaluate the DFCM. Figure 2 provides information about the intervention study with its two periods. Standard care was carried out in Period I (pre-intervention period) and intervention according to the DFCM in Period II (intervention period). Data from the two periods were compared. A pilot study with the same design preceded the intervention study.

The data collection in Periods I and II lasted from March 2014 to April 2016. The nine Public Dental Service clinics in Figure 2 were informed about and accepted participation in the study, and the *pre-period I questionnaires* for dental health professionals were collected. After completing Period I, the health professionals responded to the *post-period I questionnaire*. Between Periods I and II, the clinics were randomized to participate or not participate in the intervention study's Period II. The intervention group was trained in the DFCM, which was then tested in clinical practice in Period II. Since the dental health professionals in the intervention group were included in Period I, they were now their own controls. The non-intervention group finished the study after Period I and was acting as controls to the intervention group. Finally, all professionals in the non-intervention and

Dental Fear Summary

Patient ID

Date; time

Moderate to high dental fear (3.0)

Fear level
according to the
IDAF-4C+

Chosen cards

My experiences

I feel nauseous and dizzy when I get local anesthesia

Hopes and fears

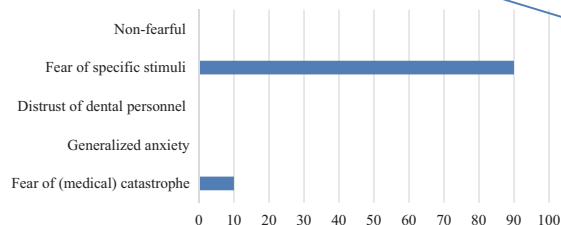
I am afraid of particular things/tools during dental treatment
'The needle' (patient's own comment)

My preferences

I would like the treatment to start gently, to feel that I am in control
and can cope with it

Information from *Ditt valg* is used by the dental health professional when taking the patient's medical history. Note that the patient made an own comment. Selected parts from the MI to be used as a communication strategy.

Distribution of categories (%)



Information about fear categories (based on the Seattle system) aiming to facilitate treatment planning and prognosis.

Figure 1. This is an example of how the Dental Fear Summary may look when a patient has responded to the web survey in the waiting room. Data are transferred from the web survey (computed by an algorithm) to the Dental Fear Summary and given to the dental health professionals before they meet the patient. The speech balloons are not normally included in the Dental Fear Summary but are included here to explain how IDAF-4C+, *Ditt valg*, and Seattle categories are shown to the professionals in the summary.

intervention groups responded to the *post-period II questionnaire* after completing Period II.

In each Period (I and II), dentists and dental hygienists were instructed to register at least 50 patients each. All but one dental health professional in the intervention group achieved the goal of 50 patients in Period I; however, this professional still went on to Period II (Period I: mean 53 patients, range 36–63; Period II: mean 52 patients, range 34–58). The dental health professionals used the *post-treatment care provider rating* to assess each patient's level of tension and cooperation.

The dental patients participating in the study were chosen irrespective of them being fearless/fearful, and irrespective of the nature of their appointment, i.e., dental examination or dental treatment. They only took part once, meaning that there were different patients in Periods I and II. The research administration personnel informed and included patients in the study consecutively, as they came to the clinic. The patients replied to a *pre-treatment questionnaire* containing questions about age, gender, reason for the appointment, and dental fear (IDAF-4C+), and a *post-treatment questionnaire* containing questions about perceived pain, other discomfort, tension during the appointment, and questions about patient satisfaction with the dentist or the dental hygienist. In Period I, the responses were handled confidentially by the research study personnel and were not accessible to the dental health professionals.

Study samples

Study clinics. Table 1 shows demographic data for the study clinics. Matching of the Public Dental Service clinics in Region Jönköping County with regard to clinic size (number of employees, in particular dentists, and dental hygienists), municipality and number of inhabitants (city district, town, and countryside), and information on the inhabitants' educational level and income, using the Small Areas of Market Statistics (SAMS) [41], resulted in a sample of dental clinics that accepted to participate in the study [city district with high socioeconomic status (SES), Jönköping ($n = 2$); city district low SES, Jönköping ($n = 2$); town ($n = 3$); and countryside ($n = 2$)]. After completion of Period I, four of the nine clinics were pairwise randomized to continue to Period II.

Dental health professionals. Figure 2 shows the numbers per occupation of the dental health professionals participating in the study. The following exclusion criteria were applied: working with children only, unable to collect sufficient data due to part-time work, and sickness or parental leave during pre-period I. The total exclusion rate was 18% ($n = 32$), and the total dropout rate was 23% ($n = 34$) for the two periods. The reasons for dropouts were sickness, parental leave, leaving employment, unable to collect sufficient data during the on-going study, or not responding to the post-period I or II questionnaires. There were no statistically significant differences between the dental health professionals who participated and those who dropped out with regard to gender, professional subgroup, post-graduate training, self-

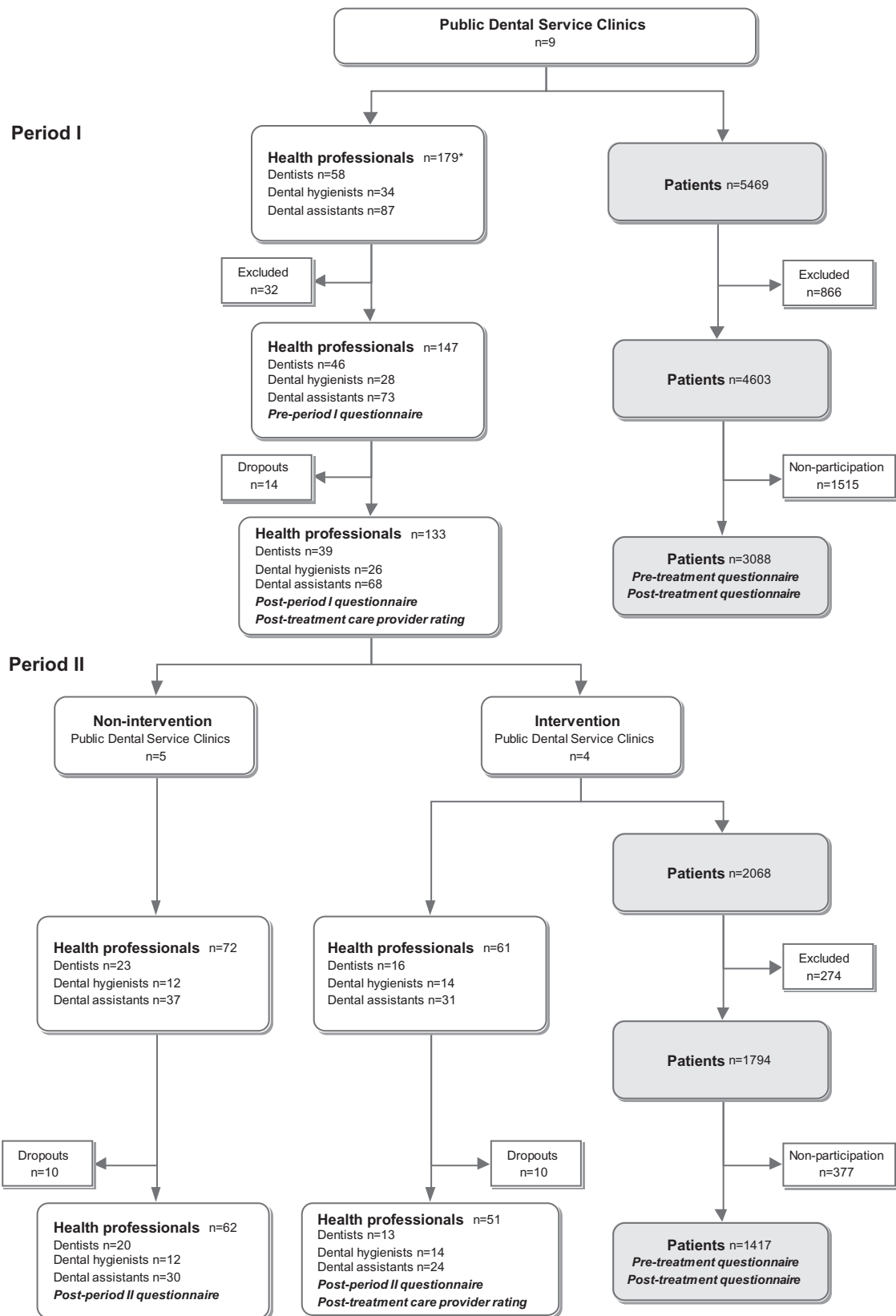


Figure 2. Flow chart illustrating the intervention study. * Eight health professionals did not participate in Period I (two dentists, one dental hygienist, and five dental assistants). Before Period II, they were included in the study, responded to the post-period I questionnaire, and participated in the DFCM training. In order to make the flow chart readable, those eight individuals were included in Period I, but did not participate until Period II (intervention group).

Table 1. The study clinics in relation to demographic data on people living in the municipality or city district where the dental clinic was located (2013).

	Staff D/DH/DA (n)	Municipality subgroup	Inhabitants (n)	Levels of education	Income levels
Clinic A ^a	4/4/6	Countryside	4920	2–4	2–4
Clinic B ^a	9/2/17	Town	18,696	1–5	1–5
Clinic C ^a	6/2/12	City district, high SES	4958	3–4	3–4
Clinic D	5/2/7	City district, low SES	5362	3	2
Clinic E	4/3/4	Countryside	3367	2–3	2–3
Clinic F	9/5/20	Town	16,678	1–4	1–5
Clinic G ^a	4/3/8	City district, low SES	4996	3–5	1–3
Clinic H	9/4/12	City district, high SES	2703	4	3
Clinic I	6/5/10	Town	14,197	2–4	2–4

D: dentist; DH: dental hygienist; DA: dental assistant.

^aIntervention group.

perceived competence in treating fearful patients, attitudes to treating adult patients with dental fear, and estimated proportion of adult fearful patients.

Patients. Patients participating in study Periods I and II are shown in Figure 2. The following exclusion criteria were applied: 'Has already participated in the study', severely impaired vision, and problems reading and speaking Swedish. Some reasons given for non-participation were lack of time or unwillingness to be enrolled. The response rate was 67% in Period I and was 79% in Period II.

Questionnaires

Pre- and post-period I questionnaires. The background questions covered gender (male and female), profession (dentist, dental hygienist, and dental assistant), and number of years in the profession (0–3 years, 4–12 years, and >12 years). Eight questions from a previous study [13] were included for comparison purposes:

1. 'Have you attended any postgraduate courses in the field of dental fear/care delivery after graduating?' (No; Yes, a few; Yes, several);
2. 'How do you assess your skills in treating adult patients with dental fear?' (Very poor; Quite poor; Fairly good; Very good);
- 3–7. 'What are your feelings/thoughts about treating an adult patient with dental fear? (3) Positively challenging; (4) Important; (5) Emotionally stressful; (6) Economically stressful?' (Not at all; A little/Somewhat; Fairly; Very positive/important/stressful); (7) 'Open comments?';
8. 'Approximately what proportion of your adult patients do you perceive as being anxious or fearful during treatment?'

In the present study, question 2 is referred to in the text as 'self-perceived competence'. An attitude sum variable was computed from questions 3–6 in order to compare the intervention and non-intervention groups at baseline.

The *post-period I questionnaire* is identical to the *pre-period I questionnaire*, except for the background questions being omitted from the post-period questionnaire.

Post-period II questionnaire. The *post-period II questionnaire* responded to by the non-intervention group was identical to the *post-period I questionnaire*, shown in the above paragraph. The *post-period II questionnaire* distributed to the 'intervention group' was different. Besides the questions in

the post-period I questionnaire, another five questions referred to the dental health professionals' experiences of the Jönköping DFCM:

1. 'In your opinion, what are the advantages and disadvantages of the structured treatment model?';
2. 'Is there anything you would change in the structured treatment model and, if so, what?';
3. 'What is your impression of the structured treatment model compared with how you worked before, regarding the identification of dental fear?';
4. 'What is your impression of the structured treatment model compared with how you worked before, regarding focus on patient needs?';
5. 'What is your impression of the structured treatment model compared with how you worked before, regarding communication with patients?'

Questions 1 and 2 were open-ended and the response alternatives to questions 3–5 were 'worse', 'equal', or 'better than before'.

In order to analyze changes over time, an additional variable was computed, showing the difference in the estimated proportion of adult fearful patients between the time points *post-period II* and *post-period I*.

Post-treatment care provider rating. After each patient encounter in Periods I and II, dental health professionals immediately recorded the reason for the appointment and assessed patient behavior and treatment functioning during dental treatment on 'The Dentist Rating Scale', with scores from 1 to 6 [42]. The reason for the appointment was also recorded.

1. The patient is totally relaxed. The treatment can be performed without problems.
2. The patient is relaxed, even if slight tension can be observed. No problems to perform treatment.
3. The patient is fairly relaxed. The treatment can be performed after adaptation to the patient's reactions.
4. The patient is not relaxed. The treatment can only be performed with difficulty and after major adaptation to the patient's reactions.
5. The patient agrees to try to undergo treatment, but is so tense or reacts in some other way as to make treatment impracticable.
6. The patient refuses treatment.

Pre-treatment patient questionnaire. The *pre-treatment questionnaire* about dental fear included one global question 'Are you afraid of going to the dentist?'. The response alternatives were 'No', 'A little', 'Yes, quite', and 'Yes, very' [39], and a dental fear index, the Index of Dental Anxiety and Fear (IDAF-4C+). The IDAF-4C+ contains three modules: the Anxiety and Fear module, the Phobia module, and the Stimuli module. The Anxiety and Fear module assesses the emotional, behavioral, physiological, and cognitive components of the anxiety, and is used for the purpose of screening dental patients. In this module, patients respond to eight items on a five-point Likert-type scale ranging from 'disagree' (1) to 'strongly agree' (5). Full-scale scores are given as an average score across the eight items [18,40]. Patient levels of dental fear according to Armfield's normative values from the IDAF-4C [5] are: No to low fear (1.00–1.49); low to moderate fear (1.50–2.49); moderate to high fear (2.50–3.49), and high to extreme fear (3.50–5.00). In the analyses of the present paper, dental fear was dichotomized into 'No to low dental fear' (1.00–1.49) and 'Low to extreme dental fear' (1.50–5.00).

Post-treatment patient questionnaire. The patient's perceived tension during the encounter (How tense were you during examination/treatment?) was measured in the *post-treatment questionnaire* on a VAS scale (0–10): 'Completely relaxed' (VAS = 0) and 'Very tense' (VAS = 10). The patient responded to the question after treatment, outside the treatment room.

Data analyses

Both parametric and non-parametric methods were used in the statistical inference testing (post-periods I and II). Results from the continuous scales were reported using mean (M) values and standard deviations (SD). For correlations, Spearman's rank order correlation was used. For tests between two independent groups, Fisher's exact test was used for dichotomous variables, Mantel-Haenszel exact chi-square test (Exact linear-by-linear association) for ordered categorical variables, and Mann-Whitney *U*-test for continuous variables. Changes within a sample were analyzed using Sign test for ordinal scales, and Wilcoxon signed-rank test for continuous variables. The pre-chosen level of significance was $p < .05$ in all analyses, and all tests were two-tailed. Version 24.0 of the SPSS software package was used for all statistical analyses.

Qualitative content analysis according to Hsieh and Shannon was used for the analysis of open questions [43]. Overall positive or negative respondents were identified by adding the positive and negative comments made by each health professional, leading to an overall positive, overall neutral or overall negative sum. A respondent was labeled 'overall positive' if all or most of the statements made were positive, and 'overall negative' in case of the reverse overall response.

The variable, 'How do you assess your skills at treating adult patients with dental fear?', was used in the power calculation. Based on the assumption that all dentists and

dental hygienists would increase their self-perceived competence by at least one step, meaning that 30% in the non-intervention group and 60% in the intervention group would improve after Period II, the power was calculated to 0.9 (0.882). According to the power calculation, the number of health professionals (dentists and dental hygienists) needed was 60 (the non-intervention group 26 and the intervention group 34).

Ethical aspects

The study was approved by the Regional Ethical Review Board of Linköping University (Reg. no: 2013/322-31), and performed in accordance with the Declaration of Helsinki. Informed consent was obtained from health professionals and patients.

Results

Table 2 provides baseline data on the dental health professionals participating in both periods, including gender, profession, years of practice, post-graduate training, and attitudes towards treating fearful patients; in total, and separated into the intervention and non-intervention groups. The majority of the professionals were females (91%). Furthermore, the total proportion of dental health professionals with >3 years of work experience was high (81%). No statistically significant differences were found between the intervention and the non-intervention groups for any of the variables (Table 2). Analyses of the same variables divided by professional subgroup between the intervention and non-intervention groups showed no statistically significant differences at baseline in Period I either; nor were there any statistically significant differences in attitudes towards treating fearful patients within the intervention and non-intervention groups between Periods I and II. Analysis of the attitude sum variable showed no statistically significant differences between the non-intervention and intervention groups ($p = .175$).

The primary analysis, i.e., improvement in self-perceived competence in treating fearful patients for the intervention vs. the non-intervention groups between Periods I and II, showed no statistical significance. Moreover, there was no statistically significant difference between Periods I and II in the professionals' estimated proportion of fearful patients between the intervention and the non-intervention groups (Table 3). No statistically significant differences were found for improvement in perceived competence within the intervention and the non-intervention groups, or for the estimated proportion of adult fearful patients (Table 3). Nor did the same analysis for the professional subgroups reveal any statistically significant differences. Only dental health professionals who participated in both periods were included in the analyses.

Table 4 presents the dental health professionals' opinions about the Jönköping DFCM with regard to: 'Identifying adult patients with dental fear', 'Focusing on patient needs', and 'Communicating with the patient'. In total, 63% reported improvement in identifying dental fear according to the

Table 2. Baseline data for dental health professionals participating in both periods: gender, years of practice, post-graduate training in dental fear, and attitudes towards treating adult patients with dental fear in relation to intervention and non-intervention.

	Intervention		Non-intervention		Total		<i>p</i>
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Gender							
Men	4	7.8	6	9.7	10	8.8	1.000 ^a
Women	47	92.2	56	90.3	103	91.2	
Profession							
Dentists	13	25.5	20	32.3	33	29.2	.535 ^a
Dental hygienist	14	27.5	12	19.4	26	23.0	
Dental assistant	24	47.1	30	48.4	54	47.8	
Years of practice							
0–3	11	21.6	10	16.4	21	18.8	.465 ^b
4–12	15	29.4	17	27.9	32	28.6	
>12	25	49.0	34	55.7	59	52.7	
Post-graduate training							
No	16	31.4	17	27.9	33	29.5	1.000 ^b
Yes, a few	26	51.0	36	59.0	62	55.4	
Yes, several	9	17.6	8	13.1	17	15.2	
Positive							
Not at all	1	2.0	1	1.6	2	1.8	.110 ^b
A little/somewhat	6	12.0	11	17.7	17	15.2	
Fairly positive	24	48.0	37	59.7	61	54.5	
Very positive	19	38.0	13	21.0	32	28.6	
Important							
Not at all	0	0.0	0	0.0	0	0.0	.17 6 ^b
A little/somewhat	2	3.9	4	6.5	6	5.3	
Fairly important	6	11.8	14	22.6	20	17.7	
Very important	43	84.3	44	71.0	87	77.0	
Emotionally stressful							
Not at all	10	20.0	4	6.5	14	12.5	.473 ^b
A little/somewhat	26	52.0	40	64.5	66	58.9	
Fairly stressful	12	24.0	18	29.0	30	26.8	
Very stressful	2	4.0	0	0.0	2	1.8	
Economically stressful							
Not at all	13	26.0	16	25.8	29	25.9	.772 ^b
A little/somewhat	18	36.0	24	38.7	42	37.5	
Fairly stressful	15	30.0	12	19.4	27	24.1	
Very stressful	4	8.0	10	16.1	14	12.5	

^aFisher's exact test.^bExact linear-by-linear association.

Jönköping DFCM compared with standard care, with no statistically significant differences shown between the professional subgroups. Improvement was reported for *Focus on patient needs* (50%) and *Communication* (54%), with no statistically significant differences between the professional subgroups.

There were two open-ended questions in the post-period II questionnaire: *'In your opinion, what are the advantages and disadvantages of the structured treatment model?'*, and: *'Is there anything you would change in the structural treatment model and, if so, what?'*. Answers to the first question were submitted by 70% ($n=33$, 33/47), and 13% ($n=6$, 6/47) to the second question. The amount of data from the responses to the latter question was too small to draw any generalizable conclusions. Most open comments describe improved quality of patient care: 'Can otherwise sometimes be difficult to know what the patient is afraid of'; 'Increased awareness and one's mindset has changed'; 'Gives a faster and clearer insight into the patient's problems, can then take better action' and 'I interact better with the patient'. All answers to these questions were broken down into statements, with some answers containing more than one statement. In total, there were 68 statements forming the basis for a qualitative content analysis. Two of the authors (C.O.B. and S.G.C.)

searched the pool of statements, independently of each other, for a structure of categories covering the multitude of opinions given. After discussion, the two judges arrived at a two-stage structure, with 'positive statement', 'negative statement', and 'other statement' at the higher level; the latter category was of little interest in assessing the attitudes to the DFCM. For the positive statements, the subcategories were: *Improved anamnesis and diagnostics*, *Better communication and contact*, and *Better understanding of patients and of dental fear*. Among the negative statements, two subcategories emerged: *More demanding* and *Less spontaneous*.

Forty-six comments were *positive*, 16 *negative*, and six were categorized as *other comment*. Twenty-one of the respondents were overall positive, two were overall negative, and eight were neutral. Another two respondents did not leave any positive or negative comment, only *other comment*.

Separate analyses were performed of the open comments made by the dental health professionals who assessed the Jönköping DFCM as 'overall equal to standard care' (the middle response alternative in all three closed questions). In this group of 13 professionals, eight left a total of 14 comments. Of these, six were positive, four were negative, and four were 'other comment'. Examples of positive comments in this group were: 'I need to spend less time sorting out [...] the

Table 3. The hypothesis variables of 'self-perceived competence' in treating fearful patients and estimated 'proportion of fearful patients' in Periods I and II, and differences over time, in relation to intervention and non-intervention.

	Intervention, <i>n</i> = 51		Non-intervention, <i>n</i> = 62		
	<i>n</i> (%)	<i>p</i> within	<i>n</i> (%)	<i>p</i> within	<i>p</i> between
<i>Perceived competence^a</i>					
Period I					
Very poor	0 (0.0)		0 (0.0)		.085 ^c
Quite poor	5 (10.2)		8 (12.9)		
Fairly good	34 (69.4)		50 (80.6)		
Very good	10 (20.4)		4 (6.5)		
Period II					
Very poor	0 (0.0)		0 (0.0)		.680 ^c
Quite poor	3 (6.0)		5 (8.1)		
Fairly good	39 (78.0)		49 (79.0)		
Very good	8 (16.0)		8 (12.9)		
Change between Periods I and II					
Worse	7 (14.6)	1.000 ^e	3 (4.8)	.092 ^e	.249 ^c
Equal	34 (70.8)		49 (79.0)		
Better	7 (14.6)		10 (16.1)		
	Mean (SD)	<i>p</i> within	Mean (SD)	<i>p</i> within	
	Median (min; max)		Median (min; max)		
	<i>n</i>		<i>n</i>		
<i>Proportion of fearful patients^b</i>					
Period I	32.9 (22.7)		28.2 (19.0)		.321 ^d
	30.0 (0.0; 80.0)		27.5 (0.0; 70.0)		
	<i>n</i> = 49		<i>n</i> = 60		
Period II	30.3 (21.3)		30.8 (19.9)		.945 ^d
	30.0 (0.0; 80.0)		25.0 (3.0; 80.0)		
	<i>n</i> = 49		<i>n</i> = 59		
Change between Periods I and II	-2.3 (17.8)	.405 ^f	2.6 (23.4)	.324 ^f	.249 ^d
	0.0 (-45.0; 40.0)		0.0 (-67.0; 65.0)		
	<i>n</i> = 48		<i>n</i> = 57		

^aSelf-perceived competence = response to the question: 'How do you assess your skills in treating adult patients with dental fear?'.^bProportion of fearful patients = response to the question: 'Approximately what proportion of your adult patients do you perceive as being anxious or fearful during treatment?'.^cExact linear-by-linear association.^dMann-Whitney *U*-test.^eSign test.^fWilcoxon signed ranks test.**Table 4.** Dental health professionals' post-period II assessment of the Jönköping Dental Fear Coping Model/intervention compared with standard care.

	Dentists		Dental hygienists		Dental assistants		Total		<i>p</i>
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Identifying dental fear									
Worse	0	0.0	0	0.0	0	0.0	0	0.0	.742 ^a
Equal	5	38.5	4	28.6	8	42.1	17	37.0	
Better	8	61.5	10	71.4	11	57.9	29	63.0	
Focus on patient needs									
Worse	0	0.0	1	7.1	0	0.0	1	2.2	.301 ^a
Equal	7	53.8	4	28.6	11	57.9	22	47.8	
Better	6	46.2	9	64.3	8	42.1	23	50.0	
Communication									
Worse	0	0.0	0	0.0	0	0.0	0	0.0	.086 ^a
Equal	8	61.5	3	21.4	10	52.6	21	45.7	
Better	5	38.5	11	78.6	9	52.4	25	54.3	

^aFisher's exact test.

patient's dental fear, if I get the information through this survey'; 'You may [otherwise] forget to ask patients how they feel about the treatment, [but you are now] reminded to do so'; '[It is an] advantage to have this prior information about new patients'. Some of the negative comments were the following: 'Stressful environment – sometimes difficult to work fully with the [new] treatment model'; 'For my recall patients, I think there is probably a small disadvantage because I already know their fears and agonies'; 'Takes time from treatment'.

In the same group of eight professionals, three were overall positive, two overall negative, and two were neutral. One respondent did not leave a positive or negative comment, only *other comment*.

Post-treatment care provider ratings

Table 5 shows the dental health professionals' assessments of the patients' tension and ability to cope with dental treatment (dentist rating) in Periods I and II in the intervention group in relation to patient levels of dental fear (no to low, low to extreme). In Period II, only the intervention group made the assessments according to the study design.

There were no statistically significant differences in 'Dentist rating' between the patients responding 'no to low' levels of dental fear between Periods I and II. In the low to extreme fear group, all professional subgroups rated the patients higher in Period II compared with Period I, despite no patient-reported differences in tension between Periods I and II by fear group (Table 5).

Discussion

The Jönköping DFCM was developed for the purpose of reducing stress reactions among dental health professionals

Table 5. Patient tension to any degree during treatment (dentist rating (DR) > 1) according to dental health professionals in the intervention group and patients (VAS) in Periods I and II, in relation to dental fear.

Tension (professionals)	Level of dental fear					
	No to low (IDAF 1.0–1.49)			Low to extreme (IDAF 1.5–5.0)		
	<i>n</i>	%	<i>p</i> ^a	<i>n</i>	%	<i>p</i> ^a
Dentist (DR) ^c						
Period I	113/396	28.5	.347	116/177	65.5	.019
Period II	148/556	26.6		107/133	80.5	
Dental hygienist (DR) ^c						
Period I	128/475	26.9	.740	88/168	52.4	.006
Period II	162/585	27.7		87/123	70.7	
Dental assistant (DR) ^c						
Period I	67/390	17.2	.537	89/156	57.1	.011
Period II	101/551	18.3		102/135	75.6	
	<i>n</i>	M (SD)	<i>p</i> ^b	<i>n</i>	M (SD)	<i>p</i> ^b
Patients (VAS)						
Period I	915	1.1 (1.51)	0.243	360	4.2 (2.93)	.809
Period II	1134	1.2 (1.60)		255	4.2 (2.97)	

^aExact linear-by-linear association.^bMann–Whitney *U*-test.^cThe full DR scale was used in the analysis.

and fearful patients in a treatment situation, preventing the onset of fear, and reducing manifest dental fear. To our knowledge, no study has previously described a systematic attempt to improve the routine care of fearful dental patients.

Our first hypothesis was that dental health professionals working according to the Jönköping DFCM would increase their self-perceived competence in treating adult fearful patients. However, 20% in the intervention and 6.5% in the non-intervention groups reported their competence at baseline to be 'very good' (Table 3), which means that they could not improve further. While we failed to find support for this hypothesis, our study revealed other positive results of the model. The professionals became more observant of patients' dental fear and tension. Also, the majority of the respondents described the Jönköping DFCM as equal to or better than standard care. The absence of increased competence in treating fearful patients is not necessarily disappointing: the results may indicate that dental health professionals in the intervention group have developed an increased awareness of dental fear as a complex condition; thus, a humbler attitude towards the treatment of fearful patients.

Our second hypothesis was that dental health professionals working according to the Jönköping DFCM estimate higher numbers of adult patients with dental fear. The rationale behind the hypothesis was that working according to the model would lead to increased awareness of dental fear. In a previous study [13], Swedish dentists estimated the mean proportion of dental fear among their patients to be 16%, which is consistent with a recent Swedish epidemiological study reporting a total prevalence of dental fear of 19% [2]. In the present study, the dental health professionals estimated the proportion of fearful patients to around 30% in both periods. Thus, the estimated proportions were twice as high compared with the results from the previous study. This was unexpected, since we anticipated a lower estimated proportion of fearful patients in Period I, comparable to the results of the previous study, and a relatively higher

estimated proportion in Period II. Thus, with such high initial assessments, increased rates were not to be expected after the introduction of the DFCM. The high assessments of dental fear in Period I were probably due to mere participation in the study induced an increased mental focus on dental fear in the dental health professionals. The larger estimated proportion of fearful patients in Period I compared with the previous study [13] may thus be due to confirmation bias, i.e. the tendency to search for, interpret, favor, and recall information in a way that confirms one's pre-existing beliefs or hypotheses [44].

Perceived emotional stress was frequent (87%) among the dental health professionals at baseline, and comparable to a previous study including 889 dentists [13]. The Jönköping DFCM was developed, *i.e.*, for the purpose of reducing stress reactions among health professionals, by creating a structure or a protocol for treating patients with dental fear. Feelings after successful treatment of being capable of working with fearful patients, or the positive feedback from patients would reduce stress levels among health professionals. However, using the DFCM did not contribute to stress reduction, neither emotional nor economic. Emotional and economic stress rather appears to be an effect of organizational matters, which is confirmed by the open comments: the treatment of patients with moderate to severe dental fear is time-consuming and expensive.

The results of the dental health professionals' opinions about the intervention (Table 4) were favorable to the DFCM. The Dental Fear Summary provided the health professionals with information about the patient's dental fear level, which was helpful in identifying the fear. The majority of the health professionals assessed the DFCM as equal or better than standard care with regard to meet patient needs. However, one dental hygienist stated that standard care was better than the model for recall patients but not for new patients, where the model was found useful.

Parts of the motivational interviewing (MI) were used as a tool for improving communication with the patient.

Originally, MI was developed to promote behavioral changes in psychiatric care [36]. In the present study, the purpose of using a model inspired by MI was not to achieve behavioral changes in dental patients, but to improve the health professional's communication techniques. The reason why dentists are less positive than dental hygienists to MI may be the extra time needed. Dental hygienists focus more than dentists on behavioral changes in their profession. Here, communication skills may be a powerful tool to change patients' oral health care habits [37].

The open comments to the Jönköping DFCM supported our belief that it is a useful tool when treating not only fearful adults but all dental patients. Irrespective of the dental fear level, the DFCM was believed to improve contact and communication with the patient and the understanding of each patient's specific needs. In clinical practice, the DFCM may be beneficial when it comes to offering a holistic treatment approach to the patient. The majority of the respondents was overall positive to the DFCM and, surprisingly, half of the 13 dental health professionals who rated the model as equal to standard care on the closed questions were overall positive or neutral in their open comments. This result questions the use of a three-grade scale as a measure, as it may have been too narrow, with no response option between 'equal' and 'improvement'. The negative comments were expected, since implementing new routines takes time, effort, and resources.

Some shortcomings and limitations of the study have to be considered. (1) The expected increase in self-perceived competence in treating fearful adult patients in the intervention group did not materialize, which is far from our presumptions during the development stage of the Jönköping DFCM; (2) the power analysis was based on our hypothesis about perceived competence in treating fearful patients, which we failed to support. Possibly, the presumed effect was too high; the direction of the effect was calculated to be positive (one-way); the dental health professionals' awareness of patients with dental fear and the complexity of the fear itself increased, leading to a humbler attitude to their own competence. Furthermore, the dropout levels were high. The number of dental health professionals in the intervention group, 34 dentists and dental hygienists, was calculated to reach power, but only 27 dentists and dental hygienists were included in the intervention group; (3) patients who had commenced dental treatment were also included in the study, which may have interrupted the health professional-patient interaction and the flow of the treatment, thereby affecting the opinion of the DFCM negatively. The model was developed for the purpose of being used for new and recall patients at dental examinations, but in order to accomplish the project (in terms of time and economic resources), the study had to be designed like this; (4) it would have been preferable to measure if the dental health professionals used MI and the dental fear summary as they were trained to do. However, a reliable assessment of the adherence to the DFCM among the professionals would require some kind of recording (preferably video) at the treatment site and this was difficult to achieve with the present design; and (5) the post-periods I and II questionnaires were not validated. This

is a limitation shared with many questionnaire studies, which is linked to the validity of answers chosen from ready-made alternatives. Judging from the meaningful relationships between answers, we feel confident that the responses were not given haphazardly.

The main focus of the study is on the dentists and dental hygienists that were included in the power calculation, but the effect of all three professional subgroups is interesting. They (the assistants) are important team members (in the DFCM), who seem to develop a more comprehensive view of the patient than do dentists, and (maybe) have more caring and supporting qualities than dentists. Thus, the role of dental assistants during the treatment of fearful patients should not be underestimated. Since the analyses of self-perceived competence in treating fearful patients and estimated numbers of fearful patients did not differ when all three professional subgroups were compared, the dental assistants were included in the statistical analyses of the study.

Most likely, the model would be less time-consuming and more user-friendly if the evaluation part was removed before implementation in clinical practice. The results are interesting, as they suggest that increasing awareness about dental fear without any other intervention than the DFCM training, including training in communication/MI and practical training on how to use the model/role play session, may create positive effects. Therefore, using a simplified DFCM in dental examinations may be favorable with regard to dental fear treatment in the future. Providing time and money to dental fear treatment when necessary may further increase the positive effects of the DFCM.

The qualitative data suggest that dental health professionals find the DFCM beneficial in routine dental care. The model promotes a holistic approach to the treatment of adult patients. However, stress among the professionals was not reduced when measured, neither quantitatively nor qualitatively. It is important to evaluate the model in further studies to make it possible to draw generalizable conclusions.

Note

1. *Ditt valg* was developed at the University of Oslo, the Faculty of Dentistry, Department of Paediatric Dentistry and Behavioural Science, by Erik Skaret and Ivar Espelid, in association with Jesper Lundgren, University of Gothenburg.

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Disclosure statement

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