

Effects of cognitive therapy, applied relaxation and nitrous oxide sedation. A five-year follow-up study of patients treated for dental fear

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Five years after completing a controlled, randomized treatment trial comparing the effect of nitrous oxide sedation (NO), cognitive therapy (CT), and applied relaxation (AR), all 62 patients who had participated were invited to a follow-up questionnaire study. Forty-three responded. All participants had been to the dentist during the follow-up period. Mean scores ($\bar{x}$) on Corah's Dental Anxiety Scale (CDAS) and Symptom Checklist 90 Revised (SCL-90-R, a measure of general psychological distress) were 10.4 (4.1) and 0.35 (0.34), respectively. There were no between-group effects. Significant changes across the assessment phases (at enrollment, after treatment, and 5 years after) were found for both dental fear and general distress (CDAS: $F = 137.8$, $P < 0.01$; SCL-90-R: $F = 12.5$, $P < 0.01$). However, no significant changes between measures obtained after treatment and at follow-up emerged. Seven participants (3 from the NO group, 2 from the CT group, and 2 from the AR group) had CDAS scores above 14, indicating a recurrent or continual dental fear problem. The majority (81%) assessed the dental fear treatment received 5 years previously to have been useful for them. In conclusion, the favorable effects on dental fear and general psychological distress continued at 5-year follow-up for all treatment groups. □ *Attendance; dental anxiety; dental fear; follow-up; treatment*

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Dental fear treatment has been reported to be successful in a number of publications (1–7). Many studies have been conducted in university clinics where psychologists and dentists work together. In a recent review on dental fear treatment, Berggren (8) concluded that optimal care of dental fear patients can best be achieved by cross-disciplinary efforts involving both dentists and psychologists. Generally, however, this is not feasible in dental practice, particularly in rural areas. We have earlier (9, 10) argued that in the search for new treatment methods the following criteria should be fulfilled: The methods should (i) not include expensive equipment, (ii) be relatively brief, (iii) be described in a manual, and (iv) be possible for an interested dentist to perform. Pharmacological sedation (e.g. benzodiazepines, nitrous oxide sedation), relaxation training, and cognitive interventions are all treatment methods which may fulfil these criteria. While all these treatment methods have shown promising results in dental fear treatment (11–19), the methods are not described in manuals and are often based on a cross-disciplinary treatment approach.

In a study conducted by Willumsen and co-workers (9, 10), the efficacy of nitrous oxide sedation (NO), cognitive therapy (CT), and applied relaxation (AR) was investigated in a randomized clinical trial. All patients received 10 treatment sessions given by a trained dentist over a period of 10 weeks. Treatment delivery was closely supervised and monitored by psychologists. The treatment methods were described in treatment manuals, which

included material to guide the therapist regarding for example procedures, techniques, themes, and use of non-specific treatment principles. At enrollment, all patients had evidence of severe dental fear (a score above 14 on the Corah Dental Anxiety Scale), in addition to elevated general distress levels compared with general population norms. As a rule, restorative dental treatment started in the 3rd or 4th session. After the 10th session, all patients were referred to general practitioners near their homes (a total of 12 general practice clinics). Substantial treatment effects on both dental fear and general distress were documented. Importantly, 1 year after treatment the effects were sustained.

However, it is questionable whether dental fear treatment could be characterized as successful before the patients are able to improve their dental status and maintain sound oral health by attending dental services regularly and on a permanent basis. To maintain sound oral health, most dentists recommend that patients have regular check-ups at given intervals; for instance every year.

There are relatively few studies of the long-term effects of dental fear treatment. Hakeberg and co-workers (20) reported that both systematic desensitization and oral premedication with benzodiazepines had positive effects on dental attendance and dental fear 10 years after treatment. Better results were reported for patients who had received systematic desensitization and oral premedication than for patients who had received general

anaesthesia (21). In a 4-year follow-up study, Liddell et al. (22) reported that 70% of a group of dental fear patients still attended regular dental check-ups after group therapy based on relaxation and cognitive restructuring. Finally, Daily (23) reported that 47% were receiving regular dental care 4 years after dental fear treatment. These patients had received desensitization, modelling and semi-hypnotic suggestion.

In view of these results, it was a challenge to explore long-term treatment outcomes in our randomized trial, in which a dentist had performed all psychological interventions in addition to the dental treatment. Thus, the aims were to examine, first, dental fear, general distress, and use of dental services 5 years after treatment, and, second, differences between the three treatment groups.

Study sample and methods

Patients

Sixty-two patients (38 F, 24 M) who had attended the treatment program for dental fear (see 9, 10 for a more detailed description) were invited to participate in a 5-year follow-up questionnaire study. Their mean age at the start of dental fear treatment was 33.4 years (range 17–56), and they had avoided dental treatment for a mean period of 11.7 years (range 1–30).

Questionnaires

Corah's Dental Anxiety Scale (CDAS). This 4-item test instrument, the most often used scale for assessing dental fear (24, 25), measures anticipatory dental fear on a scale ranging from 4 (no fear) to 20 (extreme fear). Scores above 12 and 14 have been proposed as cut-off points for dental fear and very high dental fear/dental phobia, respectively (25).

Kleinkecht's Dental Fear Scale (DFS) is a 20-item test that taps behavioral, physiological, and experiential facets of dental fear. The DFS is considered to have advantages over the CDAS because of its comprehensiveness (26, 27) and the possibility of generating subscales (28). In the present study, the total score, which ranges from 1 (no fear) to 5 (extreme fear), was used.

The Dental Belief Scale (DBS) was used to assess the patient's attitudes to dentists (29). This is a 15-item test with scores ranging from 1 (high trust) to 5 (no trust).

The Symptom Checklist 90 Revised (SCL-90-R) was used to assess emotional distress symptoms (30–32). The SCL-90-R comprises 90 items, each rated on a 5-point scale. The Global Severity Index (GSI), which is the subject's mean score on the instrument, is a widely used global index of distress and was employed in the present study.

Dental health at enrollment in the treatment program was measured using DMFS (decayed, missing and filled dental surfaces) registered clinically in the first session.

Use of dental services after the treatment program was

explored using questions concerning (i) dental treatment attendance and (ii) change of dentist.

Benefits from the treatment program were assessed on a 5-point scale ranging from 1 (very beneficial) to 5 (not beneficial at all).

The impact of treatment on life situation as a whole was explored using a 3-point scale (1 – positive impact on life, 2 – no impact, and 3 – negative impact).

Statistical analyses

Repeated measures analysis of variance (ANOVA) was performed for each measure of dental fear and general distress (CDAS, DFS, DBS, and SCL-90-R) in order to examine (i) time effects, (ii) differences between treatment groups, and (iii) time $\times$ group interaction effects. In these analyses, data from three assessment phases (at enrollment, after treatment, and at follow-up) were used.

As both dental fear and general distress measures displayed skewed distributions, the data were re-analysed using non-parametric tests (Wilcoxon signed-rank test and Kruskal-Wallis test). On the whole, however, the parametric and non-parametric tests yielded highly similar results. Thus, only the results from the parametric tests are presented here. In order to test group differences for measures obtained in the same assessment phase, *t* tests, one-way ANOVA, or the chi-squared test were used. Associations between dental fear measures and general distress were examined using Pearson correlation coefficients.

Results

Response rate

Forty persons returned the questionnaires, and 3 were interviewed by telephone. We did not succeed in reaching the rest of the group. Thus, this follow-up study comprised 43 persons (69.4%), 26 F and 17 M (14 from the NO group, 12 from the CT group; and 17 from the AR group).

Differences between non-respondents and respondents were examined, and the results are summarized in Table 1. As can be seen, non-responders were younger persons with lower initial DMFS and lower CDAS scores after the treatment program. However, they did not differ from the responders with regard to dental fear or general distress at enrollment. Immediately after treatment and 1 year after treatment the non-responders scored significantly lower on CDAS. However, adjusted for CDAS at enrollment the difference was no longer significant. One year after treatment the non-responders scored significantly higher on the DBS. The difference was still present when DBS at enrollment was adjusted for.

Dental fear and general distress

Mean scores on the dental fear and general distress

Table 1. Comparison between respondents and non-respondents

	Respondents <i>n</i> = 43 (38% men)		Non-respondents <i>n</i> = 19 (39% men)		<i>t</i> value
	Mean	<i>s</i>	Mean	<i>s</i>	
Before dental fear treatment:					
Age	35.1	9.2	29.3	10.7	2.21*
Years since last dental treatment	13.1	8.1	8.1	5.8	2.05*
Family income in NOK 1000	299	183	277	172	0.41
DMFS	59.4	27.2	44.6	25.4	2.00*
CDAS	18.3	1.6	17.9	1.7	0.86
DFS	4.1	0.5	4.0	0.5	0.19
DBS	3.0	0.9	3.2	0.6	0.71
SCL-90-R	0.9	0.6	0.7	0.7	1.20
After dental fear treatment:					
CDAS	9.7	2.6	8.0	2.8	2.29*
DFS	2.6	0.9	2.5	0.8	0.71
DBS	1.8	0.8	1.9	0.9	0.15
SCL-90-R	0.5	0.5	0.5	0.5	0.51
One year after dental fear treatment:					
CDAS	9.9	3.7	7.4	2.7	2.56*
DFS	1.8	0.6	1.9	0.8	0.71
DBS	1.6	0.7	2.2	1.0	2.11*
SCL-90-R	0.4	0.5	0.4	0.4	0.39

s = standard deviation.

**P* < 0.05.

measures at the 3 assessment points are presented in Table 2 together with ANOVA results. Complete data were obtained for CDAS, whereas 37 participants had filled in the DFS, 39 the DBS, and 34 the SCL-90-R. Significant time effects indicated a reduction in dental fear and general distress after treatment and at follow-up as compared with initial (enrollment) levels. No significant changes emerged during the period after therapy and at follow-up. To explore differential long-term effects from the 3 treatment methods, between-group differences and time $\times$ group interactions were investigated. However, no such significant effects emerged with regard to the dental fear measures. A group effect on general distress was found. Post hoc tests revealed lower distress level in the NO group as compared with the AR group (data not shown).

No significant correlations between dental fear measures 5 years after treatment and level of general

distress before treatment and 5 years after treatment were found.

Mean general distress and dental fear scores in each treatment group 5 years after the trial are summarized in Table 3. No between-group differences were found for either measure. Adjusted for initial values (time 1) the group effect on the DBS approached significance (*P* = 0.06).

About three-quarters (74.4%) of the participants reported a CDAS score below 13 (78% in the NO group, 58.3% in the CT group, and 82.4% in the AR group). Seven patients (15.9%) had a CDAS score above 14, which is the proposed cut-off score for high dental fear (21.4% in the NO group, 16.7% in the CT group, and 11.8% in the AR group). In addition, these patients scored significantly higher than the rest on the DFS [*T*(35) = 3.2, *P* < 0.05] and the DBS [*T*(37) = 1.82, *P* < 0.05], but not on the SCL-90-R [*T*(32) = 0.90, *P* = 0.32].

Table 2. Mean scores of dental fear and general distress at the start of dental fear treatment (time 1), after treatment (time 2), and at 5-year follow-up (time 3)

	<i>N</i>	Time 1		Time 2		Time 3		F value		<i>T</i> $\times$ <i>G</i>
		Mean	<i>s</i>	Mean	<i>s</i>	Mean	<i>s</i>	<i>T</i>	<i>G</i>	
CDAS	43	18.3	1.6	9.7	2.6	10.4	4.1	126.1*	0.72	0.73
DFS	37	4.1	0.5	2.6	0.9	2.6	0.8	59.6*	0.6	1.2
DBS	39	3.0	0.9	1.8	0.8	1.7	0.9	46.9*	0.2	1.7
SCL-90-R	34	0.9	0.6	0.5	0.5	0.4	0.4	12.5*	4.9*	1.9

s = standard deviation.

T = time effect, *G* = between group (NO, CT and AR) effect, and *T* $\times$ *G* = time $\times$ group interactions.

**P* < 0.05.

Table 3. Dental fear measures 5 years after dental fear treatment

	Nitrous oxide sedation <i>n</i> = 14		Cognitive therapy <i>n</i> = 12		Applied relaxation <i>n</i> = 15		F ANOVA
	Mean	<i>s</i>	Mean	<i>s</i>	Mean	<i>s</i>	
CDAS	10.6	3.9	10.9	4.3	9.9	4.4	0.24
DFS	2.7	0.8	2.8	0.7	2.3	0.9	0.92
DBS	2.0	1.2	1.6	0.7	1.5	0.7	1.20
SCL-90-R	0.3	0.2	0.4	0.4	0.4	0.4	0.26

s = standard deviation.

Dental attendance

All participants reported that they had been to the dentist after they had finished dental fear treatment. Six (46.2%) from the NO group, 3 (23.1%) from the CT group, and 5 (31.5%) from the AR group reported that they had changed dentist once or more often. Seven persons (16.3%) reported that they had cancelled a dental appointment because of fear (29.6% in the NO group, 8.3% in the CT group, and 11.8% in the AR group).

The patients' self-reported use of dental services is presented in Table 4. More than half of the patients (61.9%) had regular controls and were categorized as non-symptomatic users of dental services. The rest (38.1%) reported that they were symptomatic attenders (53.8% in the NO group, 33.3% in the CT group, and 29.4% in the AR group). No significant differences between the treatment groups were found. Compared with the symptomatic users, the non-symptomatic users of dental services scored significantly lower on the CDAS [$T(40) = 2.55$, $P < 0.05$], the DFS [$T(34) = 2.41$, $P < 0.05$], and the DBS [$T(35) = 4.55$, $P < 0.05$].

Other effects of treatment

Concerning their present attitude towards dental treatment, 94.5% of the participants still reported the dental fear treatment 5 years previously as very beneficial or beneficial (92.9% in the NO group, 91.7% in CT group, and all the patients in the AR group). One patient from the NO group and one from the CT group reported no benefit from the treatment program. The patient from the NO group, a woman 21 years of age, started out with a CDAS score of 18 before treatment, 14 after treatment, and 17 five years later. Her SCL-90-R score was 1.3

before treatment and 0.3 and 5 years later. The patient from the CT group was a 22-year-old woman who had a CDAS score of 20 at enrollment, 7 after treatment, and 13 five years later. Her SCL-90-R score changed from 1.8 before treatment to 0.6 five years later.

A large group of the patients (76%) reported that the dental fear treatment 5 years previously had had a positive impact on parts of their lives other than their dental fear (78.6% in the NO group, 75% in the CT group, and 82.2% in the AR group). Nobody reported negative consequences of the treatment. Improved subjective oral health was reported by a majority (75.6%) of the patients (64.4% in the NO group, 80.4% in the CT group, and all the patients in the AR group). On the other hand, 19.5% reported unchanged oral health (21.4% in the NO group, 41.7% in the CT group, and none in the AR group), while 4.9% (2 from the NO group and one from the CT group) reported worse oral health at follow-up.

More than half (57.5%) of the patients reported that they needed dental treatment (71.4% in the NO group, 58.3% in the CT group, and 50% in the AR group). The stated reasons for unfinished dental treatment was (i) 'is in the middle of a treatment plan' (15.9%), (ii) 'could not afford treatment' (29.5%), and (iii) 'was too frightened' (13.6%).

Discussion

Ideally, dental fear treatment studies should provide long-term follow-up data (preferably years after the intervention), although this is infrequent. In the present study, substantial reductions in dental fear and general distress levels after treatment and at 1-year follow-up were demonstrated (10). Importantly, no significant changes

Table 4. Use of dental services during the past 5 years

	Total <i>n</i> = 42		NO <i>n</i> = 13		CT <i>n</i> = 12		AR <i>n</i> = 17	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Have been in a dentist's recall program	21	50.0	5	38.5	7	58.3	9	53.0
Have contacted a dentist for check-ups regularly	5	11.9	1	7.7	1	8.3	3	17.6
Have contacted a dentist when needed for treatment	8	19.0	4	30.8	1	8.3	3	17.6
Have contacted a dentist only when in pain	8	19.0	3	21.3	3	25.0	2	11.8

occurred in the period after therapy and the 5-year follow-up, although some of the patients had regained a high level of dental fear (CDAS > 14). A majority of the patients (74.4%) scored below the cut-off point for dental anxiety (CDAS < 12). In comparison, Aartman et al. (33) reported 11.8% below the cut-off point for patients who had received intravenous sedation, 39.0% after nitrous oxide sedation, and 51.6% after behavioral management.

No significant correlations were found between dental fear measures 5 years after treatment and general distress either before treatment or 5 years after treatment. Thus, all methods were shown to be robust and useful to patients with different levels of general distress. This was supported by the fact that almost all patients still reported benefit from the treatment program 5 years after treatment.

As is well known, there are many methodological problems involved in obtaining and interpreting follow-up data. Certainly, one of the main problems is attrition (34). Usually, the longer the follow-up period, the greater the loss of subjects. Attrition is a problem, because the follow-up data may not represent the true level of functioning that would be achieved if the complete sample was reassessed.

It could be anticipated that individuals with little or no effect from dental fear treatment would not respond to follow-up studies. This was not supported in this study. Moreover, the non-responders of this study did not differ from the responders on dental fear and general distress indices before the trial. However, they were significantly younger, had less time of avoidance, and lower DMFS scores at enrollment. After the trial, and 1 year after treatment, their CDAS scores were significantly lower compared with the responders' scores. Moreover, while the responders' attitudes toward dentists, as reflected in DBS scores, changed favorably the 1st year after the trial, the opposite tendency was observed in the non-responders. The most frequent reasons for non-contact were unknown address or unknown telephone number (28%). This is in accordance with an English study (23) reporting non-contact (29%) for the same reasons. On the whole, responders and non-responders did not differ on essential study variables at enrollment. However, it seems that young individuals who achieve favorable results concerning their dental fear but have negative experiences with interpersonal relationships with dentists are less likely to participate in follow-up studies.

As in our 1-year follow-up, there were no differences between the treatment groups in this study. Such results can be interpreted as indicating that the different types of treatment are equally effective. Yet weak power is an alternative interpretation, because of the reduced sample size. However, while the AR group generally exhibited lower dental fear scores, the group differences with regard to mean CDAS and GSI scores were negligible. On the whole, there was no obvious trend in the data suggesting undetected differences in dental fear and general distress between the groups.

However, other types of evidence suggesting group

differences should be commented on. More participants from the NO group had changed dentist, cancelled dental appointments because of fear, were symptomatic attenders, and had present dental treatment needs than participants from the CT and AR groups. Moreover, fewer from the NO group reported improved subjective oral health at 5-year follow-up. Although not significant, these results may indicate that patients who have received psychological treatment (CT or AR) develop more favourable oral health behaviors after treatment. In future studies, more low-frequent phenomena (such as recurring high dental fear at follow-up) should be investigated using larger treatment groups (see also 35).

A second potential problem relates to non-specific treatment effects. All patients received a 10-week treatment program, one session every week. All participants received education about fear reactions in general and dental fear reactions in particular, and they were educated in dental equipment and dental procedures. The dental team that performed the treatment was instructed to use the same routines concerning pain control, patient control in the treatment situation, and motivation and self-efficacy encouragement. The patients had previously assessed these non-specific factors of treatment to be as important as the specific treatment method (9, 10). Thus, as in psychotherapy research, such common factors may not be trivial in the processes they mobilize in the dental fear patient or in the changes they produce (34). This assumption is supported in the studies by Friedman (36, 37), who achieved a positive treatment outcome from an iatrosedative interview, and Berggren (35) who found motivation to be predictive of successful dental fear treatment. Furthermore, Freeman (38–40) highlights the importance of the patient–dentist relationship, while Kulich (41) addresses the importance of dentist–patient communication. Clearly, the importance of these non-specific factors should be investigated more thoroughly in future research.

The results showed that the non-symptomatic attenders scored significantly lower on dental fear measures than symptomatic attenders, thus confirming the findings of Daily et al. (23), who found that non-symptomatic attenders 4 years after dental fear treatment had a mean CDAS score of 12.0, and the symptomatic attenders a mean score of 17.4. However, the CDAS scores of both symptomatic and non-symptomatic attenders in the present study were lower than the corresponding CDAS scores in the study of Daily et al.

The patients in this study were encouraged to contact the clinic at the Dental Faculty if difficulties with dental treatment arose. Although many of them reported such difficulties (e.g. had changed dentists, cancelled an appointment because of fear, and contacted dental clinics only when they had symptoms), only a few patients had contacted the Dental Faculty. No contact was initiated from the clinic. The relationship between dental attendance and dental anxiety is described in several papers (e.g. 42–44), and it seems clear that avoidance behavior is a risk factor for the development of dental fear. Further

research should address whether some sort of contact (e.g. motivational telephone calls after the trial) would increase dental attendance and thus improve treatment outcome in dental fear programs.

The positive impact on general distress achieved during the trial (45) was maintained and about 75% of the participants reported the dental fear treatment to have had a positive effect on their life situation outside the dental setting. This supports reports from Moore & Hakeberg (21, 46) and highlights the importance of treating dental fear in order to improve patients' general health and life situation.

In conclusion, the results from the present follow-up study show that all three dental fear treatment methods designed for use by dentists seem to have positive effects on both dental fear and general distress 5 years after treatment. Almost all individuals (95%) still reported the treatment program to have been beneficial and three-quarters reported better oral health. The results did not suggest any differential treatment effects concerning dental anxiety or general distress. However, it seems that participants from the two psychological treatment groups achieved a more responsible attitude towards their oral health and dental attendance.

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