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# How Do We Measure Dental Fear and What Are We Measuring Anyway?

Jason M. Armfield[a]

Dental anxiety shares similar characteristics with many clinical anxiety disorders, and this is especially the case with other specific fears and phobias. These often debilitating conditions comprise several different dimensions, including cognitive, emotional, behavioural and physiological components. In addition, dental anxiety and fear are associated with a range of aversive health consequences. A number of indices have been developed to measure dental anxiety and fear, but their sheer number is indicative of a continuing problem with delineating the concept of dental fear and anxiety and how these should best be measured. This paper addresses the widespread confusion in the use of relevant terminology and aims to trace and assess the theoretical underpinnings of a selection of the most widely used self-report measures. It is concluded that the most popular measures of dental anxiety and fear lack adequate or sufficiently explained theoretical foundations. This is of concern given that these scales, by their very nature, serve to define the concept they aim to measure.

**Key words:** anxiety, assessment, dental fear, scale development

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Dental anxiety and fear pose a significant problem in patient management, with anxious patients more likely to avoid or delay treatment and more likely to cancel dental appointments (Armfield et al, 2006; Eitner et al, 2006; Skaret et al, 2007). In addition, people with dental anxiety often have poorer oral health than their non-anxious counterparts (Wisloff et al, 1995; Ng and Leung, 2008; Armfield et al, in press). It has been argued that these characteristics feed into a 'vicious cycle', whereby the level of dental anxiety is either reinforced or increased as a result of greater disease prevalence and severity associated with delayed dental visiting (Armfield et al, 2007). It is because of the growing understanding and appreciation of the significance of these associations that the study of dental fear has assumed increasing importance in dental research.

The widespread use of questionnaires and behavioural measures for assessing dental anxiety or fear is a sign of the ready adoption and application of psychological methods to the study of oral health (Newton and Buck, 2000). Dental fear scales have been used to determine population prevalence, to measure risk factors and symptoms, and to examine changes brought about by experiences or treatment over time. Such scales are also recommended for use by clinicians to aid in screening for dental fear and providing better and more tailored treatment options. Because these measures are not just central to studies of dental fear, but by their very nature define the concept, it is crucial that they are both valid and reliable. Yet, theoretical discussion of these scales and the concepts they seek to capture has rarely taken place. It is not enough to ask merely how we measure dental fear—rather it is important to address the more fundamental question of what it is we are actually measuring, or perhaps not measuring, with the current litany of dental fear scales.

The single most significant problem with existing measures of dental fear is the weak conceptual and theoretical underpinnings of the central construct. At the outset, to measure a construct requires a precise understanding of that construct. There are two issues in particular which have complicated the measurement of dental fear: (1) a lack of conceptual clarity in defining the core psychological

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terms of anxiety, fear and phobia, which has led to their often interchangeable use and (2) a failure to account for the various aspects or components that comprise the fear and anxiety response. There is a general consensus in the psychological literature on the first of these issues, although it is rarely well addressed in scale development. The second point has to do with fear or anxiety being a complex emotional state. To better comprehend what we mean by dental fear, both the nomenclature of dental fear and the idea of dental fear as a complex human emotion will be discussed first.

## WHAT ARE DENTAL ANXIETY, FEAR AND PHOBIA?

Anxiety is the most common complaint that is dealt with by psychologists and psychiatrists, and forms the basis of a large number of diagnosable disorders. Yet, there is considerable uncertainty surrounding the definition of complex emotional/behavioural responses such as anxiety and fear, both at the lay level and in the scientific literature. This is to some extent a consequence of the problems inherent in explaining subjective feelings or emotions in symbolic form. Words do not capture but only ever approximate one's inner experience (Taylor and Arnow, 1988). Adding to this problem is the multiplicity of terms relating to anxiety and fear. Examples of these terms, which express various nuances or shades of emotion, include concern, worry, trepidation, nervousness, disquiet, solicitude, phobia, edginess, horror, anxiousness, apprehension, agitation, qualm, terror, misgiving and alarm. While this rich vocabulary of expressions underlines the importance of this emotion to human beings (Marks, 1987), it also adds to the difficulties encountered in defining the core psychological terms of anxiety, fear and phobia.

Distinguishing anxiety from fear from phobia is complicated because these terms are frequently employed interchangeably in the literature. Indeed, even the primary diagnostic tool used in psychology and psychiatry, The Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1994), is not conceptually clear on the issue. Specific Phobia, while classified under the general rubric of anxiety disorders, is defined as a marked fear characterised by anxiety. An example of a dictionary definition of fear is a 'painful feeling of impending danger, evil, trouble etc.' (Delbridge et al, 1991). But such a definition poorly captures the complicated and multifaceted nature of the emotion. For example, fear is not unidimensional, but can be perceived as an emotional response syndrome comprising several components (Marks, 1987). The exact combination of these elements is impossible to determine and is both phenomenologically and situationally distinct in any event. Certainly, the subjective experience of fear can be potent, producing marked effects on perception, thought and action (Izard, 1991). It is generally an aversive state and is most likely based in the biological imperative of the 'flight or fight' response to threatening stimuli or situations. However, fear is not always extreme and can range from feelings of vague apprehension or uneasiness all the way to circumscribed terror or panic.

In contrast to fear, a phobia can be distinguished by the significant degree to which the fear or avoidance of the feared stimulus interferes with a person's normal routine, occupational or academic functioning, or social activities and relationships. According to the American Psychiatric Association (1994), Specific Phobia refers to an intense fear of 'clearly discernible, circumscribed objects or situations' (p. 405), which appreciably limits (as adjudged by a given qualified person) the functioning of an individual in one or more domains. A phobia then is a clinical diagnosis, and not just marked fear. The five currently accepted subtypes of this disorder include the Animal Type, the Natural Environment Type, the Blood-Injection-Injury (BII) Type, the Situational Type and the catch-all Other Type. There is no definitive list of what phobias fit into what categories and while dental fear might appear to fit well into the Situational Type, some researchers classify dental fear as an example of a BII Type (e.g. Wolitzky-Taylor et al, 2008). However, while dental anxiety has been found to be correlated with symptoms of both injection phobia and blood-injury phobia (Vika et al, 2008), factor analysis of general fear scales has not always shown dental fear to group with items related to blood, injections or injury (Armfield, 2008). The proposed association of dental fear with BII type fears therefore requires further investigation.

With regard to anxiety, contemporary psychological research generally defines this as an aversive emotional state related to an anticipated or expected encounter with a feared stimulus. While a physical cue might not be immediately present, there is at least some expectation of an upcoming aversive experience. It therefore serves as a relatively useful heuristic, at least in relation to specific fears and phobias, to distinguish anxiety and fear on the basis of their temporal relationship to the fear-relevant stimulus. The psychological and biological aspects accompanying anticipation of encountering the fear-relevant

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stimulus or situation can be termed the anxiety response, whereas the various sequelae of encountering the stimulus or situation can be termed the fear response. At a more functional level, anxiety can be seen as priming an individual for a fear response.

## FEAR AS A COMPLEX EMOTION

An emotion can be defined as a subjective feeling, usually accompanied by an aroused physiological state, and may be considered a drive to the extent that it orientates a person towards a particular course of action (Gray, 1991). Fear is considered by some researchers to be one of the six basic human emotions (Ekman and Friesan, 1975; Ekman et al, 2002). In 1971, Lang proposed that emotions were composed of behavioural, physiological and verbal or cognitive response systems. However, other definitions have also been advanced (McConnell, 1986; Watson and Clark, 1994). Westermeyer (2005), for example, has proposed that there are four symptom groups. He argued that the emotional component comprises fear; the physical symptoms include shortness of breath, rapid heart rate and a myriad of other biological changes; the cognitive symptoms involve a narrowing of focus, memory retrieval and catastrophic thinking; and the behavioural symptoms are associated with the purpose of the flight response. Other researchers have also identified these four aspects of anxiety/fear reactions both generally (Schwarzer et al, 1987; Edelmann, 1992) and in relation to dental anxiety specifically (Stouthard et al, 1993).

While it might be expected that anxiety-evoking situations would result in the activation of the four different response components, research indicates that in some circumstances the response systems may be discordant, supporting the argument that they should not be regarded as equivalent. For example, Eysenck (1992) has argued that behaviour, in contrast to physiology, may be more amenable to social influence. Certain behavioural responses may be suppressed if they are considered to be socially unacceptable. In a study of professional pianists, stressful responding was found to be relatively consistent within response domains, whereas measures from different domains were poorly correlated (Craske and Craig, 1984). By implication, measures of anxiety should ideally tap all possible response domains or else erroneous conclusions regarding emotional responding may be reached (Eysenck, 1992).

Given that there is good reason to consider dental anxiety and fear to have emotional, behavioural, cognitive and physiological components or response systems, it is worth enquiring as to whether these components are currently measured in existing measures of dental fear. If not, what are the theoretical foundations of existing measures of dental fear or anxiety and how do they relate to the current conceptualisation of disorders of emotion?

## MEASURING DENTAL FEAR AND ANXIETY

The data in Table 1 present some of the more common and well-constructed scales assessing dental fear, as well as how often they have been mentioned in the recent scientific literature. Apart from this list, several single-item questions have also been developed to assess dental fear, often on an ad hoc basis. In a search of the PubMed bibliographic database provided by the US National Centre for Biotechnology Information, 57 of the 163 published articles mentioning dental fear or anxiety in 2008 used at least one psychometric measure. The Dental Anxiety Scale (DAS) was the most widely used dental fear scale for adults (19 of 57 articles), while the Dental Subscale of the Children's Fear Survey Schedule (CFSS-DS) was the most widely used scale for children (11 citations). This can be compared to results for the period 1988 to 1998, when the DAS was used in 35 of the 38 identified articles employing a dental fear scale and the Children's Fear Survey Schedule (CFSS) was the most used children's dental fear scale, being cited in two of the 38 identified articles (Newton and Buck, 2000).

Rather than carry out an exhaustive review of all of the dental fear scales and single-item measures, a selection of scales used in the literature is analysed below, with the main emphasis on tracing and assessing their theoretical underpinnings. The selected scales were chosen either because they are among the most commonly used measures of dental fear and anxiety or because they are specifically developed with a theoretical model in mind and could therefore be considered to be the most theoretically advanced.

### *Corah's DAS*

The most widely used measure of dental anxiety, the DAS, was originally based on a single-item question that was developed to measure 'psychologic stress' (Corah and Pantera, 1968). Reliability and validity data for the formal DAS were subsequently presented in a short article that was published soon after (Corah, 1969). Interestingly, although Norman Corah was

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**Table 1 Dental anxiety scales, scale items and reported use in 2008**

| Scale | Scale items | 2008 usage |
|---|---|---|
| **Adult dental anxiety scales** | | |
| Corah's Dental Anxiety Scale (DAS) | 4 | 19 |
| Modified Dental Anxiety Scale (MDAS) | 5 | 6 |
| Kleinknecht's Dental Fear Survey (DFS) | 20 | 10 |
| Dental Fear Assessment Scale (DFAS) | 31 | 0 |
| Gatchel's 10-Point Fear Scale (FS) | 1 | 0 |
| Stouthard's Dental Anxiety Inventory (DAI) | 36 | 0 |
| Dental Anxiety Inventory Short Version (DAI-S) | 9 | 8 |
| Gale's Ranking Questionnaire (RQ) | 25 | 0 |
| Photo Anxiety Questionnaire (PAQ) | 10 | 0 |
| Hierarchical Anxiety Questionnaire (HAQ) | 11 | 1 |
| Fear of Dental Pain (FDP) questionnaire | 18 | 1 |
| Single-item measures | 1 | 9 |
| Other scales | Vary | 3 |
| **General scales used to measure dental anxiety** | | |
| Spielberger's State-Trait Anxiety Inventory (STAI-S) | 10 | 5 |
| Hospital Anxiety and Depression Scale-Anxiety subscale (HADS) | 7 | 3 |
| **Child-specific dental anxiety scales** | | |
| Children's Fear Survey Schedule-Dental Subscale (CFSS-DS) | 15 | 11 |
| Modified Child Dental Anxiety Scale (MCDAS) | 8 | 0 |
| Frankl Behaviour Rating Scale (FBRS) | 1 | 2 |
| Venham Picture Scale (VPS) | 8 | 1 |
| Facial Image Scale (FIS) | 4 | 2 |
| Morin's Adolescent's Fear of Dental Treatment Cognitive Inventory (AFDTCI) | 23 | 0 |

a faculty member in the School of Dental Medicine at the University of Buffalo at the time he published the DAS, he was previously an associate professor in the Department of Psychology at Washington University in St. Louis (Anon, 2001). It can be assumed that he was probably well acquainted with the relevant psychological literature at that time. It is perhaps surprising, therefore, that the theoretical basis for the DAS has never been explicitly described.

The four questions in the DAS relate to scenarios varying in temporal and distal proximity from the dental experience. Presumably, increased physical and temporal proximity to the dental encounter was believed to be related to increases in anxiety, and this has formed the basis of other scales, such as the Dental Anxiety Inventory (DAI) (Stouthard et al, 1993). However, the four questions also vary in what they measure, with the first two questions relating to anxiety generally and the second two questions seeming to relate to anticipated fear of specific stimuli—the drill and cleaning instruments. The first item in the DAS uses a bi-directional scale, whereas the other three items use a unidirectional scale. This is of significance as a score of either one or two for the first question is indicative of no dental fear, being equivalent to a one on any of the other three questions. There are other differences between the first question and the subsequent three questions. For instance, the first item asks people to speculate on hypothesised future feelings, whereas the other three questions ask people to rate how they feel when they are in a prescribed situation. A further problem with the DAS is that the response categories are not mutually exclusive. For example, 'tense' and 'anxious' describe physiological and emotional symptomatology, respectively. Indeed, 'relaxed', 'uneasiness', 'tension', 'anxiety' and 'anxiety characterised by sweating or feeling sick' might be viewed as qualitatively, rather than quantitatively, different.

### *Modified Dental Anxiety Scale*

The series of fundamental problems with the DAS make it a seriously flawed measure of dental anxiety and/or fear. However, despite its common usage,

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the numerous problems with the DAS have not gone unrecognised. Indeed, the Modified Dental Anxiety Scale (MDAS) was developed precisely to overcome some of the issues with the DAS (Humphris et al, 1995). The MDAS differs from the DAS in some important ways. A fifth item, related to the receipt of a local anaesthetic injection, was added to the four items included in the DAS, and a standard response format ('Not anxious', 'Slightly anxious', 'Fairly anxious', 'Very anxious' and 'Extremely anxious') was developed for all items, which fixed the problems with the DAS response scales. There is no doubt that the MDAS represents a real and significant improvement over the DAS. However, and despite these improvements, the MDAS still shares the same theoretical shortcomings of the DAS. The multicomponent nature of dental anxiety (Stouthard et al, 1993) is not measured by the scale and a theoretical definition of the main concept the scale aims to measure is still not provided.

### *Kleinknecht's Dental Fear Scale*

The second most commonly used measure of dental anxiety and fear is the Dental Fear Scale (DFS), originally developed as a 27-item scale (Kleinknecht et al, 1973) and subsequently reduced to 20 items as a result of a later factor analytic study (Kleinknecht et al, 1984). Like the DAS, the DFS had its development out of the rejection of psychoanalytic theory and the growing acceptance of behaviourist theory in the 1950s and 1960s. Kleinknecht et al (1973) argued that 'rather than looking for explanations of fear in repressed impulses, we might view ... [fear] reactions as learned responses to the stimuli inherent in the dental treatment situation' (p. 843). Ironically, and despite the DFS being widely used as a measure of dental fear, the scale was not developed to produce a single fear score, but rather to provide information on the variety of specific stimuli that might elicit fear or avoidance responses as well as 'the patient's specific and unique response to those stimuli' (p. 843).

That the DFS was not specifically developed as a measure of dental anxiety and fear helps explain the problems which have resulted from its use for such a non-intended purpose. The original 27-item scale had two items on the avoidance of dentistry, six items related to felt physiological arousal, 14 items assessing fear of specific stimuli, a single item concerning overall fear and four items on the reaction to dentistry among family and friends. The subsequent 20-item scale retained the two items focused on avoidance and the single item tapping overall fear, but reduced the number of questions that were related to physiological arousal from 6 to 5, of specific dental items from 14 to 12, and eliminated the items related to dental reactions of friends and family. Lacking any explicit direction or rationale for combining the items, researchers have almost universally summed the 20 items to create a single score ranging from 20 to 100. However, there is no justification for this procedure, and the end result is that while 25% of the final score reflects physiological symptomatology, a disproportionate 60% relates to fear responses to specific stimuli, 10% to avoidance, while 5% reflects self-rated general fear. While the DFS has been criticised for not explicitly linking the theoretical construct to the questionnaire and for not explicitly defining fear (Schuurs and Hoogstraten, 1993), this is perhaps missing the point in that the DFS was designed to be a useful practical tool for practitioners rather than a theoretically derived measure of dental fear. While the DFS remains a useful and informative measure that could help clinicians better understand a client's fear, it is not ideally suited to be used as a measure of that fear.

### *Stouthard's Dental Anxiety Inventory*

In the 1980s, Stouthard developed a questionnaire for anxiety research based on explicit theoretical considerations and designed to measure situation-specific trait anxiety (Stouthard, 1989; Stouthard et al, 1993). The Dental Anxiety Inventory (but also referred to more recently as the DAxI to avoid confusion with the Dental Aesthetic Index) is a 36-item scale based on three 'content facets' (time, situation and reaction) perceived as being relevant to dental fear (Stouthard et al, 1995). The time facet mimics the assumption built into the DAS that the nature and strength of anxiety may change depending on proximity to dental treatment. The situation facet reflects three different elements of the dental experience—introductory aspects of dental treatment, interaction with the dentist and actual dental treatment. Finally, the reaction facet refers to elements of the anxiety or fear experience. Although the DAI has several questions relating to behavioural avoidance, the behavioural reaction mode is stated to have been deliberately excluded as a separate element because it occurs 'too infrequently in the adult population ... to justify inclusion of this category on psychometric grounds' (Stouthard et al,

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1993, p. 92). A diagrammatic model presented by Stouthard therefore shows the reaction facet as assessing only emotional feelings, physical reactions and cognitive reactions (Stouthard et al, 1993, 1995).

In their review of the DAI, Schuurs and Hoogstraten (1993) concluded that the DAI appeared promising and received a positive overall assessment (alongside the DFS, the other scales not fairing as well). However, the DAI too has a few shortcomings. For example, although analyses of predicted fear across the four time elements have been claimed as showing 'the expected tendency' of greater fear to be associated with increased proximity, only one of these elements has been shown to differ significantly from any of the others (Stouthard et al, 1993). In addition, attempts to confirm the facet design using confirmative factor analysis have not been successful (Stouthard et al, 1993).

One of the biggest problems encountered with the facet approach employed while developing the DAI is that it led to a 36-item scale, which is acknowledged as being too long to be practical in field situations (Stouthard et al, 1993). Anticipating this problem at the outset, a 9-item short form of the scale (variously termed the SDAI, DAI-S, S-DAI or SDAxl) was also developed alongside the full scale (Stouthard et al, 1994). Although the original study reporting on the short form of the scale was not published in an English language journal, subsequent papers have provided some insight into the short version of the DAI. Stouthard et al (1993), for example, report that the nine items for the SDAI were selected on 'psychometric grounds' (p. 101). However, while it has been argued that the short version takes the multicomponent nature of dental anxiety (Aartman, 1998) into consideration, it is clear from the scale that the cognitive component of the reaction facet was not included in the nine questions. Indeed, almost half of the items appear to relate to the emotional reaction (with nervousness classed as an emotional response), three to the physical or motor-behavioural responses, and two to avoidance or escape. Despite these varying numbers of items, a full-scale score is formed by summing across all items—a practice used for the DFS full-scale score and criticised by Stouthard et al (1993). Interestingly, factor analysis of the shortened scale revealed only a single factor (Aartman, 1998), which may reflect the psychometric criteria employed for item selection. Aartman (1998) also regards one of the nine items as 'deficient', arguing that it might be better to exclude this item to form an 8-item scale. In summary, although the DAI has some theoretical strength it is impractical to use, and although the DAI-S is more practical to use, it is theoretically compromised as a result of it having been shortened.

### *Child Fear Survey Schedule-Dental Subscale*

The Child Fear Survey Schedule-Dental Subscale (CFSS-DS) is the most widely used measure of dental fear for children. Interestingly, the origins and theoretical foundations of the scale have, for the most part, been glossed over. For example, in a review of anxiety and pain measures in dentistry, the development of the measure is described with the simple statement 'A dental subscale has been devised' (Newton and Buck, 2000, p. 1452). Indeed, while the development of the CFSS-DS is almost universally credited to Cuthbert and Melamed (1982), those authors attribute the development of the scale to modifications made by Melamed et al (1975a, b) to the Child Fear Survey Schedule (CFSS), which was originally developed by Scherer and Nakamura (1968) and then termed the Fear Survey Schedule for Children (FSS-FC). The CFSS, in turn, was based on a general fear scale for adults (Wolpe and Lang, 1964). The FSS-FC (CFSS) required fear ratings for 80 specific stimuli, developed under eight different categories, to obtain measures of total general fear and also the total number of fears. A single item out of those 80 items dealt with fear of 'going to the dentist'. In contrast, the CFSS-DS has 15 items, although other authors have used variations on this number (Carson and Freeman, 1997; Folayan and Otuyemi, 2002), only four of which appear on the CFSS. The complicated development process of the CFSS-DS has led to some confusion in the literature. For example, Carson and Freeman (1997) mistakenly cite the CFSS (the 80-item general fear measure) as a 'well-recognized, valid and reliable measure of child dental anxiety' which is certainly not the case.

The selection of the additional 14 items by Melamed and colleagues for the CFSS-DS, to accompany the single fear of the dentist item, has not been explained. For example, Melamed et al (1975a, b) simply make the statement that they used a 'modified CFSS with dental-specific items included' (p. 798) and referenced the earlier Scherer and Nakamura (1968) paper. Quite likely, the additional 14 items included three of the conceptually more related items from the 'Medical fears' factor identified in the factor analysis of the CFSS undertaken by Scherer and Nakamura (1968). Fear of getting a haircut and fear of deep water or the ocean were also listed as loading on to the 'Medical fears'

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factor, but were presumably ruled out on the basis of poor face validity. The other 11 items must be presumed to have been added on the basis of an assessment of face validity.

The CFSS-DS has been shown to be both reliable and valid to varying extents; however, its theoretical underpinnings have not been explored. At the outset, the construct validity of the scale is dubious, with some items, such as fear of 'doctors', 'having somebody look at you', 'having a stranger touch you', 'people in white uniforms' and 'having to go to the hospital', being poorly or only tangentially related to dentistry. Indeed, these items have been found to load poorly on an identified 8-item 'Dentistry' factor (Boman et al, 2008). Further, the dental-specific items comprising the CFSS-DS do not even reflect aspects or components of dental fear per se. Rather, they present specific moments of treatment, much as the fear-specific stimuli used in the DFS. The cognitive, physiological, behavioural and emotional aspects of dental fear are not measured, which undermines any claim that the CFSS-DS is a theoretically sound measure of dental fear.

### *Summarising existing dental anxiety and fear scales*

It has been noted that a wide range of instruments have been developed to measure dental anxiety and fear (see Table 1). Ideally, these instruments would all be based on explicit theoretical foundations and should demonstrate good psychometric properties. Unfortunately, this is not the case. The most widely used measure of dental fear, Corah's DAS, has been criticised as having no described theoretical structure underlying it and mixing questions measuring anxiety with questions measuring fear stimuli (Schuurs and Hoogstraten, 1993). The second most commonly used fear measure, Kleinknecht's DFS, focuses primarily on specific dental situations and procedures, and employs an arbitrary and debateable weighting of the scale's components. Neither the DAS, MDAS nor DFS measures the various components of the anxiety or fear response. Stouthard's DAI has a stronger theoretical underpinning, but is severely restricted by the large number of items, which makes it potentially unwieldy for much research, while the shorter version compromises the original aim of measuring the 'multicomponent nature of dental anxiety' (Stouthard et al, 1993, p. 90). The CFSS-DS is by far the most widely used anxiety measure for children, but is possibly the most questionable of all the scales in terms of its conceptual and theoretical basis.

Suggestions for use of the existing dental anxiety and fear scales are not always straightforward. In one review, it was recommended that Corah's DAS be used in clinical settings, while the DFS be used to measure dental anxiety as part of research (Newton and Buck, 2000). However, given the clinically relevant stimuli assessed by the DFS and the established normative data of the DAS, one could argue more convincingly for their use the other way around. While stimulus characteristics may be important cues for fear reactions they are not, in and of themselves, an aspect of fear. Yet, such scales as the DFS and CFSS-DS rely predominantly on measuring the extent of emotional reaction to various potential dental stimuli, rather than the full extent of the reaction. At the present time, the DAI-S is to be regarded as the preferred scale for measuring dental anxiety among adults.

A final problem currently characterising all existing measures of dental anxiety/fear is that they do not attempt to identify people who might be classifiable as having a dental phobia. The use of cut-points, such as is often done with the DAS, is naïve and cannot disentangle dental fear from dental phobia—one is a complex emotional state, the other a diagnosable psychological disorder based on specific diagnostic criteria (American Psychiatric Association, 1994).

## CONCLUSION

While it is not uncommon for a large number of measures to be developed to assess any one construct, the discreteness of dental fear as a psychological phenomenon means that many of the scales developed to date are likely to be redundant or superfluous. In their review of the literature, Schuurs and Hoogstraten (1993) concluded that 'the availability of so many dental anxiety/fear questionnaires may be interpreted as representing dissatisfaction with the existing lists' (p. 335). While this may be true, the development of each new dental fear measure has generally not been foreshadowed or accompanied by much criticism of available measures at the time. Inadequacies in existing measures are often merely implied by discussion of new areas, topics or issues that require assessment. Stouthard and colleagues are in the minority in developing a scale according to a specific theoretical model and on the basis of the argued failure of existing measures. Yet, it remains the case that the most widely used measures of dental anxiety rest on weak or

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insufficiently explained theoretical foundations. While this does not necessarily mean that they cannot accomplish the goal of sorting dentally anxious from non-anxious people, it is of concern that the construct they claim to measure is often operationalised in such a limited or tangential manner. There is currently considerable room for improvement when it comes to measuring the complex condition of dental anxiety and fear.

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