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## What is the Most Effect Treatment for the Management of Dental Anxiety among Adults? A Systematic Review of Interventions

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### Abstract

This review aimed to find the most effective intervention for the management of dental anxiety among adults by way of a systematic review of Randomised controlled trials. Compared to European and US counterparts, the number of studies concerning the management of dental anxiety in the United Kingdom is limited. Several interventions have been reported with varying modes of action and duration. Two main groups of interventions: pharmacological and psychological/behavioural have been implemented. The pharmacological interventions employ the use of centrally acting sedatives whereas the psychological/behavioural interventions serve to change the behavioural and learning effects of dental anxiety. A third group operationally defined as "Complementary" for the purpose of this review consists of holistic therapies such as acupuncture, music distraction and aromatherapy for in the management of dental anxiety. Although reduction of dental anxiety before and after dental treatment has been recorded historically in the majority of trials, these have mainly investigated psychological/behavioural interventions. Exploring more recent trials, this study uncovers the benefits of complementary interventions for managing dental anxiety in adults and computer based variants of psychological/behavioural interventions. None compared the efficacy of one type or group against the other. Also, outcomes such as avoidance of dental treatment and economic implication of interventions were scarcely evaluated thus evidence on this remains inconclusive. The need for further investigation of these outcomes as well as those in Complementary Therapies is justified.

**Keywords:** Anxiety; Interventions; Complementary therapies

### Introduction

Dental anxiety affects about 4-30% of adults across the world [1,2]. This condition is known to be associated with avoiding the dental environment all together as a mechanism to cope with the anxiety and further leads to a deterioration of oral health status and oral health related quality of life [2-6]. Factors implicated in the anxiety of dental anxiety include fear of dental pain, discomfort, perceived lack of control over dental events, perceived negative attitude of dental staff, influence of other dentally anxious peers, past traumatic dental experiences [7-11].

In the United Kingdom alone according to the 2009 adult dental health survey, 40% of the adult population had some degree of dental anxiety [10]. Anxiety towards dental procedures often results in delay, postponement or cancellation of appointments. A radiographic examination of the oral status among adults with dental anxiety showed that they had more decayed teeth, higher number of missing teeth and gum problems compared to non-anxious patients [13]. Many patients report that shame and embarrassment are common experiences; as dental conditions deteriorate tends to escalate and constitute a financial burden [14].

To address the numerous consequences of dental anxiety, various interventions have been employed to reduce dental anxiety. These include pharmacological agents for general anaesthesia or sedation prior to the commencement of dental treatment; the use of cognitive and behavioural approaches (psychological interventions) and the use of complementary interventions. The use of pharmacological agents for

management of dental anxiety provide the dentist ample opportunity to perform extensive procedures within a shorter time but since the patient is unaware of procedures done under general anesthesia or sedation, he/she doesn't benefit from any positive experiences during the usual treatment (without general anesthesia) [15]. The use of cognitive/behavioural interventions has also been widely researched with studies showing a reduction in self-reported dental anxiety [18-20]. Complementary interventions such as the use of music therapy, aromatherapy and acupuncture are also interesting developments that present the need to explore their efficacy in managing dental anxiety [15-17]. Another avenue that has been explored in the management of dental anxiety is use of online dental support groups for anxious adults. A study of an online support group reported that participants found the group to be useful in assisting them to confront their debilitating anxiety and successfully receive dental care [21]. The ability of a dentist to identify an anxious patient from the moment he/she enters the dental clinic is a valuable step in the management of dental anxiety outset [22]. Ancillary members of the dental team may also be able to contribute to the management of dental anxiety as they are often the first in line of management of a dental patient [23].

The problem and management of dental anxiety as well as the negative impact on the oral health and oral health related quality of life has been researched since the 20th century [11,24]. Yet oral health policies in the United Kingdom till date are devoid of strategies to tackle such an important determinant of oral healthcare utilization [25]. Furthermore, guidelines for the management of dental anxiety in the United Kingdom are predominantly available for children [26]. The present management of dental anxiety among adults in the United

Kingdom typically involves referring them to special care dentistry clinics or clinics of oral medicine [15].

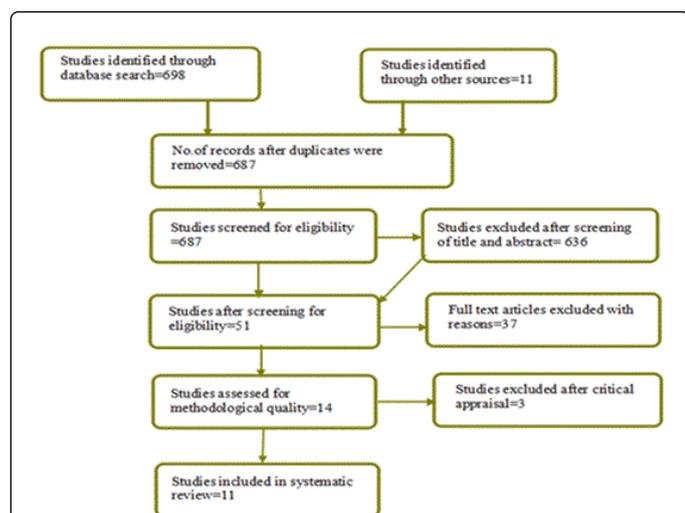
The purpose of the present review was to systematically review available literature and present evidence on the most effective intervention to reduce dental anxiety.

## Methods

**Search Strategy:** A three stage search strategy was used search for studies reporting randomized controlled trials RCTs published in English language spanning from January 2007 to June 2014. The first stage included a limited search of databases such as Cochrane Central register of trials, EMBASE, PUBMED and MEDLINE to identify search terms followed by an analysis of the text words in the title and abstract, and search terms in the article. A second stage search using all identified keywords and index terms was then undertaken. The third step consisted of a search of the reference lists of all identified reports and articles for additional studies as well as unpublished studies from grey literature. Hence the following databases : Cochrane Register of Trials, MEDLINE, EMBASE, Trip database, Clinical trials.gov, NHS evidence, DISCOVER, CINAHL were searched.

## Study selection

Studies had to fulfil the participant, intervention and outcome components of the question. and studies were all randomised controlled trials on interventions for management of dental anxiety among adults. Studies were excluded after screening through titles, abstracts and then inclusion and exclusion criteria. Participants were adults older than 18 years of age who did not have confounding anxiety disorders, learning disabilities or special needs. Included interventions were pharmacological interventions (use of benzodiazepines); non-pharmacological/psychological interventions (based on cognitive behavioural therapy and behavioural therapy (CBT/BT) and a third group called complementary therapies for the purpose of this study (these included acupuncture, music therapy, muscle relaxation, aromatherapy). Studies were not selected by outcome (Figure 1).

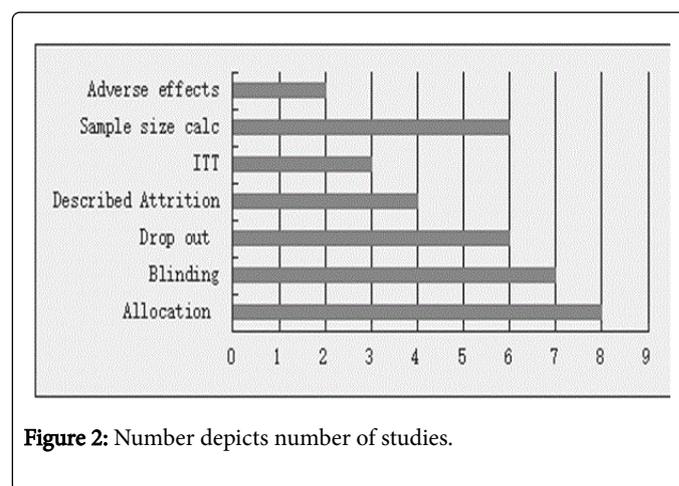


**Figure 1:** The PRISMA flow chart used to document the selection of studies.

## Assessment of quality of included studies

Studies in this review were assessed using the Critical Appraisal Skills Program (CASP) toolkit [23]. This tool kit evaluated randomization, accountability for patients, blinding of participants and investigator, withdrawals, treatment effect, applicability of study results to clinical practice or local context. This tool did not have a scoring system. Assessment of individual components of methodological quality was carried out and a pictorial representation of risk of bias is shown below (Figure 2).

**Data Extraction:** Data from the included studies were extracted using the Joanna Briggs institute data extraction tool.



**Figure 2:** Number depicts number of studies.

## Results (Data Synthesis)

After assessing for methodological quality and inclusion and exclusion criteria, 11 studies were included in this systematic review. A total of 1316 participants were randomized into groups and 1254 completed the studies with an age range of 18-65 years. The included studies were published between 2007 and 2013. Three of the studies took place in the USA [28-30]. Eight took place in Europe 2 in the UK [31,32], three in Germany [18-34] one in Austria [19,20]. another in Greece [20] and the last in Norway [17]. All 11 studies evaluated the effects of intervention on dental anxiety, state dental anxiety [17-32,34] dental phobia [33] and dental injection phobia [28].

The interventions included were: Pharmacological (4 mg of intranasal midazolam [34]; 0.5 mg and 0.75 mg Alprazolam [30]). The complementary interventions included the use of auricular acupuncture [19,34] Lavender scent oil [30]; brief relaxation and music therapy [18]. The psychological interventions included the use of Cognitive behavioural therapy (CBT) [17] Process simulations [31]; Eye movement desensitization and reprocessing (EMDR) [33] Completion of dental anxiety survey [32]; Biofeedback technique [28]; Computer assisted relaxation learning (CARL) [29].

Outcome measures were dental anxiety scales such as dental anxiety survey (DAS) ,modified dental anxiety scale (MDAS), visual anxiety scale (VAS), Spielberg state trait anxiety inventory; X1 form (STAI-X1) and dental fear scale (DFS). Results were expressed as mean scores of dental anxiety scale by group and p values of mean differences.

The findings, summarised in Table 1, will be discussed using intervention groups: Pharmacological, non-pharmacological/psychological.

## Meta-Analysis

This statistical analysis of data from trials in a study increases the how precise the estimate of a treatment effect is and can be applied when results are presented in odds ratios, relative risks [35]. This is not

the case with this review. Trials in this review presented results using different interventions, diverse outcome measures, and varied methods of analysis. Though a meta-analysis was considered initially, it was not possible.

No.	Author's name	Type of Design	Type of Intervention	Is study in favour of experimental or control group	Outcome measure	Outcome I	Outcome II	Intervention/Mean anxiety scale scores	Intervention/Mean anxiety scale scores
								Pre treatment	Post treatment
1	Coldwell et al. [30]	Randomised controlled trial	Pharmacological vs. Psychological intervention	No	DAS Scores	Dental anxiety	Avoidance of Dental Appointments	NR	NR
2	Karst et al. [34]	Randomised controlled trial	Pharmacological vs. Complementary intervention	Yest to both	STAI-IX and VAS Scores	State dental anxiety		(STAI-IX) Aur Acu: 50.47(8.83) Pla Acu: 49.32(13.49) Mida: 56.53(9.61) CNTRL: 53.00(9.61)	Aur Acu: 41.84 (12.72) Pla Acu: 39.16(9.87) Mida: 38.68(9.19) CNTRL: 47.20(12.78)
3	Haukebo et al. [17]	Randomised controlled trial	cognitive behavioural therapy, one vs. five sessions and wait-list	Yest to both	DAS, DFS, BAT, DBS scores	State dental anxiety	Avoidance of dental treatments	(DAS) One S: 16.6 (2.8) Five S: 16.6 (2.8)	One S: 10.4 (3.4) Five S: 10.1 (3.2)
4	Hull and Humphris [32]	Randomised clinical trial	Behavioural therapy	Yes, dental anxiety reduced when patient knew that dentist received Das and discussed their anxiety with them	Mean STAI-s scores	State dental anxiety		NR	NR
5	Kritsidima et al. [20]	Cluster Randomised controlled trial	Complementary intervention (Lavender vs. control)	Yes	STAL-6 score, MDAS	State dental anxiety		(STAI-6) LAV: 9.84 (4.74) CNTRL: 10.65 (5.40)	LAV: 7.41 (2.43) CNTRL: 10.71 (4.35)
6	Michalek-Sauberer et al. [19]	Randomised controlled trial	Complementary intervention (Acupuncture vs. control)	Yes	STAI, VAS scores	State dental anxiety		(STAI)Aur Acu: 54.7 (10.8) Sham: 51.9 (10.2) CNTRL: 51.0 (11.7)	Aur Acu: 46.9 (10.4) Sham: 48.4 (10.0) CNTRL: 54.0 (11.6)
7	Lahmann et al. [18]	Randomised controlled trial	Complementary intervention (Brief relaxation, music distraction and control)	Yes	STAI, HAQ scores	State dental anxiety		(STAI) BR: 42.4 (10.4) MD: 41.3 (9.6) CNTRL: 41.9 (11.5)	BR: 29.4 (6.3) MD: 36.8 (9.8) CNTRL: 41.9 (11.5)
8	Doering et al. [31]	Randomised controlled trial	Psychological intervention (Eye movement densitisation and reprocessing vs. wait-list group)	Yes	Post treatment DAS scores 3.6.12 month follow up with DAS, DFS scores	Dental phobia	Avoidance of dental visits	(DAS) EMDR: 18.2 (1.6) CNTRL: 18.1 (1.8)	EMDR: 12.2 (2.9) CNTRL: 17.9 (1.2)
9	Morarend et al. [28]	Explorator Randomised controlled trial	Psychological intervention (Biofeedback technique and control)	Yes	VAS, DAS scores	Negative feeling toward dental injection (Dental Anxiety)		(VAS) RESP: 15.05 (2.91) CNTRL: 14.20 (3.11)	RESP: 9.9 (2.94) CNTRL: 8.88 (2.34)

10	Armitage and Reidy [31]	Explorator Randomised controlled trial	Psychological intervention (Process simulation of dental treatment)	Yes	STAI scores	State dental anxiety	(STAI) P.S: 2.06 (0.80) CNTRL: 1.55 (0.51)	P.S: 2.20 (0.83) CNTRL: 1.73 (0.46)
11	Heaton et al. [29]	Randomised clinical trial	Psychological intervention (Computerised systemic desensitisation and control)	Yes	MDAS, scores	DAS Dental fear	(MDAS) CARL:19.6 (14.0) CNTRL: 20.5 (3.0)	CARL: 13.5 (3.0) CNTRL: 18.5 (3.0)

**Table 1:** Summary of findings.

## Discussion

A larger number of studies in this review evaluated psychological/behavioural interventions compared to those evaluating pharmacological or complementary interventions. 6 of 11 trials used psychological approaches such as one or five sessions of CBT [17]; systematic desensitization [29,30]; biofeedback techniques [28]; process simulations [31]; eye movement desensitisation and reprocessing (EMDR) [33] and completion of dental anxiety questionnaires with the knowledge that the dentist would be willing to discuss their anxiety [32]. Results were found to statistically significant in five of these RCTs. Two RCTs reported the use of pharmacological interventions where the reduction in dental anxiety was not statistically significant. The third group applied the use of music distraction [18], auricular acupuncture [19] and aromatherapy (lavender scent oil) [33] and were found to reduce dental anxiety among patients.

Other outcomes such as reduction of avoidance behaviour, adverse outcomes and economic implication were scarcely evaluated in included RCTs. Four studies in this review assessed this outcome with follow up periods of up to one year. Economic implication of interventions were not reported in any of the trials, however authors of the two complementary interventions concluded that they were inexpensive as they did not require any specialised equipment [18,20]. Adverse reactions were reported in two RCTs where 7% of participants who received intranasal midazolam (pharmacological intervention) described burning sensations in their nostrils [34]. 20% of participants who received auricular acupuncture also complained of tingly sensations on the ear where they had received acupuncture [19].

Another important finding was the use of computer based interventions. Computer assisted relaxation learning (CARL) which is based on systematic desensitisation [28-30] and even cognitive behavioural therapy (CBT) were shown to reduce dental anxiety. This mode of administration could become useful and easily accessible to anxious adults from the comfort of their home. A meta-analysis of internet and computer based CBT showed that they were superior to control conditions in the reduction of anxieties in adults [36].

The reduction in dental anxiety was reported by various dental anxiety scales and questionnaires without uniformity or particular detail on number or percentage of participants who actually showed this reduction or the magnitude of the reduction. Adequate diagnosis and stratification of levels of dental anxiety among participants was reported in only two studies [26,29]. This lack of diagnosis makes it difficult to accurately measure rate of improvement of participants

hence results are only generalizable without specific indication for management of people with lower or higher levels of dental anxiety/phobia [37].

This review included trials which were published within the last seven years. A longer duration and a wider hand search to include journals and studies not published in English language may also have returned more studies. Some studies scored low on the CASP toolkit used to assess for methodological quality but were included in this review. This gave the opportunity to compare various studies, note strengths and limitations and then make recommendations.

## Recommendations for Research

### Diagnosis

Different levels of dental anxiety would require different forms of intervention and in some cases a combination of interventions. Hence case-studies or trials matching interventions to level of anxiety are recommended.

### Sample sizes

Sample sizes of trials in this review were quite small as they ranged from 31 to 340 participants which minimizes generalizability the chances of concluding that positive results in a small population will be the same in the larger general population.

### Follow-up

Only two studies assessed effect of intervention on participants at follow-up intervals ranging from 1month to a year; and therefore could not assess the long term benefits. It is therefore recommended that studies measure outcomes at longer follow up intervals.

## Recommendations for Practice

Evidence from this review supports the application of psychological/behavioural interventions in the management of dental anxiety among adults. The use of dental anxiety questionnaires may be employed as a routine measure within general medical and dental practices to identify dentally anxious adults, refer where necessary and manage as appropriate. Computer-based psychological interventions have been indicated as effective in reducing dental anxiety.

## Conclusion

Although this review set out to compare the effectiveness of one intervention against the other, studies were mostly found to be compared against a control condition with the exception of one study. The results of this systematic review indicate the short term benefits of psychological interventions over the pharmacological and complementary interventions in reducing dental anxiety within a clinical setting. This conclusion is not considered firm due to the lack of uniform measurement of dental anxiety; inadequate evidence of adverse effects and economic implication and short length of follow-up in most of the trials.

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