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Diagnostic categories of dental anxiety: a population-based study

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Abstract

This study aimed to use a population-based sample to assess the psychological validity of the Seattle system for diagnosing dentally anxious individuals. This system consists of four diagnostic types in which such individuals are categorized according to the main source of their fear regarding dental treatment. Subjects were 1420 randomly selected adults aged 18 years and over who took part in a two-stage mail survey. The questionnaires contained measures of dental anxiety and standardized measures of general anxiety and fearfulness. Allocation to the Seattle categories was based on responses to four diagnostic items. Overall, 16.4% of the sample were dentally anxious. Their distribution across the four Seattle types was as follows: type I (simple conditioned phobia) – 49.6%; type II (fear of catastrophe) – 7.8%; type III (generalized anxiety) – 19.4% and type IV (distrust of dentists) – 9.9%. The remaining 13.3% could not be categorized. Judging by their scores on measures of dental anxiety, these subjects were borderline cases. Scores on the measures of anxiety and fearfulness indicated that the diagnostic system was valid and identified sub-groups of the dentally anxious population which were internally consistent. However, all subjects indicated extreme fear of dental treatment and were broadly similar in terms of their cognitive and behavioral responses to dental care. Of particular interest was the distribution of diagnoses according to age. Younger subjects were more likely to be categorized as type I, while older subjects were more likely to be categorized as type III. Overall, the results indicate that dental anxiety is a complex fear with a number of components. © 1998 Elsevier Science Ltd. All rights reserved.

Keywords: Dental anxiety; Etiology; Diagnostic categories; Psychological characteristics

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1. Introduction

Dentally anxious individuals are not a homogenous group but differ in terms of the origins, age of onset and manifestations of their fears of dental treatment (Milgrom et al., 1985; Locker et al., 1997). In terms of etiology, dental anxiety has been attributed to traumatic or painful dental experiences, especially in childhood (Lautch, 1971; Bernstein et al., 1979; Ost and Hugdahl, 1985; Milgrom et al., 1988) and fearful attitudes learned from dentally anxious family members (Shoben and Borland, 1954; Berggren and Meynert, 1984). It has also been linked to general anxiety syndromes and other phobias (Gale, 1972). For example, Fiset et al. (1989) found that 22.4% of a population-based sample of dentally anxious subjects had two or more other severe fears and McNeil and Berryman (1989) found that fear of pain, closed spaces and mutilation were linked to dental anxiety. Consequently, debate exists over whether dental anxiety is a simple conditioned fear or a component of other mood or anxiety disorders. Weiner and Sheehan (1990) referred to these two types of dental anxiety as exogenous and endogenous.

Based on their extensive clinical experience, Milgrom et al. (1985) proposed a more elaborate classification system reflecting both the origins and the main sources of fear about dentistry. Usually known as the Seattle system, it consists of four diagnostic types: (I) simple conditioned fear of specific dental stimuli; (II) anxiety about somatic reactions during dental treatment; (III) patients with generalized anxiety states and multiphobic symptoms; (IV) distrust of dental personnel. Although originally a pragmatic classification, some data have been presented to indicate that the system is psychologically valid and identifies sub-types of dental anxiety.

Moore et al. (1991) evaluated the Seattle system using data from subjects being treated at a Dental Phobia Research and Treatment Center. On the basis of in-depth interviews and standardized psychological measures, 80 subjects with a mean dental anxiety scale (Corah, 1969) score of 18.1 were allocated to diagnostic categories as follows: type I – 19%; type II – 7%; type III – 28%; type IV – 46%. Type IV subjects were further split into three sub-categories depending upon the way in which their fear was acquired. These categories seemed to meet the three criteria of distinct uniqueness, internal consistency and distinct response to treatment type as suggested by Sheehan and Sheehan (1983) for distinguishing sub-types of phobic disorder. This modified Seattle system was also presented in terms of each category's DSM-III-R equivalents.

Broadly similar results were reported by Roy-Byrne et al. (1994). In a study of 73 patients attending a Dental Fears Research Clinic, 60% met current DSM-III-R criteria for simple phobia. The remainder has Axis I diagnoses, predominantly mood and anxiety disorders. Using the Seattle system, 29% had type I dental anxiety, 14% type II, 29% type III and 28% type IV. However, Roy-Byrne et al. (1994) found no evidence that the categories comprising the Seattle system corresponded to the DSM-III-R diagnoses proposed by Moore et al. (1991). They suggest that schemes which classify dentally anxious subjects are distinct from psychiatric diagnostic systems.

The two studies which have evaluated the Seattle diagnostic system have been undertaken using self-referred subjects attending treatment facilities for dental anxiety. The dental anxiety scale (Corah, 1969) and dental fear survey (Kleinknecht et al., 1973) scores of these patients indicated that they were at the upper end of the distribution in terms of fear of dental

treatment. Whether or not their findings can be generalized to all dentally anxious individuals, both treated and untreated, is not known. Moreover, neither explored the extent to which the diagnostic categories may overlap. Consequently, we undertook a population-based study of dental anxiety which had the following aims: (1) to estimate the prevalence of the four diagnostic types comprising the Seattle system in a sample drawn from the general population; (2) to provide further evidence of the psychological validity of the classification; (3) to determine whether this system is a categorical or dimensional classification and (4) to describe the psychological and response characteristics of dentally anxious subjects in each category.

2. Methods

2.1. Survey procedures

The data were collected as part of a population-based study of the epidemiology and psychology of dental anxiety in adults (Locker et al., 1996a). 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 comprised Metropolitan Toronto. Using the Electoral Register as a sampling frame, a two-stage random start systematic sampling procedure was used to select a sample of 6360 subjects.

Data were collected by means of two mail surveys. Initially, all 6360 subjects were sent a questionnaire which included measures of dental anxiety. Subsequently, a 60% sub-sample of those responding were sent a second questionnaire containing a number of psychological measures and a set of questions which allowed dentally anxious subjects to be assigned to a diagnostic category. The questionnaires also included questions pertaining to fear evoking stimuli and physiological, behavioral and cognitive responses to dental treatment.

2.2. Measures

2.2.1. Dental anxiety

Dental anxiety was measured using Corah's Dental Anxiety Scale (DAS) (Corah, 1969), the Gatchel Fear Scale (Gatchel, 1989) and the single item used by Milgrom et al. (1988). The DAS is a four item scale giving rise to scores of 4 to 20. The Gatchel Fear Scale consists of a single item in which Ss are asked to rate their fear of dental treatment on a scale from 0 (no fear) to 10 (extreme fear). The Milgrom et al. item asks Ss to rate their fear of dental treatment using the following categories: not at all afraid, a little afraid, somewhat afraid, very afraid and terrified. Any subject who scored 12 and above on the DAS, 8 or above on the Gatchel FS or reported being very afraid or terrified of dental treatment were considered to be dentally anxious (Locker et al., 1996a). A DAS score of 12 was used in this classification because it represented one standard deviation above the mean.

2.2.2. Diagnostic classification

In order to assign dentally anxious subjects to one of the four Seattle categories, they were asked to indicate the extent to which each of the following questions applied to them: (1) I am

afraid of things that dentists do such as injections or having my teeth drilled (type I); (2) I am afraid of fainting or having a panic attack or a heart attack while having dental treatment (type II); (3) in general, I am a nervous person (type III); (4) I am anxious about dental care because I don't trust dentists (type IV). The response options and their numerical scores were: not at all (score 1); a little (score 2); somewhat (score 3); much (score 4) and very much (score 5).

2.2.3. General anxiety and fearfulness

These were measured using the following scales: a 20-item version of the fear survey schedule II (FSS II) (Geer, 1966); the Spielberger trait anxiety index (STAI) (Spielberger et al., 1983); the anxiety sensitivity index (ASI) (Reiss et al., 1986) which assesses the fear of fear; the emotional control questionnaire (ECQ) (Rapee et al., 1989) which measures the extent to which subjects believe they can control their emotional responses to stressful situations, and the 12-item version of the general health questionnaire (GHQ) (Goldberg and Williams, 1988) which measures the frequency of symptoms potentially indicative of psychiatric disturbance. Also included were two scales which address more specific fears; a 12-item version of the mutilation questionnaire (MQ) (Klorman et al., 1974) which measures blood and body injury fears, and a four-item fear of pain scale (FPS) derived from McCracken et al. (1992) in which low scores indicate more fear of pain.

2.2.4. Fear evoking stimuli

The dental fear survey (DFS) (Kleinknecht et al., 1973) was used to assess the extent of anxiety evoked by nine invasive and five non-invasive stimuli in the dental setting. The items were measured on a six point scale ranging from 1 (not at all) to 6 (very much). A score was created by counting the number of stimuli which caused high levels of anxiety as indicated by response options 5 and 6.

2.2.5. Responses to dental treatment

Physiological responses to dental treatment, such as increases in breathing rate, increased heart rate and feeling nauseous, were also assessed using items from the DFS. These were measured on the same six point scale as the items referring to dental stimuli. The responses to the six items were summed to produce a physiological reactions scale (PRS). Behavioral responses to dental anxiety were assessed using questions concerning the avoidance of dental care, canceling appointments and failing to show up because of anxiety about dental treatment. Cognitive responses were measured using a negative cognitions scale (NCS). This consisted of 13 items concerning the negative thoughts subjects had prior to and during dental treatment (Kent and Gibbons, 1987; Locker et al., 1996b). The dental beliefs survey (DBS) (Milgrom et al., 1985) was used to assess Ss perceptions of four components of the dentist–patient relationship that have a bearing on dental anxiety; namely, communication, belittlement, lack of control and trust.

2.3. Analytic procedures

The following analytic steps were undertaken. First, the four items used to assign dentally anxious subjects to a diagnostic category were validated by testing these hypotheses:

(1) responses on the item dealing with fear of specific dental procedures will be positively associated with scores on the fear of pain scale and scores on the evoking stimuli scale derived from the DFS;

(2) responses on the item referring to fainting, panic and heart attack will be positively associated with scores on the physiological reactions scale derived from the DFS, the anxiety sensitivity index and the emotional control questionnaire;

(3) responses on the item dealing with general anxiety will be positively associated with the number of severe fears reported on the FSS II, scores on the Spielberger trait anxiety index and the number of symptoms reported on the general health questionnaire;

(4) responses on the item referring to distrust of dentists will be positively associated with scores on the dental beliefs survey and the number of social evaluation and social interaction fears from the fear survey schedule II.

Second, subjects were assigned to a Seattle diagnostic category according to the diagnostic item which received the highest score. In the case of ties, a set of decision rules were used to determine which diagnostic category applied. The percentage of dentally anxious subjects falling into each category was then determined. Third, the extent of overlap in diagnostic categories was assessed by determining the percentage of subjects in each diagnostic type who had high scores on one or more of the remaining three diagnostic items. Finally, chi-square tests and oneway analysis of variance were used to compare the psychological and behavioral characteristics of subjects in each diagnostic type with the non-anxious subjects who comprised a normative reference group. This is a standard epidemiological approach in which Ss with a given condition (cases) are compared with Ss without the condition (controls). Multiple group comparisons were undertaken using the Tukey procedure.

3. Results

3.1. Response

The initial questionnaire was completed by 3055 Ss or 60.4% of the 5061 individuals presumed to be alive and living at the listed address. Of these, 1420 completed the second questionnaire. The mean DAS scores of those returning the initial questionnaire and those returning the second questionnaire were identical. This paper is based on the responses of the 1420 subjects who completed both. Census data indicated that, when compared to the target population, they were somewhat older and better educated.

3.2. Prevalence of diagnostic types

Using the definition cited above, 16.4% ($n = 233$) of subjects were judged to be dentally anxious. Their mean (SD) DAS score was 13.8 (2.8). The responses of these Ss to the four

Table 1
Percent distribution of dentally anxious subjects on the four diagnostic items ($n = 233$)

Diagnostic item	Not at all	A little	Somewhat	Much	Very much
(1) Fear of dental procedures	4.3	16.5	24.2	26.0	29.0
(2) Fear of fainting, panic, heart attack	59.9	18.5	13.4	6.0	2.2
(3) Nervous person in general	21.2	39.0	25.1	8.2	6.5
(4) Distrust of dentists	45.2	28.1	18.9	3.5	29.0

diagnostic items are shown in Table 1. Table 2 shows the associations between responses to the four diagnostic items and scores on selected psychological measures. All hypotheses pertaining to these diagnostic items were confirmed (Table 2). For example, diagnostic item 1, referring to fear of dental procedures, was the only one of the four associated with scores on the fear of pain scale and the number of fear evoking stimuli. Similarly, diagnostic item 3, referring to general anxiety, was the only item associated with the number of severe fears, trait anxiety and psychiatric symptomatology as measured by the GHQ. As predicted these associations were linear. Ss who responded 'not at all', 'a little', 'somewhat', 'much' and 'very much' to the item concerning general anxiety had the following scores on the FSS-II: 1.4, 1.8, 2.9, 4.5, 8.2 ($p < 0.0001$). Their scores on the STAI were: 2.6, 4.1, 6.3, 8.6, 10.9 respectively ($p < 0.0001$). Consequently, Ss self-reports regarding the basis of their dental anxiety appeared to be valid and provide a reasonable basis on which to assign them to diagnostic groups.

The distribution of the 233 dentally anxious Ss according to the Seattle diagnostic system is shown in Table 3, along with the mean DAS score for each group. Just over one tenth ($n = 31$) of subjects could not be classified according to the Seattle system and have been labelled 'indeterminate'. All responded 'not at all' or 'a little' to all four diagnostic items. Their mean (SD) DAS score of 11.5 (3.1) suggests that they were borderline dentally anxious.

Table 2
Statistical significance of associations between the diagnostic items and selected psychological measures among dentally anxious subjects

Psychological scale	Item 1	Item 2	Item 3	Item 4
Fear of pain scale	$p < 0.05$	ns	ns	ns
Number of evoking stimuli	$p < 0.0001$	ns	ns	< 0.001
Physiological reactions scale	< 0.001	$p < 0.0001$	ns	ns
Anxiety sensitivity index	ns	$p < 0.0001$	< 0.001	ns
Emotional control questionnaire	ns	$p < 0.01$	ns	< 0.001
Fear survey schedule II	ns	ns	$p < 0.0001$	ns
Speilberger trait anxiety index	ns	ns	$p < 0.0001$	ns
General Health Questionnaire	< 0.01	ns	$p < 0.0001$	< 0.0001
Dental belief survey	ns	ns	ns	$p < 0.0001$
Social evaluation/interaction fears	ns	ns	< 0.001	$p < 0.05$

Item 1: fear of dental procedures; item 2: fear of fainting, panic, heart attack; item 3: nervous person in general; item 4: distrust of dentists.

All p values obtained from oneway analysis of variance.

Table 3
Distribution of dentally anxious subjects across diagnostic categories and mean DAS score per category

Diagnostic category	Percent	Mean DAS (SD) score
Type I	49.6	14.0 (2.6)
Type II	7.8	14.1 (3.5)
Type III	19.4	13.8 (2.4)
Type IV	9.9	15.0 (2.6)
Indeterminate	13.4	11.5 (3.1)

However, this was significantly higher than the mean (SD) DAS score of the non-anxious which was only 7.1 (2.0) ($p < 0.001$; t -test). If this indeterminate group is excluded then the distribution of dentally anxious subjects across the four diagnostic groups is as follows: type I – 56.9%; type II – 9.4%; type III – 22.3%; type IV – 11.4%. There were no significant differences between these groups in DAS scores.

There were no differences in the distribution of diagnostic types by gender. However, there were significant differences by age (Table 4). Among those aged 18–29 years, 51.6% had simple conditioned phobia (type I). None were generally anxious (type III) but 25.0% were distrustful of dental personnel (type IV). The proportion with simple conditioned phobia declined with age while the proportion with general anxiety increased with age. Among those aged 70 years and over, 35.7% were of type III.

3.3. Overlap of diagnostic categories

Although subjects were classified according to their main reason for being dentally anxious, there was a degree of overlap in the four categories; 27.6% responded ‘much’ or ‘very much’ to two or more of the four diagnostic items. Subjects in type I (simple conditioned phobia) constituted a relatively homogenous group and no had high scores on the remaining three diagnostic items. For subjects in type III (generalized anxiety), 31.1% had high scores on one other diagnostic item, although this was invariably the one referring to fear of dental procedures. Types II (fear of catastrophe) and IV (distrust of dentists) were the most complex of all; 67.5% and 60.9% respectively had high scores on one or more of the other diagnostic items. For type II subjects, 52.7% had high fear of dental procedures, 42.1% reported generalized anxiety and 8.7% were distrustful of dentists. For those in type IV, 54.6% had

Table 4
Distribution of dental anxiety categories by age group (%)

Age group	Diagnostic category				
	type I	type II	type III	type IV	indeterminate
18–29 years	51.6	12.9	0.0	25.0	9.7
30–49 years	56.4	8.9	17.8	7.9	8.9
50–69 years	46.3	6.3	23.8	6.3	17.5
70 years or over	28.6	7.1	35.7	14.3	14.3

$p < 0.05$: chi-square test.

high fear of dental procedures, 14.4% reported being generally anxious and 5.3% were fearful of catastrophe while in the dental chair.

3.4. Psychological and response characteristics of diagnostic types

Table 5 shows the mean scores of study subjects on the five measures pertaining to general anxiety and fearfulness (FSS-II, STAI, ASI, ECQ, GHQ, FPS, MQ) and the two measures of specific fears (FPS, MQ), while Table 6 shows their mean scores on three other measures. In order to simplify the interpretation of group differences, the scores of each diagnostic group were compared with those of the normative reference group. Because of the number of statistical tests undertaken, multiple comparison tests with Tukey's procedure, were used to minimize the occurrence of type I errors. The results of the analyses are summarized in Table 7. Cells containing asterisks indicate statistically significant differences between groups while cells with double asterisks indicate which diagnostic group had the most extreme score on each of the measures.

The data in Tables 5–7 suggest that subjects in type I (simple conditioned fear) were similar to the normative reference population with respect to general anxiety and fearfulness. They differed on one measure only, the anxiety sensitivity index (ASI). However, they reported more fear of pain and more blood and body injury fears.

Subjects in type II (fear of catastrophe) were similar to the normative reference population in terms of general anxiety (STAI) and symptoms potentially indicative of psychiatric disorder (GHQ). However, they did appear to be multi-phobic; they had the highest number of other severe fears (FSS-II), the most extreme score on the anxiety sensitivity index (ASI), indicating a fear of fear, and the most extreme score on the mutilation questionnaire, indicating more severe blood and body-injury fears. They also had a noticeably higher score on the physiological response scale than the other four diagnostic groups and the normative reference group.

Types III (generally anxious) and IV (distrust of dentists) were broadly similar and differed from the normative reference group on almost all measures. In this regard, they appeared to be

Table 5
Mean scores on general and specific measures of anxiety and fearfulness by diagnostic category

Scale	Diagnostic category					
	type I	type II	type III	type IV	indeterminate	not anxious
FSS II	1.8	5.5	3.4	3.7	1.5	1.5
STAI	4.0	5.2	7.9	7.2	3.6	3.7
ASI	37.0	46.1	42.2	39.8	34.1	33.3
ECQ	0.31	0.78	0.82	1.34	0.58	0.32
GHQ	0.6	1.1	0.9	2.0	0.2	0.4
FPS	9.5	10.3	9.5	9.3	9.9	11.0
MQ	4.9	5.9	5.5	4.9	3.3	3.4

FSS II: fear survey schedule II; STA: Spielberger trait anxiety index; ASI: anxiety sensitivity index; EMQ: emotional control questionnaire; GHQ: general health questionnaire; FPS: fear of pain scale; MQ: mutilation questionnaire.

Table 6
Mean scores on other measures by diagnostic category

Scale	Diagnostic category					
	type I	type II	type III	type IV	indeterminate	not anxious
PRS	13.4	17.0	13.4	15.6	10.6	7.5
DBS	5.1	3.2	5.4	7.7	2.8	2.1
NCS	5.7	5.2	5.7	5.9	3.5	2.2

PRS: physiological response scale; DBS: dental beliefs scale; NCS: negative cognitions scale.

both multiphobic and generally anxious. Type III had the most extreme score on the Spielberger trait anxiety index (STAI), while type IV had the most extreme scores on the emotional control questionnaire (ECQ) and the general health questionnaire (GHQ). Type IV was the only diagnostic category which differed from the reference group in terms of GHQ scores. Type IV also had the most extreme score on the dental belief scale (DBS) indicating a rather profound distrust of and negative orientation to dentists.

Dentally anxious subjects who could not be assigned to a diagnostic category differed from the normative group on the fear of pain scale only. However, in common with other dentally anxious subjects they were more likely than the normative group to respond physiologically to dental treatment, had more negative thoughts concerning this treatment and were more distrustful of dentists.

Table 7
Comparison of mean scores: Diagnostic types versus normative reference group

Scale:	Diagnostic category				
	type I	type II	type III	type IV	indeterminate
FSS II		**	*	*	
STAI			**	*	
ASI	*	**	*	*	
ECQ			*	**	
GHQ				**	
FPS	*		*	**	*
MQ	*	**	*	*	
PRS	*	**	*	*	*
DBS	*		*	**	*
NCS	*	*	*	**	*

*, ** Differences between groups $p < 0.05$, multiple comparison tests. ** Identifies group with most extreme score.
FSS II: fear survey schedule II; STA: Spielberger trait anxiety index; ASI: anxiety sensitivity index; EMQ: emotional control questionnaire; GHQ: general health questionnaire; FPS: fear of pain scale; MQ: mutilation questionnaire; PRS: physiological response scale; DBS: dental beliefs scale; NCS: negative cognitions scale.

3.5. Evoking stimuli

There were no differences between the subjects in diagnostic types I–IV in the mean number of dental stimuli (7.8, 7.9, 7.1 and 8.8, respectively) which provoked high levels of fear and anxiety. However, when invasive and non-invasive stimuli were examined separately, one difference did emerge. Subjects in type IV (distrust of dentists) reported being more likely to experience anxiety associated with non-invasive stimuli such as making a dental appointment, approaching the dental office, sitting in the waiting room and sitting in the dental chair, than subjects in type I (simple conditioned phobia) ($p < 0.05$).

The mean number of evoking stimuli causing distress among dentally anxious subjects who could not be categorized was 4.4. This was significantly lower than the means for types I–IV ($p < 0.05$) but significantly higher than the mean of 1.4 ($p < 0.05$) reported by non-dentally anxious subjects.

3.6. Avoidance of dental care

There were no significant differences among diagnostic types I–IV in the proportions reporting avoiding dental care because of fear and anxiety (81.6%, 76.5%, 74.4%, 95.2% respectively; NS: chi-square test). Ss in the indeterminate category were less likely to report such avoidance (60.0%) than those diagnosed as types I–IV ($p < 0.05$: chi-square test), but more likely than Ss who were not dentally anxious (20.7%) to refrain from seeking dental treatment ($p < 0.0001$: chi-square test).

4. Discussion

In this population-based study of dental anxiety, 16.3% of participating Ss were classified as being dentally anxious. Their mean DAS score was 13.8. Using self-reports they were classified according to the Seattle diagnostic system which consists of four sub-groups. The distribution of the dentally anxious Ss across the four diagnostic types was quite different from that found in two studies of Ss who had sought treatment for their dental fears. Moore et al. (1991) and Roy-Byrne et al. (1994) reported that 19% and 29%, respectively, of the Ss they studied had type I dental anxiety. In this study it approached 50%. Moreover, 13.4% of our subjects could not be classified according to the Seattle system, probably because they were borderline cases. A comparison of DAS and DFS scores of Ss participating in the three studies indicate that, as expected, the clinical populations assessed by Moore et al. (1991) and Roy-Byrne et al. (1994) were much more severe in terms of their fears of dental treatment than the Ss included here. Almost half of the group assessed by Moore et al. (1991) were classified as type IV. In the study reported here, the type IV subjects had the highest DAS scores. However, all three studies were similar in the proportions of Ss classified as types II and III.

The scores of the dentally anxious Ss on a number of measures of anxiety and fearfulness support both the simple dichotomous classification suggested by Weiner and Sheehan (1990) and the more complex Seattle system proposed by Milgrom et al. (1985).

Ss in type I (simple conditioned fear) fall into the exogenous group suggested by Weiner and Sheehan (1990). Their main problem is fear of dental procedures, probably arising as a result of various forms of conditioning, which is not complicated by multiple phobias of general anxiety states. The only measure which distinguished them from the non-anxious reference group was the anxiety sensitivity index. However, in common with other diagnostic types, they reported more fear of pain and more blood and body injury fears than those who were not anxious. Types II to IV were broadly similar in that they were all characterized by multiple fears and/or general anxiety. In this regard, they all fall into the endogenous class described by Weiner and Sheehan (1990). These two broad groupings overlap to the extent that all Ss in types I to IV reported high levels of fear about dental procedures. It was also the case that all four diagnostic groupings showed broadly similar response patterns to dental treatment in terms of physiological arousal, negative cognitions and avoidance behaviors.

Although there were similarities between types I–IV in terms of their psychological characteristics and their cognitive and behavioral responses, the data presented here suggests that they meet two of the three criteria indicated by Sheehan and Sheehan (1983), distinct uniqueness and internal consistency, for identifying different phobias. In this regard the findings testify to the validity of the Seattle system and suggest that it is a more refined version of the dichotomous classification presented by Weiner and Sheehan (1990).

For example, as previously indicated, type I constituted a relatively homogenous category characterized by a profound aversion to dental procedures. Type II Ss were multiphobic but not generally anxious. They had significant blood and body injury fears and showed the most extreme physiological response to dental care. Previous studies of mutilation phobias have indicated that they are associated with marked physiological reactions to blood and body injury stimuli in the form of diphasic cardio-vascular responses and fainting (Ost and Hugdahl, 1985; Kleinknecht and Lenz, 1989). The type III category was characterized by multiple fears and general anxiety states and Ss were distinguished by their extreme scores on the Spielberger trait anxiety index. Type IV was the most complex of the diagnostic classifications. Ss in this category were had multiple fears, general anxiety and were the only group to have scores on the general health questionnaire indicating symptoms potentially indicative of psychiatric disorders. They were characterized by a social phobia manifesting as negative attitudes towards and a marked distrust of dentists. Consequently, even though groups II–IV were similar in most respects, they were sufficiently different to warrant being designated as diagnostic sub-types.

However, since we did not collect data using clinical interviews we cannot resolve the issue of whether the Seattle system can be interpreted in terms of DSM-III-R equivalents or whether it constitutes a separate classificatory scheme.

In contrast to the studies by Moore et al. (1991) and Roy-Byrne et al. (1994), we also identified a group of Ss who could not be classified according to the Seattle system, largely because their DAS scores were on the borderline between the dentally anxious and non-anxious. However, they were distinct from the non-anxious in terms of their fear of pain and their aversion to dental procedures associated with pain. They were also different from the non-anxious in terms of their responses to dental treatment and, in spite of their equivocal DAS scores, should be considered to be dentally anxious Ss. This issue arises in population-based studies which sample from the continuum of dental anxiety but not in clinical studies

whose Ss are usually self-referred individuals at the upper end of the continuum. These Ss are important from a dental practice point of view since they may be regarded as ‘goers but haters’ who will present for dental treatment.

One interesting finding with respect to these Seattle diagnostic categories was their distribution with regard to age. The oldest Ss were less likely to be categorized as type I and more likely to be categorized as type III than the youngest Ss. While this could be explained by cohort effects, it is also consistent with the view that those with a simple conditioned phobia recover over time, while those whose anxiety is complicated by multiple phobias or anxiety states do not. This issue can only be resolved by longitudinal studies of dental anxiety in adulthood. In the only such study reported to date, Locker and Liddell (1995) found considerable stability in the DAS scores of Ss aged 50 years and over studied over a three year period. By comparison, a similar study of adolescents (Thomson et al., 1997) found considerable change in DAS scores between the ages of 15 and 18 years.

Our data also support the work of McNeil and Berryman (1989) indicating that for many individuals dental anxiety is a complex fear with multiple components. Although usually categorized as a specific phobia along with fears such as those of animals and flying, it appears to be distinct in that the situation feared is a multi-dimensional experience, many aspects of which may be a cause of anxiety. This is explicitly recognized in the Seattle diagnostic system which was the first to indicate the multi-faceted nature of dental anxiety. It also imposed a degree of coherence on previous research which indicated that conditioning experiences, fears and expectations of pain, family influences and social phobias all contributed to dental anxiety.

Although the Seattle system is valid from a psychological point of view it is a useful clinical tool. As Moore et al. (1991) have indicated, different diagnostic categories require different treatment strategies. While relaxation and desensitization were effective with the simple conditioned phobias, the more complex diagnostic types required psychotherapy. Whether or not a dentist is able to manage dentally anxious patients without recourse to psychological intervention will be determined by the category into which a patient falls. Consequently, it is imperative that dentists not only identify which patients are anxious and the severity of their anxiety, but are also able to assign them to a Seattle category. The four diagnostic items used in this study may be one way in which they can do this simply and efficiently.

References

- Berggren, U., & Meynert, G. (1984). Dental fear and avoidance – causes, symptoms and consequences. *Journal of the American Dental Association*, *109*, 247–251.
- Bernstein, D., Kleinknecht, R., & Alexander, L. (1979). Antecedents of dental fear. *Journal of Public Health Dentistry*, *34*, 113–124.
- Corah, N. (1969). Development of a dental anxiety scale. *Journal of Dental Research*, *48*, 596.
- Gatchel, R. (1989). The prevalence of dental fear and avoidance: expanded adult and recent adolescent surveys. *Journal of the American Dental Association*, *118*, 591–593.
- Fiset, L., Milgrom, P., Weinstein, P., & Melnick, S. (1989). Common fears and their relationship to dental fear and utilization of the dentist. *Anaesthesia Progress*, *36*, 258–264.
- Gale, E. (1972). Fears of the dental situation. *Journal of Dental Research*, *51*, 964–966.
- Geer, R. (1966). Development of a scale to measure fear. *Behaviour Research and Therapy*, *3*, 45–53.
- Goldberg, D., & Williams, P. (1988). *A User's Guide to the General Health Questionnaire*. Windsor: NFER-Nelson.
- Kent, G., & Gibbons, R. (1987). Self-efficacy and the control of anxious cognitions. *Journal of Behaviour Therapy and Experimental Psychology*, *18*, 33–40.

- Kleinknecht, R., Klepac, R., & Alexander, L. (1973). Origins and characteristics of fear of dentistry. *Journal of the American Dental Association*, 86, 842–848.
- Kleinknecht, R., & Lenz, J. (1989). Blood/injury fears, fainting and avoidance of medically-related situation: a family correspondence study. *Behaviour Research and Therapy*, 27, 537–547.
- Klorman, R., Hastings, J., Weerts, T., Melamed, B., & Lang, P. (1974). Psychometric description of some specific-fear questionnaires. *Behavior Therapy*, 5, 401–409.
- Lautch, H. (1971). Dental phobia. *British Journal of Psychiatry*, 119, 151–158.
- Locker, D., & Liddell, A. (1995). Stability of Dental Anxiety Scale scores: a longitudinal study of older adults. *Community Dentistry and Oral Epidemiology*, 23, 261–269.
- Locker, D., Shapiro, D., & Liddell, A. (1996a). Who is dentally anxious? Concordance among measures of dental anxiety. *Community Dentistry and Oral Epidemiology*, 24, 346–350.
- Locker, D., Shapiro, D., & Liddell, A. (1996b). Negative dental experiences and their relationship to dental anxiety. *Community Dental Health*, 13, 86–92.
- Locker, D., Shapiro, A., & Liddell, A. (1997). Overlap between dental anxiety and blood–injury fears: Psychological characteristics and avoidance of dental care. *Behaviour Research and Therapy*, 35, 583–590.
- McCraken, L., Zayfert, C., & Gross, R. (1992). The Pain Anxiety Symptoms Scale: development and validation of a scale to measure fear of pain. *Pain*, 50, 67–73.
- McNeil, D., & Berryman, M. (1989). Components of dental fear in adults. *Behaviour Research and Therapy*, 27, 233–236.
- Milgrom, P., Weinstein, P., Kleinknecht, R., & Getz, T. (1985). *Treating Fearful Dental Patients*. Reston, VA: Reston Publishing Co.
- Milgrom, P., Fiset, L., Melnick, S., & Weinstein, P. (1988). The prevalence and practice management consequences of dental fear in a major US city. *Journal of the American Dental Association*, 116, 641–647.
- Moore, R., Brodsgaard, I., & Birn, H. (1991). Manifestations, acquisition and diagnostic categories of dental fear in a self-referred population. *Behaviour Research and Therapy*, 29, 51–60.
- Ost, L., & Hugdahl, K. (1985). Acquisition of blood and dental phobia and anxiety response patterns in clinical patients. *Behaviour Research and Therapy*, 23, 27–34.
- Rapee, R., Craske, M., & Barlow, D. (1989). The emotional control questionnaire. Paper presented at AABT, Washington, November, 1989.
- Reiss, S., Peterson, R., Gursky, D., & McNally, R. (1986). Anxiety sensitivity, anxiety frequency and the prediction of fearfulness. *Behaviour Research and Therapy*, 24, 1–8.
- Roy-Byrne, P., Milgrom, P., Khoon-Mei, T., Weinstein, P., & Katon, W. (1994). Psychopathology and psychiatric diagnosis in subjects with dental phobia. *Journal of Anxiety Disorders*, 8, 19–31.
- Sheehan, D., & Sheehan, K. (1983). The classification of phobic disorders. *International Journal of Psychiatric Medicine*, 12, 243–266.
- Shoben, E., & Borland, A. (1954). An empirical study of the etiology of dental fears. *Journal of Clinical Psychology*, 10, 171–174.
- Speilberger, C., Gorsuch, R., & Luchene, R. (1983). *Manual for the State-Trait Anxiety Inventory* (revised edition). Palo Alto, CA: Consulting Psychologists Press.
- Thomson, W., Poulton, R., Kruger, E., Davies, S., Brown, R., & Silva, P. (1997). Changes in self-reported dental anxiety in New Zealand adolescents from ages 15 to 18 years. *Journal of Dental Research*, 76, 1287–1291.
- Weiner, A., & Sheehan, D. (1990). Etiology of dental anxiety: psychological trauma or CNS chemical imbalance? *General Dentistry*, 22, 39–43.