

Acquisition and measurement of dental anxiety: a summary paper

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Key words: Dental anxiety, Cognitive Vulnerability Model, measures of anxiety

INTRODUCTION

Why is it important to research dental anxiety and phobia?

Despite advances in local anaesthetic and treatment techniques, fear of dentistry is still a widespread problem. Findings from the latest UK Adult Dental Health Survey showed that 36% of the respondents have moderate dental anxiety, with 12% indicating severe clinically significant anxiety (Health and Social Care Information Centre, 2010). Moreover, this finding has been mirrored across other countries, with moderate to high levels of dental anxiety noted in Australia (Armfield *et al.*, 2006), Canada (Locker *et al.*, 1999) and Norway (Skaret *et al.*, 1998).

Anxiety surrounding the dentist and dental procedures can have negative consequences for physical, social and psychological well-being. Those who are dentally anxious tend to have poor attendance rates at dental appointments (Mejía *et al.*, 2010), often resulting in poor oral health (Oosterink *et al.*, 2009). As oral health deteriorates this can have a profound effect on sufferers' social relationships, and they often experience sleep disturbance, negative physiological impact and decreased vitality (Cohen *et al.*, 2000; Mehrstedt *et al.*, 2002; Oosterink *et al.*, 2009). Dental anxiety has major implications not only for the individual but also for the dental professional and dental care services. Indeed, providing treatment for a dentally anxious patient can be time consuming and demanding for clinicians and can have financial implications for dental services (Moore and Brodsgaard, 2001; Weinstein, 2008).

Given the adverse effects of dental anxiety/phobia, it is important to understand why it develops and be able to formally identify and quantify this anxiety. Therefore, the aims of this summary paper are two-fold. First, to outline and review some of the key explanations put forward for how dental anxiety/phobia develops. Second, to cover the assessment options for measuring adult and child dental anxiety. It should be noted that this is not a systematic review of the literature, rather a brief summary paper covering only some of the main issues.

THE AETIOLOGY OF DENTAL ANXIETY/PHOBIA

Psychodynamic explanations

There are a number of theories that attempt to explain why individuals acquire dental anxiety. For example, Freeman (1998) has proposed a psychodynamic theory for dental phobia based on the concepts of false connections and displacement. Using case illustrations she has demonstrated how false connections

have resulted in anxiety associated with situations removed from dentistry being transferred or displaced onto dental treatment (resulting in dental phobia). Freeman presents a fascinating account of this route to development of dental phobia, but as with most of Freud's psychodynamic explanations it suffers from being difficult to disprove. The theory is difficult to test empirically and researchers have tended to turn more to contemporary perspectives of phobia acquisition such as genetics, conditioning theories and cognitive models detailed below.

Genetic explanations

More recently, there has been some evidence for a genetic component in dental anxiety. For example, Ray *et al.* (2010) studied the genetic components of dental fear and anxiety in data collected for the Swedish Twin Study of Child and Adolescent Development (TCHAD), comparing dizygotic and monozygotic twins. They asked questions regarding their dental fear and intensity of the fear. Findings showed that heritability of fear/anxiety was high in girls, but low in boys and that for both boys and girls dental fear intensity was highly correlated in monozygotic (identical), but not dizygotic, twins. The authors conclude that there is genetic predisposition involved, allowing monozygotic twins to experience fear at a highly similar level, whereas dizygotic twins are not as alike so do not share this. Although the authors acknowledge that a limitation of the study is that they lacked standardised dental anxiety questionnaires they suggest that future studies and theories of dental anxiety and fear must take the possibility of genetic vulnerability into account to a greater degree than has been the case in the past.

Conditioning explanations

One of the more traditional, and popular, explanations for dental anxiety acquisition stems from the model of classical conditioning. In many ways this model makes intuitive sense - fear is acquired after a negative or traumatic experience has occurred. That is, a routine dental appointment should not elicit a fear response but if an individual experiences a traumatic or painful event at the dental clinic, then they will associate dentistry with the negative event and a fear response will be developed. Rachman (1977) later extended this and proposed that there are different ways in which fear can be acquired; through direct conditioning or indirectly through vicarious learning or modelling.

Support for acquiring dental fear via conditioning has come from a number of sources. For example, Locker, Shapiro and Liddell (1996) found that dental anxiety was specifically related to invasive or painful treatment. They reported that the negative experience of pain during dental procedures resulted in anxiety, consequently evoking a desire to avoid subsequent dental situations. Moreover, Townend *et al.* (2000) found that anxious children had experienced significantly more traumatic visits to the dentist than non-anxious children. While the conditioning model has provided considerable evidence for some cases of dental fear, there remain unexplained individual differences between those who develop dental anxiety and those who do not. Indeed, many individuals experience dental treatment which may cause some pain, yet only some of these individuals develop an anxiety (Ten Berge *et al.*, 2002). In addition, it has been shown that individuals may have a fear of the dentist and avoid attending, even though they have never had or cannot recall a traumatic dental experience (De Jongh *et al.*, 2002). One argument put forward to explain this is that researchers neglect to include any measure of individual difference variables that might account for (individually or in combination with other variables) why only some individuals who have a bad experience develop a phobia (Mineka and Öhman, 2002). For example, the extent to which someone has control over a traumatic event may play an important role in whether a fear is developed, with far less fear being conditioned for an aversive event when it is controllable than when it is uncontrollable (e.g., Mineka, Cook and Miller, 1984; Craske *et al.*, 1990). Moreover, it has been posited that if an individual has a number of good experiences with a stimulus before they encounter a traumatic event, then they will be less likely to acquire a fear – a process known as latent inhibition. There has been some support for latent inhibition within dental anxiety acquisition (Davey, 1989) though there have also been methodological criticisms that blight many of the conditioning studies that rely on retrospective recall. That is, to what extent can we rely on memories, particularly when dental anxiety normally develops in childhood? In addition, it has been argued that there might be a ‘chicken and an egg’ situation in these type of studies. That is, the anxious individuals consider themselves anxious leading them to perceive their earlier dental treatments as painful and traumatic (De Jongh *et al.*, 1995).

Cognitive explanations: The cognitive vulnerability model

A criticism that has been made of the explanations of dental fear acquisition described thus far is that they do not take into account the meaning that people give to their experiences. There is, therefore, an alternative approach to the acquisition of dental fear which reflects a cognitive orientation. One such model focuses on the notion of cognitive vulnerability (Armfield, 2006), which has prompted some interesting recent developments in dental anxiety acquisition research.

The Cognitive Vulnerability Model (CVM) (Armfield, 2006), places emphasis on the cognitions of individuals, suggesting that the components of *disgustingness*, *dangerousness*, *unpredictability* and *uncontrollability* interact to create fear and are proposed to contribute to an overall vulnerability differentially

inherent in people. Therefore, if an individual perceives an object or situation as disgusting, dangerous, unpredictable and uncontrollable, then a schema of vulnerability is created and a fear developed. While learning experiences may help shape these vulnerability-related perceptions they are not causal per se.

Armfield and colleagues have conducted several studies exploring the role of the CVM in the acquisition of dental fear. Most notably, they carried out a large-scale study sampling the general Australian population (Armfield *et al.*, 2008). Their findings indicated that uncontrollability and dangerousness were independently associated with dental anxiety; however, unpredictability was not found to have an independent relationship with dental anxiety, which they proposed may be due to high collinearity with the other factors in the CVM. Whilst these findings provide some support for the CVM, there were some limitations of the study which should be noted. For example, only dangerousness, unpredictability and uncontrollability were explored to determine the relationship of dental anxiety with the CVM, and a single item was used to measure each of the three cognitive vulnerability components included in the study.

Edmunds and Buchanan (2012) attempted to address some of the limitations of the Armfield *et al.* (2008) study by recruiting a sample of dentally anxious individuals from two online support groups to explore the role of all of the CVM components in both dental anxiety acquisition and maintenance. Findings showed moderate support for three of the key components of the CVM in maintaining dental anxiety/phobia (controllability, dangerousness and disgustingness) though in terms of dental fear acquisition, findings were less clear. However, the authors acknowledge that there was only a single item for each of the four CVM components acquisition items, and there were different types of questions for exploring dental fear aetiology and maintenance; this may have explained why there were differences across aetiology and maintenance. Topcu and Buchanan (2011) have since developed and validated a more comprehensive questionnaire for both the aetiology and maintenance of dental anxiety in relation to the CVM, with initial evidence of sound psychometric properties. Moreover, they found moderate support for three of the vulnerability-related cognitions in maintaining dental fear (uncontrollability, dangerousness, and disgustingness). However, again support for the CVM as a model of dental fear acquisition is not so clear. One reason for this may be that accessing current dental cognitions and perceptions (when utilising reliable and valid tools) is easier and more accurate than accessing perceptions of how one became anxious. Dental fear is usually acquired in childhood, thus findings rely solely on participants’ own perceptions of how they acquired their fear (Edmunds and Buchanan, 2012), much like many of the conditioning studies in this area. Although this is interesting in itself, it may not reflect actual events as research shows that memory is subject to a number of biases (Loftus, 2004). Experimental or longitudinal studies are required to establish the direction of causality between dental fear and CVM components, though it should be noted that this is a challenge in the context of fear acquisition.

In summary, there are a number of routes that have been proposed for how individuals acquire dental fear. Traditional

conditioning accounts have been given the most attention in the literature, and a number of studies have provided evidence linking negative/traumatic experiences in the dental clinic with acquisition of fear. However, these studies are often criticised for relying on retrospective recall, and there remain unexplained individual differences between those who develop a dental anxiety and those who do not. The CVM is a relatively new and interesting model of fear acquisition which has vulnerability cognitions at its centre. Most research applying this model thus far, has provided evidence for its utility in explaining current dental cognitions. As a result, efforts to alleviate dental fear should perhaps focus on an individual's perceptions of vulnerability.

MEASUREMENT OF DENTAL ANXIETY/PHOBIA

It is acknowledged that the detection and effective management of dental anxiety is an important part of the dental practitioner's role (Schuller *et al.*, 2003). The First Five Years report states that the newly-qualified dental practitioner should be able to make appropriate referrals based on patient assessments (General Dental Council, 2008). Formal psychometric measures such as standardised dental anxiety questionnaires have been recommended in helping to reach an accurate assessment of dental anxiety in patients. These measures can help highlight dentally anxious patients, or patients who are anxious of a particular procedure (e.g., injections, drill). This information can then be used to inform appropriate management techniques (such as conscious sedation and psychological techniques) as well as indicating that these patients may take longer to treat. Moreover, routinely administering dental anxiety questionnaires to new patients across practice, can act as a tool for communication. Discussion of the responses on the questionnaire can help build rapport and trust with the anxious patient. Patient and practitioner can then work together towards an acceptable treatment plan. In addition, formal measurement of anxiety across treatment sessions can be valuable for monitoring of treatment interventions (both in research and for audit purposes). Standardised measures are also needed for population estimates and surveys in order to determine prevalence levels.

Although many studies have been conducted into their use as outcome measures in relation to various behavioural interventions, application of standardised questionnaires in clinical practice in a survey of UK dental practitioners is low with only 20% of dentists using adult dental anxiety assessment questionnaires (Dailey *et al.*, 2001). This may be because dentists rely on their clinical observations, which are not always correlated with patient self-report (Buchanan and Niven, 2003; Barros and Buchanan, 2011). It should be noted, however, that Dailey *et al.*'s study was carried out over a decade ago and there appear to have been some encouraging developments since then. From 2007, the Modified Dental Anxiety Scale (MDAS) (Humphris *et al.*, 1995) has been used as a screen for a number of GDS and CDS dentists in Scotland, with plans to extend this coverage to the whole of Scotland. The MDAS is an adult anxiety measure which comprises 5 items based on the dental experience (e.g. "If you were about to have your tooth drilled, how would you feel?") and is

rated on a 5-point scale ranging from 'Not anxious' to 'Extremely anxious'; the cut-off score is 19 (indicating a strong likelihood of dental phobia) (King and Humphris, 2010). Previous studies have demonstrated good psychometric properties for this measure (e.g., Humphris *et al.*, 1995; King and Humphris, 2010) and it is also used widely in research, most notably in the latest UK Adult Dental Health Survey meaning there will now be population norms available. Other dental anxiety questionnaires are available, but tend to be of greater length and so are more suitable for research purposes (Newton and Buck, 2000).

Child self-report scales

Inevitably, assessing dental anxiety in children using self-report scales is more complex than assessing anxiety in adults. First, depending on the child's age, there can be limitations in what they can read and/or understand. For example, even the term 'anxiety' is not easy to read or comprehend in younger age groups thus employing adult dental anxiety measures are not appropriate. Second, children have short attention spans, thus scales need to be brief and they should also try and engage the child. Third, the purpose of the scale should also be considered; if it is to be used by dental practitioners in routine clinical practice, it should also be simple to score and interpret. If it is to be administered for research purposes sound psychometric properties may be especially important. Therefore, assessment measures should be child-centered, quick and easy to use as well as reliable and valid (Freeman, 2005).

It is also important to make a distinction between different types of dental anxiety measures. First, there are trait measures – these typically involve a number of items that relate to different aspects of the dental experience (e.g. sitting in the dental waiting room, having a tooth drilled etc.) where participants/patients rate their anxiety on a response set across questions. These give us important information on what the child is anxious of and also provide a comprehensive 'global' anxiety score. Second, there are state anxiety scales which assess anxiety at the moment the scale is administered – these are therefore indicators of how the child is feeling at that time (or how they are feeling about what is about to happen e.g. treatment); they can also be used to assess immediate retrospective anxiety (i.e. asking a child at the end of their treatment session how generally they felt during it).

Trait child dental anxiety measures

Possibly the most well-known trait child measure is the Children's Dental Fear Survey Schedule (Cuthbert and Melamed, 1982) which asks children to rate their fear of 15 situations on a five-point scale. These are divided into (a) fear of invasive procedures, (b) fear of potential victimisation (e.g., from strangers, being afraid of hospitals in general), and (c) fear of non-invasive dental procedures. It has been shown to have good psychometric properties (Aartman *et al.*, 2008), and because it has been used so widely across research studies it makes comparisons of scores straightforward. However, it does include some irrelevant items such as 'having to go to hospital' (most patients are not treated in hospitals) (Wong, Humphris and Lee, 1998) and items that could be deemed unacceptable such as 'having a stranger touch you'. Furthermore, the scale is 15 items long which may

be challenging for younger children to complete. It should be noted, therefore, that there is a shorter version available (the Dental Fear Survey Schedule- Short Form) which has eight items which are mostly specific dental-related situations/treatments which may be more applicable to some clinical context and research settings.

There are a number of other paper-and-pen self-report questionnaires available. For example, the Modified Child Dental Anxiety Scale (MCDAS) (Wong, Humphris and Lee, 1998) is an 8-item scale which covers a variety of different dental procedures (e.g., having a scrape and polish) as well as going to the dentist generally. It has been employed in a number of studies although it has been noted that some of the items may not be familiar to all children (Buchanan, 2005). To help engage children, and help them gauge their anxiety using a familiar response set, the use of faces has been incorporated into some anxiety measures in both paper-and-pencil questionnaire format (MCDAS-F) (Howard and Freeman, 2007), and in an interactive computerised dental anxiety scale (Smiley Faces Program) (Buchanan, 2005; 2010). 'Faces' do have their advantages in that even very young children are familiar with them as a response item, though they would still need help from adult with reading/understanding the questions/items.

State child dental anxiety measures

State measures of child dental anxiety often use pictures to help children rate their 'current' anxiety. The Venham Picture Test (VPT) (Venham, 1979) incorporates eight pictures with each depicting two cartoon boys displaying contrasting emotions. The participant is required to indicate which of the boys, within each picture, most accurately reflect their feelings at that time. This scale has been used across a number of studies and there is high internal consistency of the pictures, though there is limited information on validity and it has been noted that some of the figures are ambiguous in what they are trying to portray (Buchanan and Niven, 2002).

The Facial Image Scale (FIS) (Buchanan and Niven, 2002; 2003) is also a state measure of dental anxiety where children are asked to indicate how they feel on a row of 5 faces. It has a number of advantages, for example it can be employed with very young children (it has been employed with children as young as three years (Buchanan and Niven, 2002). Moreover, it is quick and easy to administer and like the VPT it provides immediate 'state' feedback to the clinician in the dental waiting room. However, state measures such as the FIS and the VPT do have limitations; the amount and type of information which can be gleaned from responses is minimal. It does not necessarily inform the dental practitioner, or the researcher, regarding what the child patient is afraid of.

CONCLUSION

In conclusion, the prevalence of dental anxiety has not changed markedly in the last 30 years in spite of more modern and less painful technology. It is important, therefore, to establish the

routes by which individuals acquire dental anxiety, and how this anxiety is maintained, so the adverse physical, social and psychological effects can be negated. There are many explanations put forward for how individuals acquire a fear, of which some have been covered briefly in this paper. One of the most recent models is the Cognitive Vulnerability Model (CVM). Findings appear to indicate that vulnerability cognitions may be important in maintaining dental anxiety, although more work is needed on whether they are key to the development of dental anxiety.

It is also important that dentists are able to assess dental anxiety in patients as early as possible so that they can identify patients who are in special need with regards to their fear. Moreover, researchers need to assess dental anxiety in order to determine prevalence levels, correlates of dental anxiety and determine the efficacy of treatment interventions. For these purposes, formal assessment measures are essential. Although a number of different measures are available, the Modified Dental Anxiety Scale is possibly the most widely used measure for adults in both research and practice, and has been shown to have sound psychometric properties. For child patients, a number of different measures are available for a variety of purposes (e.g., state/trait anxiety, research and practice) and populations (clinical patients, different age groups), though no 'gold standard' measure exists. Researchers and clinicians should ensure that they select an appropriate measure to fit their purpose and population. Finally, future research should endeavour to identify the extent to which dental practitioners are currently formally assessing dental anxiety.

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