

## Variations in Negative Cognitions Concerning Dental Treatment Among Dentally Anxious and Nonanxious Individuals

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*This study investigated the relationship between negative cognitions and dental anxiety in a sample drawn from the general population. Previous work showing that dentally anxious individuals have more negative thoughts concerning dental treatment and are less able to control those thoughts than the nonanxious was confirmed. However, there was variation within dentally anxious and nonanxious groups in the frequency of negative cognitions. Some dentally anxious individuals reported few negative thoughts about dental treatment and some nonanxious individuals reported many. In a series of analyses using scores from seven psychological questionnaires, those with many negative thoughts about dental treatment were more likely to be generally fearful and anxious and had more psychiatric symptoms irrespective of their dental anxiety status. When dentally anxious and nonanxious subjects with the highest negative cognitions scores were compared, the main difference to emerge was that the latter were better able than the former to control their negative thoughts. These results suggest that negative cognitions about dental treatment are influenced by broader psychological factors and that control remains an important mediator between negative thoughts and dental anxiety. They also suggest that negative cognitions play a role in fear evocation and are not simply a component of the anxiety response.*

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**KEY WORDS:** dental anxiety; negative cognitions; control, fears.

### INTRODUCTION

The important role played by cognitive factors in phobias and anxiety disorders is now well established (Beck, 1976; Beck, Emery, & Greenberg, 1985; Lang, 1968; Mizes, Landolf-Fritsche, & Grossman-McKee, 1987; Shafraan, Booth, & Rachman, 1993; Stopa and Clark, 1993). According to the cognitive model of anxiety, these take the form of negative thoughts about the danger or harm associated with various

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fear evoking stimuli (Beck, 1976). The content of these thoughts tends to be similar irrespective of the fear or phobia in question (de Jongh & ter Horst, 1993). In a study of anxious dental patients, for example, de Jongh and ter Horst found that the most common negative cognitions were about losing control, fainting, or having a panic attack. Catastrophic thoughts about treatment, such as pain or the drill slipping, were also frequent.

A number of studies have been conducted which clearly demonstrate that negative cognitions of this type are a significant component of anxiety about dental treatment. In an early study, Wardle (1984) found that expectations of pain were related to dental anxiety, and subsequent studies have confirmed the higher frequency of negative thoughts in dentally anxious as compared to nondentally anxious individuals (de Jongh, Muris, Schoenmakers, & ter Horst, 1995; de Jongh, Muris, ter Horst, & Duyx, 1995; de Jongh, Muris, ter Horst, Van Zuuren, & de Wit, 1994; de Jongh & ter Horst, 1995; Kent & Gibbons, 1987). de Jongh et al. (1994) used a 22-item negative cognitions questionnaire in a study of dental patients with high and low levels of dental anxiety. The former reported a mean of 14.0 negative thoughts and the latter a mean of 4.4. The correlation between the number of negative cognitions and dental anxiety scores was high at .82.

However, a number of studies have indicated that an individual's ability to control or suppress these negative thoughts is also important in determining levels of anxiety. Kent and Gibbons (1987) found that once ability to control was held constant, the association between the number of negative thoughts and dental anxiety scores was no longer significant. Similarly, de Jongh et al. (1994) reported that cognitive control accounted for 71% of the variance in dental anxiety scores, and this rose to 75% when the number of negative cognitions were added to the regression analysis.

In spite of the strengths of current research into cognitive factors and dental anxiety, a number of uncertainties remain. First, many studies used limited samples, such as dental patients or students, and it is not known whether the findings apply to general populations. Second, findings concerning the extent of variation in negative cognitions among dentally anxious and nonanxious individuals are inconsistent. Kent and Gibbons (1987) found that some dentally anxious people had few negative thoughts and some nonanxious individuals had many. These findings were not confirmed by de Jongh et al. (1994), who found that none of their highly anxious subjects reported few negative cognitions and none of the subjects who were not anxious reported many. Third, the issue of cause and effect remains unclear. According to Lang's three systems model of anxiety (Lang, 1968), negative cognitions, along with physiological parameters such as increased heart rate and behavioral patterns such as avoidance, are components of the anxiety response. In Beck's (Beck, 1976) cognitive model, negative thoughts play a major role in fear evocation. That is, negative thinking leads to dysfunctional affect and behavior such as anxiety and avoidance. Butler (1989) has reconciled these opposing views by suggesting a vicious cycle of cause and effect which serves to heighten and maintain psychological distress.

The aims of this paper are as follows: (1) to explore the relationship between negative cognitions and dental anxiety in a general population sample, (2) to assess variations in negative cognitions in dentally anxious and nonanxious individuals, (3)

to determine if there are differences in the psychological characteristics of those with high and low levels of negative thoughts, and (4) to determine if these data cast light on the issue of cause and effect. Given the current state of research into negative cognitions about dental treatment, it was not possible to translate these aims into hypotheses. Consequently, the study should be regarded as primarily exploratory.

## METHODS

### Survey Procedures

The data were collected during the baseline phase of a longitudinal, population-based study of the epidemiology of dental anxiety. The target population for the study was all persons aged 18 years and over living in the City of Etobicoke, one of five municipalities which comprise Metropolitan Toronto. A two-stage random start systematic sampling procedure was used with sampling fractions designed to give a sample of 6360 names and addresses.

Data were collected by means of two mail surveys. Initially, all 6360 named persons were sent a questionnaire on dental anxiety (Locker, Shapiro, & Liddell, 1996a). Subsequently, a 50% subsample of those responding were sent a second questionnaire containing a number of psychological measures.

### Measures

#### *Dental Anxiety*

Corah's Dental Anxiety Scale (DAS; Corah, 1969), the Gatchel Fear Scale (Gatchel FS; Gatchel, 1989), and the single item used by Milgrom, Fiset, Melnick, and Weinstein (1988) were used. Any subject who scored 13 and above on the DAS, who scored 8 or above on the Gatchel FS, or who reported being very afraid or terrified of dental treatment was considered to be dentally anxious. We adopted this approach since each of these measures fails to identify some dentally anxious individuals (Locker, Shapiro, & Liddell, 1996b).

#### *Negative Cognitions and Cognitive Control*

Negative thoughts about dental treatment were assessed using a 13-item scale derived from the work of Kent and Gibbons (1987), de Jongh, Muris, Schoenmakers, & ter Horst, (1995), and de Jongh, Muris, ter Horst, & Dux (1995). Items were selected to reflect the major categories of negative thoughts identified by de Jongh and ter Horst (1993). Participants were asked to indicate which thoughts they have prior to and during dental treatment using a yes/no response format. Cronbach's alpha for this scale was .79, indicating acceptable internal consistency reliability. A negative cognitions score was calculated by a count of positive responses. On the basis of these scores, participants were assigned to one of three

groups: low negative cognitions (scores of 0 to 3), moderate negative cognitions (scores of 4 to 6), and high negative cognitions (scores of 7 to 13). Participants were asked to indicate how well they could control or dismiss these thoughts using a visual analogue scale. This ranged from 0 (*Completely unable to control these thoughts*) to 100 (*Definitely can control these thoughts*).

### *Other Measures*

In order to explore differences between those with high and low negative cognitions scores, a number of other measures were used. These were a four-item Fear of Pain Scale derived from the work of McCracken, Zayfert, and Gross (1992), in which low scores indicate a fear of pain; a 12-item version of the Mutilation Questionnaire (Klorman, Hastings, Weerts, Melamed, & Lang, 1974), which assesses blood and body injury fears; and a 20-item version of the Fear Survey Schedule II (FSS II; Geer, 1966). FSS II items were selected to reflect the following fear subscales—Animals, Agoraphobia, Death and Dying, Social Evaluation, and Social Interaction.

More general anxiety measures included the Anxiety Sensitivity Index (Reiss, Peterson, Gursky, & McNally, 1986), which assesses the fear of fear and the extent to which individuals believe that anxiety itself has negative or catastrophic outcomes; the Emotional Control Questionnaire (Rapee, Craske, & Barlow, 1989), which measures an individual's ability to control his or her emotions and deal with stress; the Spielberger Trait Anxiety Index (Spielberger, Gorsuch, & Luchene, 1983); and the 12-item version of the General Health Questionnaire (Goldberg & Williams, 1988), which measures the frequency of symptoms potentially indicative of psychiatric disturbance. These provided for a broad assessment of the psychological status of those taking part in the study and reflect the fact that dental anxiety has multiple components including a fear of pain, blood and body injury fears, and agoraphobic symptoms (McNeil & Berryman, 1989).

## **Data Analysis**

In analyzing the data, one-way analysis of variance was used to identify differences in means and chi-square tests to identify differences in proportions. The relationships between negative cognitions, control, and dental anxiety were assessed using correlations and linear regression analysis, with the DAS score was used to indicate levels of dental anxiety. A similar analytic approach was used to identify predictors of negative cognitions.

## **RESULTS**

### **Response to the Survey**

The initial questionnaire was completed by 3,055 individuals. This represented 60.4% of the 5,061 people presumed to be alive and living at the listed address.

Of these, 1,420 completed the second psychological questionnaire. This paper is based on the responses of 1,329 participants with no missing data. When compared to the target population, these participants were somewhat older and better educated (Table I).

### Prevalence of Dental Anxiety

Using the procedure described above, 13.6% of participants were classified as dentally anxious. Women were more likely than men to be dentally anxious (17.1% vs. 8.8%;  $p < .001$ ). The mean DAS score of all those completing the questionnaire was 8.2 ( $SD = 3.3$ ).

### Frequency of Negative Cognitions

Overall, 81.8% of participants reported at least one negative cognition and the overall mean was 3.1 ( $SD = 2.8$ ). Dentally anxious individuals reported more negative thoughts than the nonanxious (6.2 vs. 2.7;  $p < .001$ ), and women reported more than men (3.3 vs. 2.9;  $p < .05$ ). The most common thoughts reported were that the dentist would hit a nerve while drilling a tooth, that injections would be painful, that the dentist would be critical of the care taken of the teeth, that a lot of dental treatment would be needed, and that any treatment would be painful (Table II). Although the dentally anxious were significantly more likely to report each of the 13 negative thoughts, the ranking of the thoughts in terms of frequency was broadly similar for both groups.

**Table I.** Characteristics of Study Participants and Target Population

	Study participants ( $n = 1,329$ )	Target population ( $n = 256,390$ )
Sex		
Males	42.5	42.9
Females	57.5	57.1
Age		
18 to 29 years	10.6	22.1
30 to 39 years	19.3	21.1
40 to 49 years	19.3	16.1
50 to 59 years	17.0	14.4
60 to 74 years	27.0	19.6
75 years and over	6.7	6.8
Education		
Less than high school	3.7	11.8
Completed high school	28.1	38.8
Postsecondary	38.9	34.9
University	29.3	15.5

**Table II.** Frequency of Negative Thoughts (%): All Subjects, Dentally Anxious (DA) and Nonanxious (NA) Groups

Negative thoughts	All	DA	NA	<i>p</i> <sup>a</sup>
Something may be seriously wrong with my teeth	35.7	61.8	31.6	< .0001
Any treatment I need will be very painful	34.4	80.4	27.2	< .0001
The dentist will be rough	21.7	47.5	17.8	< .0001
I am going to need a lot of treatment	34.9	67.8	29.9	< .0001
The dentist will be critical of the way I care for my teeth	35.7	47.8	33.7	< .001
If I need to have an injection it will be very painful	38.2	68.9	33.4	< .0001
The dentist will be annoyed if I am nervous	12.0	31.2	9.1	< .0001
The dentist will make sarcastic comments about my teeth	6.5	17.0	4.8	< .0001
When the dentist is drilling a tooth, he/she will hit a nerve at any moment	52.9	79.1	48.7	< .0001
The drill will slip and cut my mouth	14.3	28.4	12.2	< .0001
I will be so nervous that I'll probably faint	4.6	16.7	2.8	< .0001
I'd rather do anything than go to the dentist	24.4	71.3	17.2	< .0001
The dentist won't care about me	6.5	13.2	5.5	< .001

<sup>a</sup>Probabilities of differences between dentally anxious and nonanxious subjects: chi-square test.

### Negative Cognitions, Control, and Dental Anxiety

The correlation between participants' DAS scores and their negative cognitions scores was .60 ( $p < .001$ ). The ability to control thoughts about dental treatment was negatively associated with both the DAS score ( $-.49$ ;  $p < .001$ ) and the negative cognitions score ( $-.49$ ;  $p < .001$ ).

A stepwise linear regression analysis was undertaken to determine the contributions of negative cognitions and the ability to control negative thoughts to dental anxiety. The dependent variable was the DAS score. The negative cognitions score entered the model first, accounting for 36% of the variance in DAS scores. Control contributed another 5%, so that jointly they explained 41% of the variance in dental anxiety.

### Variations in Negative Cognitions

Overall, one in seven participants had a high frequency of negative thoughts about dental treatment (Table III). Although there was a highly statistically significant association between dental anxiety and negative cognitions, there was a degree of variation within among those who were and were not dentally anxious. Table III shows that some dentally anxious individuals (14.4%) had few negative thoughts (0 to 3), while some individuals who were not dentally anxious (8.8%) reported many (7 to 13). Of the 186 individuals with high negative cognitions scores, only 85 or 46% were dentally anxious.

### Association Between Negative Cognitions and Psychological Factors

There was a statistically significant association between the number of negative cognitions reported and scores on the seven psychological measures used (Table IV).

**Table III.** Distribution of Participants According to Negative Cognition Scores (%)<sup>a</sup>

	Low (0 to 3)	Moderate (4 to 6)	High (7 to 13)
All	61.6	24.4	14.0
Dentally anxious	14.4	38.3	47.3
Not dentally anxious	68.9	22.3	8.8

<sup>a</sup>Differences between dentally anxious and not anxious significant:  $p < .0001$ , chi-square test.

**Table IV.** Mean Scores on Psychological Variables for Low, Moderate and High Negative Cognition Groups

	Low (0 to 3)	Moderate (4 to 6)	High (7 to 13)	<i>p</i>
Fear of pain scale <sup>a</sup>	11.3	10.3	9.7	< .0001
Number of other severe fears (FSS II) <sup>b</sup>	1.3	2.0	3.0	< .0001
Mutilation Questionnaire scores	3.1	4.4	5.0	< .0001
Anxiety Sensitivity Index	31.9	35.9	40.3	< .0001
Emotional Control Questionnaire	1.0	1.4	1.8	< .0001
Trait Anxiety Index	3.1	4.6	5.8	< .0001
General Health Questionnaire	0.31	0.46	1.20	< .0001

<sup>a</sup>Low scores indicate more fear of pain.

<sup>b</sup>FSS II = Fear Survey Schedule II.

Those with many negative thoughts were more afraid of pain, had more other severe fears, and had higher levels of blood and body injury fears. They were more sensitive to the effects of anxiety, perceived themselves as less able to control their emotions, were more generally anxious, and reported more symptoms potentially associated with psychiatric disturbance.

When this analysis was repeated separately for dentally anxious and nonanxious groups, the pattern of associations remained the same. That is, those reporting many negative thoughts had significantly higher (or lower) scores on these psychological variables.

A linear regression analysis, using all subjects, with the negative cognitions score as the dependent variable, showed that only four of the seven psychological variables had significant independent effects: fear of pain ( $p < .0001$ ), blood and body injury fears ( $p < .0001$ ), anxiety sensitivity ( $p < .0001$ ) and the number of symptoms on the General Health Questionnaire ( $p < .05$ ). These accounted for 26% of the variance in negative cognitions scores.

### Comparison of Dentally Anxious and Nonanxious Participants with High Negative Cognitions Scores

Of some interest was the fact that, in spite of the close association between negative thoughts and dental anxiety, fewer than half of those with high negative

cognitions scores were dentally anxious. In order to begin to understand this, dentally anxious and nonanxious participants with scores of 7 and above were compared on the seven psychological measures. The only significant difference observed was that the dentally anxious were more afraid of pain, although the magnitude of the difference between the two groups was small (Table V).

However, an important difference did emerge upon further analysis. Those who were not dentally anxious were better able to control or dismiss these thoughts than those who were afraid of dental treatment (scores of 67.7 and 51.4, respectively,  $p < .001$ ). This was also the case for groups with low and moderate levels of negative thoughts; dentally anxious individuals were less able to control or suppress their negative thinking. This confirms the importance of control as a mediator between negative cognitions and dental anxiety.

## DISCUSSION

Although random sampling techniques were used, those taking part in the study tended to be older and better educated than the population from which they were drawn. However, the sample included a wider range of ages and educational levels than many other studies, which have often focused on students.

The results confirm that, in a sample drawn from the general population, the majority had negative thoughts about dental treatment prior to and during a visit to the dentist. These negative thoughts centered around the pain and harm associated with treatment procedures, negative responses on the part of the dentist, and the need for a lot of treatment. In this respect, the study confirms previous work concerning the frequency and content of negative cognitions about dental treatment.

The study also confirmed the close association between negative thoughts and dental anxiety. Dentally anxious participants reported, on average, more than three times the number of negative thoughts than the nonanxious. The correlation between a negative cognitions score and scores on the DAS was .60. The ability to control negative thoughts also emerged as an important factor; it was negatively

**Table V.** Mean Scores on Psychological Variables for Dentally Anxious ( $n = 85$ ) and Nonanxious ( $n = 101$ ) Participants with High Negative Cognitions Scores

	Dentally anxious	Not anxious	<i>p</i>
Fear of pain scale <sup>a</sup>	9.3	10.1	< .001
Number of other severe fears (FSS II) <sup>b</sup>	3.4	2.6	n.s.
Mutilation Questionnaire scores	5.1	5.0	n.s.
Anxiety Sensitivity Index	41.7	39.2	n.s.
Emotional Control Questionnaire	2.0	1.7	n.s.
Trait Anxiety Index	6.4	5.3	n.s.
General Health Questionnaire	1.3	1.1	n.s.

<sup>a</sup>Low scores indicate more fear of pain.

<sup>b</sup>FSS II = Fear Survey Schedule II.

associated with both the frequency of negative cognitions and dental anxiety scores. However, in a regression analysis using stepwise entry procedures, the number of negative cognitions emerged as the most important factor, followed by ability to control. This conflicts with the findings of Kent and Gibbons (1987) and de Jongh et al. (1994), who found control to make the greatest contribution to dental anxiety scores. The percentage of variance explained by these two cognitive factors was lower in this study: 41% compared to 75% as reported by de Jongh et al. (1994). The differences in these findings are difficult to explain but may be accounted for by age differences among those taking part in these studies.

Although negative thinking about dental treatment and dental anxiety are closely associated, the association is far from perfect. Like Kent and Gibbons (1987), we found that some dentally anxious individuals had few negative thoughts while some nonanxious individuals had many. Of some interest was the fact that within both dentally anxious and nonanxious groups, those with many negative cognitions had scores on a number of psychological questionnaires which indicated that they had more other fears and were more generally anxious than those with few. They also had more psychiatric symptoms as indicated by the General Health Questionnaire. This indicates that the frequency of negative cognitions is influenced by broader psychological factors and not simply levels of dental anxiety. The association may be explained by the fact that fear of dental treatment is not simply related to a single stimulus but has a number of components (McNeil & Berryman, 1989). Consequently, those who fear pain, have blood and body injury fears, have agoraphobic symptoms, and, have social evaluation fears are likely to have negative thoughts about each of these dimensions of the dental experience.

Of some interest is the fact that fewer than half of those with high negative cognitions scores were dentally anxious. Participants with high scores who were and were not dentally anxious were very similar in terms of the seven psychological characteristics examined. Where they did differ was with respect to control. Those not fearful of dental treatment were better able to control or suppress their thoughts than those who were fearful.

This relationship between dental anxiety, negative thinking, and control is complex and may reflect the fact that anxiety has an effect on a number of cognitive processes. For example, it has been shown that anxiety affects learning and memory and impairs the rehearsal and storage of task-relevant information (Eysenck, 1985). It has also been shown that anxious individuals are characterized by an attentional bias which favors threat-provoking stimuli (Mathews, May, Mogg, & Eysenck, 1990), thereby creating a vicious cycle of attention and anxiety (Hawton, Salkovskis, Kink, & Clark, 1989). These stimuli, because they provoke worry (Eysenck & Calvo, 1992), can consume processing resources, reduce spare processing capacity, and reduce task performance (Calvo, Eysenck, Ramos, & Jimenez, 1994). If coping with dental treatment is viewed as a task, then the attentional biases and reduced processing efficiency associated with anxiety help to explain why dentally anxious individuals are less able than dentally nonanxious individuals to accomplish the suppression of negative thoughts about dental treatment. This suggests that inability to control negative thoughts is a function of anxiety rather than a mediator between negative thinking and anxiety. From a treatment perspective, helping anxious patients to control, sup-

press, or replace their thoughts about dentists and dental treatment, or providing training in distraction techniques, may break the attention-anxiety cycle and assist them in coping with dental procedures.

Although the study design was not optimal in terms of sorting out issues of cause and effect, the data tend to support the cognitive model of anxiety. Since negative thoughts appear to exist independently of anxiety, this suggests that they precede rather than follow from fear of dental treatment. This is also consistent with Butler's view of a cycle of negative thinking and anxiety (Butler, 1989).

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