

An Experimental Study of the Effects of Psychological Interventions on Adult Patients with Dental Anxiety

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Abstract

Dental anxiety is a common problem and is considered an obstacle to providing quality dental care to patients. The present study was conducted to determine the prevalence of dental anxiety among patients under going restorative procedures in a university dental clinic, to determine the effect of a combination of psychological interventions (psychoeducation, relaxation therapy, and modeling technique) in reducing dental anxiety within and between experimental and control groups, and to identify differences in concern or anxiety towards dental procedures between pre-assessment, post-assessment, and follow-up assessment of experimental and control groups. Corah's Dental Anxiety Scale, Revised (DAS-R) measured dental anxiety prevalence, and the Dental Concerns Assessment (DCA) identified factors causing dental anxiety. Patients experiencing dental anxiety were randomly assigned into an experimental or control group. Experimental group patients (n=15) received a 45-minute session of a combination of psychological interventions to reduce dental anxiety, whereas control group patients (n=15) received dental treatment as usual from general dental practitioners. A *t*-test and One-way analysis of variance were used for analyses. Results show that out of 65 patients, 41 had dental anxiety (prevalence 63.1%). Experimental group patients showed significant reduction in the post-assessment and follow-up DAS-R scores ($F=18.85$, $P<0.01$) compared with pre-assessment scores. Significant reductions in post-assessment DCA scores were found for extraction, injection, and sound or vibration of the drill for the experimental group compared with pre-assessment scores ($P<0.03$). Over all, the combination of psychoeducation, relaxation therapy and modeling technique was effective at reducing dental concern and anxiety of dental procedures.

Keywords: dental anxiety, psychoeducation, modeling, relaxation therapy

1. Introduction

Dental anxiety has been described as “an overwhelming feeling of tension, dread and apprehension associated with an unknown threat involving dentistry” (Bray et al., 2009) and is the fifth most commonly feared situation (Hmud & Walsh, 2009). Hmud and Walsh (2009) described dental anxiety as a complex phenomenon that may result from characteristics specific to an individual patient, a fear of pain, previous dental experiences that were traumatic, previous negative dental experiences of family members or friends, and fears about blood-related injury.

One of the consequences of dental anxiety is that patients avoid treatment for dental problems, resulting in poor oral health status (Hmud & Walsh, 2009). An epidemiology study revealed that about 30% of dental anxiety patients did not have regular dental attendance (Hagglin et al., 1996), which can lead to significant deterioration of oral health and contribute to a vicious cycle of cumulative anxiety and increasing avoidance (Armfield, Stewart, & Spencer, 2007). One study found this behavior was highly correlated with anxiety level, comorbidity problems, and decayed, missing, and filled surfaces scores (Eitner et al., 2006). In another study, patients with dental anxiety had a statistically significant higher number of decayed and missing teeth, but a lower number of filled teeth (Schuller, Willumsen, & Holst, 2003). The dental anxiety of patients can also be a source of stress for

some dentists. Many dentists believe that treating anxious patients is challenging because these patients require longer treatment time and frequently cancel scheduled appointments (Moola, Pearson, & Mejia, 2012).

In view of the serious consequences that dental anxiety has on deterioration of oral health and quality of life, several methods have been proposed to manage it. Some of the methods include explanation of the treatment procedure, pharmacological strategies, biofeedback, hypnosis, behavioral interventions, and relaxation (Moola, Pearson, & Mejia, 2012). Several self-coping strategies, such as increased self-efficacy, distracting the mind from dental anxiety, and praying to enhance self-confidence, have been shown to effectively reduce dental anxiety (Moola, Pearson, & Mejia, 2012; Bernson, Elfstrom, & Berggren, 2007).

A few researchers (Berggren, Hakeberg, & Carlsson, 2000; Hmud & Walsh, 2009; Moola, Pearson, & Mejia, 2012) have used a combination of psychological techniques to reduce dental anxiety, but none have used a combination of psychoeducation, relaxation therapy, and modeling technique. A combination of these specific techniques may be useful for educating patients about dental anxiety causes and consequences, management of adverse psychophysiological effects (trembling, sweating, palpitation, etc.) of dental anxiety, and awareness about dental treatments. Previous studies (Armfield, 2010; Bernson, Elfstrom, & Berggren, 2007; Berggren, Hakeberg, & Carlsson, 2000; Corah, 1969; Eitner et al., 2006; Moola, Pearson, & Mejia, 2012; Ronis, 1994; Ronis, Hansen, & Antonakos, 1995; Schuller, Willumsen, & Holst, 2003) have investigated these techniques in relation to cognitive behavior therapy, but cognitive behavior therapy requires more sessions and patients are required to learn many psychological techniques to reduce dental anxiety. A simple psychological technique would be useful for patients to comprehend and easy to implement, and if the psychological session is short patients may be more willing to participate.

The present study was designed to identify the prevalence of dental anxiety among patients attending a university dental clinic in Malaysia, to determine the effectiveness of combination of psychological interventions consisting of Psychological Education (PE), Brief Relaxation Therapy (BRT), and Modeling Technique (MT) to reduce dental anxiety within (pre-assessment, post-assessment, and follow-up assessment) and between experimental and control groups, and to identify the differences in concern or anxiety towards dental treatment between pre-assessment, post-assessment, and follow-up assessment of experimental and control groups. The present study tested the hypothesis that patients who received psychological treatment would show significant reduction in dental anxiety compared with patients who did not receive psychological treatment. Secondly, patients who received psychological treatment would show significant reduction in post-assessment and follow-up assessment of dental anxiety compared with their pre-assessment scores. Third, patients who received psychological intervention would show significant reduction in their scores of concern and anxiety towards having dental treatment compared with the control group.

2. Materials and Method

2.1 Participants

Sixty-five patients attending a university dental clinic in Malaysia were approached to participate in the present study: 26 males and 39 females, mean (standard deviation) of the age of the participants was 39 (1.64) years. Of the 65 patients, 41 were identified as experiencing dental anxiety by using the Dental Anxiety Scale-Revised (DAS-R). Of those 41 dental anxiety patients, 30 patients agreed to participate in the dental anxiety reduction part of this research. The present study included patients who scored a 9 or above on the DAS-R, were able to understand and English, and had orally confirmed their dental anxiety with study researchers. Exclusion criteria were patients with a history of mental illness and/or the use of any anxiolytic drug; these criteria were identified from the demographic information scale.

2.2 Instruments

2.2.1 Assessment of Demographic Information

A Demographic Information Scale (DIS) was prepared specifically for the present study to collect data on gender, age, educational status, and past and current history of mental illness.

2.2.2 Assessment of Dental Anxiety

The DAS-R is used to measure dental anxiety and is scored using a 5-point Likert scale. Scores range from 4 to 20 points. A score of 4-8 points is defined as no dental anxiety, 9-12 points as moderate anxiety, 13-14 points as high anxiety, and 15-20 points as severe anxiety. It has been widely used by many researchers to measure dental anxiety (Armfield, 2010). It has a Cronbach's α coefficient of 0.82 indicating adequate reliability (Ronis, 1994; Ronis, Hansen, & Antonakos, 1995).

2.2.3 Assessment of the Concern or Anxiety towards Dental Treatment Procedures

The Dental Concerns Assessment (DCA) (Clarke & Rustvold, 2015) is used to identify the important factors causing dental anxiety. It consists of 26 items and is measured using a 4-point Likert scale. Some of the items on the DCA are the following: sound or vibration of the drill, fear of being injured, x-rays, etc. Participants who scored a 2 or above on the DCA were considered as experiencing anxiety towards the dental treatment procedures.

2.3 Procedures

After obtaining ethics and research approval from the International Medical University in Malaysia, patients seeking restorative treatment, such as composite restoration and crown preparation, were explained the objective of the present study and asked to participate. Patients who required oral surgery procedures were excluded from the study since these patients generally present with more fear. Patients who were willing to participate in the study provided their written informed consent before they completed the DIS, DAS-R, and DCA questionnaires. The 41 patients who exhibited dental anxiety according to DAS-R scores were randomly assigned into an experimental or control group. Randomization of participants was done by using SPSS statistical software, and randomization was performed by the study investigator who did not provide the intervention. Prior to their restorative treatment, patients in the experimental and control groups were contacted by telephone to confirm their scheduled treatment. Thirty of the 41 patients (15 from the experimental group and 15 from the control group) were willing to continue participation in the study and confirmed their consent to participate.

The 15 patients in the experimental group received 1 session of psychological interventions which occurred 45 minutes prior to their dental restorative treatment; the 15 control group patients also received 45 minutes of advice, suggestions, and dental education to ease their dental anxiety from the dental officer who provided treatment. Both groups then had their dental treatment as normal. The experimental group patients were told that the psychological treatments were part of the dental treatment to reduce their dental anxiety. The psychological interventions for the experiment group were given in one of the dental consultation rooms. The dentists who provided psychological interventions for the experimental group and the advice, suggestions, and dental education for the control group were equally qualified. To avoid bias, the dentist who provided treatment for the control group was unaware that he was providing treatment for the control group.

In this experimental study, a pre, post, and follow-up design were used. Both groups of patients completed the post-assessment DAS-R and DCA questionnaire after the second dental visit. Participants completed the DAS-R and DCA when they came for a follow-up assessment a week later. The pre-assessment, post-assessment, and follow-up assessments were conducted by the study investigator who did not provide the intervention for the study participant. Control group participants who showed dental anxiety after the follow-up assessment were referred to a dentist to receive psychological treatment for their dental anxiety.

2.4 Psychological Intervention

Combinations of psychological interventions (PE, BRT, and MT) were used to reduce dental anxiety in experimental group patients. For PE, participants were educated about dental anxiety, the symptoms of dental anxiety, the prevalence of dental anxiety, available treatments for dental anxiety, the mind and body relationship, the effect of dental anxiety on dental treatment, and the rationale for dental anxiety treatment. To provide a more problem-based education, the reason for dental fear and past bad experiences with dental treatment, such as insufficient anesthesia, were also discussed. Following PE, the patient watched a video demonstrating the dental treatment procedure in order for them to understand the procedure. Patients were also allowed to look at the dental treatment room and touch the dental instruments, such as the dental hand piece and periodontal probe, to help them overcome their fear towards dental instruments and the treatment room. Before the dental treatment was performed, the patient was taught BRT to reduce tension in the facial muscles and body. Patients were instructed to sit comfortably on the chair, close their eyes, and take 3 deep and slow breaths. After that, instructions were given to help patients relax the body by tensing and relaxing facial muscle groups.

2.5 Data Analysis

SPSS version 20 (IBM Corp., 2011) was used to analyze the study data. Descriptive statistics were used to measure the prevalence of dental anxiety. A *t*-test was used to determine differences between the experimental and control groups. Finally, analysis of variance was used to compare the differences of dental anxiety among pre-assessment, post-assessment, and follow-up assessment of the experimental group. The same test was used to determine control group assessment differences. Significant was set at $P < 0.05$.

3. Results

3.1 Prevalence of Dental Anxiety

Out of 65 participants, 41 (63.1%) experienced dental anxiety and 24 (36.9%) did not. There were no differences between groups for dental anxiety, gender, age, and education ($P>0.09$).

3.2 Difference between and within Groups of Dental Anxiety Scores

Table 1 presents the pre-assessment, post-assessment, and follow-up assessment between experimental and control groups. There were no significant differences between groups. There was a significant difference between the groups in DAS-R score reduction from pre-assessment to post-assessment ($t(28)=2.65$, $P=0.01$).

Table 1. Analysis of differences between the experimental and control groups

DAS-R Score	Experimental		Control		t(df)	P Value
	Mean	SD	Mean	SD		
Pre-assessment	12.13	2.10	10.80	2.40	1.43 (27)	0.17
Post-assessment	8.00	1.89	9.20	3.55	-1.14 (27)	0.27
Follow-up assessment	8.43	2.06	9.07	2.99	-0.66 (27)	0.51
DAS-R score reduction						
Pre to post DAS-R score	4.13	2.10	1.60	3.04	2.65 (28)	0.01*
Post to follow-up DAS-R score	-0.43	1.99	0.13	3.60	-0.52 (27)	0.61

Notes. DAS-R=Corah's Dental Anxiety Scale, Revised. SD=standard deviation. *=significant at $p<0.05$.

3.3 Differences among Pre-Assessment, Post-Assessment, and Follow-Up Assessment for Experimental and Control Groups

Table 2 shows a significant difference ($F=18.855$; $P<0.001$) among pre-assessment, post-assessment, and follow-up assessment for the experimental group. A post hoc Tukey test showed significant differences between pre-assessment and post-assessment ($P=0.001$) and between pre-assessment and follow-up assessment ($P<0.001$), but no significant difference was found between post-assessment and follow-up assessment ($P=0.84$). There were no significant differences for the control group between pre-assessment, post-assessment, and follow-up assessment.

Table 2. Differences among pre-assessment, post-assessment and follow-up assessment of dental anxiety

DAS-R Score	N	Mean	SD	F	P Value
Pre-assessment	15	12.13	2.10	18.855	0.001*
Post-assessment	15	8.00	1.89		
Follow-up assessment	14	8.43	2.06		

Notes. SD=standard deviation. *=significant at $p<0.05$.

3.4 Analysis of Dental Anxiety Reduction for Experimental and Control Groups

Table 3 illustrates the dental anxiety recovery (based on DAS-R cut off score of 9) in the experimental and control groups. Both groups had a reduction of dental anxiety between pre-assessment, post-assessment, and follow-up assessment, but the experimental group had a larger reduction.

Table 3. Analysis of dental anxiety reduction in the experimental and control groups

Experimental group	Dental anxiety		No dental anxiety		Total	
	Number	%	Number	%	Number	%
Pre-assessment	15	100.0%	0	0.0%	15	100%
Post-assessment	2	13.3%	13	86.7%	15	100%
Follow-up assessment	4	28.6%	10	71.4%	14	100%
Control group						
Pre-assessment	15	100.0%	0	0.0%	15	100%
Post-assessment	10	66.7%	5	33.3%	15	100%
Follow-up assessment	8	53.3%	7	46.7%	15	100%

3.5 Differences in Dental Concern between Experimental and Control Groups

Participants who scored above a 2 and above for each item of the DCA were considered as experiencing concern (anxiety) about dental treatment procedures. Of the 26 items on the DCA, the present study found 5 major concerns of study participants: extraction, cost of treatment, fear of being injured, injection, and sound or vibration of the drill. Table 4 shows that patients from the experimental group had significant reduction in their level of concern related to extraction ($P=0.002$), injection ($P=0.03$), and sound or vibration of the drill ($P=0.01$). Table 5 shows that patients from the control group had a significant reduction in their level of concern only for extraction ($P=0.02$)

Table 4. Dental concern assessment analysis for the experimental group

Dental Concern	Mean score		t	P Value
	Pre-assessment	Post-assessment		
Extraction	2.91	1.91	4.282	0.002*
I am worried about the cost of the dental treatment	2.56	2.22	0.894	0.40
Injection	2.60	1.70	2.586	0.03*
Fear of being injured	2.29	2.00	0.795	0.46
Sound or vibration of the drill	2.88	2.25	3.416	0.01*

Note. *= significant at $p<0.05$.

Table 5. Dental concern assessment analysis for the control group

Dental Concern	Mean score		t	P Value
	Pre-assessment	Post-assessment		
Extraction	2.90	2.40	3.000	0.02*
I am worried about the cost of the dental treatment	2.60	2.20	1.309	0.22
Injection	2.57	2.29	0.603	0.57
Fear of being injured	2.33	1.83	1.168	0.30
Sound or vibration of the drill	2.20	2.20	0.000	0.99

Note. *=significant at $p<0.05$.

4. Discussion

Dental anxiety poses a significant problem for both the dental patient and the dentist. The present study investigated the effectiveness of a combination of PE, BRT, and MT for managing dental anxiety. The prevalence of dental anxiety in the present study was 63.1%. This result is comparable with the reported prevalence of 60% in Brazil (DeMoraes, 1994). However, our prevalence rate was lower compared with the reported dental fear prevalence of 80% in Japan (Domoto et al., 1988) and with other reported rates of 94.10% (Savithri & Esa, 2008), 85.10% (Kadir, Ling, & Chong, 2010), and 95.20% (Manab & Ahmad, 2012) from Malaysia. Although these previous studies used different experimental designs, it may be useful to make these dental anxiety prevalence comparisons. The differences between our results and previous results may be due to our study's inclusion criteria in that we enrolled only restorative dental patients. Further, we did not include patients undergoing invasive dental treatments, such as extraction or minor oral surgery. When compared with other Western countries, our dental anxiety prevalence result was higher than the prevalence of 16.1% in Australia (Armfield, Spencer, & Stewart, 2006) and 17.0% in Ireland (Brady, Dickinson, & Whelton, 2012). Our higher dental anxiety prevalence in comparison with Western populations could be due to better oral healthcare awareness and advanced technologies for dental treatment in the Western populations (Armfield, Spencer, & Stewart, 2006; Brady, Dickinson, & Whelton, 2012; Kadir, Ling, & Chong, 2010).

The present study found no evidence to support our first hypothesis that patients who received psychological treatment would show significant reduction in dental anxiety compared with patients who did not receive psychological treatment. We found no significant differences between the experimental and control groups. However, the mean DAS-R scores of experimental group patients were lower compared with control group patients in the post-assessment and follow-up assessment. Significant differences were also found when subtracting the pre-assessment mean score from the post-assessment mean score for the experimental and control groups. Possible explanations for our non-significant differences between the experimental and control groups may be due to small sample size and because the control group also received treatment from a dentist that included advice, suggestions, and education to manage their dental anxiety. However, experimental group patients who received the psychological intervention had a lower mean score compared with the control group, and our paired *t*-test showed the experimental group had a significant difference between pre-assessment and post-assessment. This result suggested that the psychological intervention reduced dental anxiety among the experimental group patients.

Results of the present study supported our second hypothesis that patients who received psychological treatment would show significant reduction in post-assessment and follow-up assessment of dental anxiety compared with their pre-assessment scores. The experimental group had a significant reduction in dental anxiety for post-assessment and follow-up assessment compared with pre-assessment. Previous studies have also found similar reductions in dental anxiety among patients who received cognitive therapy (Berggren, Hakeberg, & Carlsson, 2000), brief relaxation technique (Lahmann et al., 2008), video training (Moore, 1991), behavior therapy (Kuscu, Caglar, & Sandall, 2014) relaxation training (Berggren, Hakeberg, & Carlsson, 2000), and clinical rehearsal (Moore, 1991). However, combinations of the psychological techniques used in the present study (PE, BRT, and MT) for a shorter period of time seemed to reduce dental anxiety, and this combination of techniques has not been used by previous researchers. For example, PE alone may not be sufficient for the patient to learn how to manage physiological complications (sweating, trembling hands, or palpitation) due to dental anxiety. As such, providing BRT with PE is useful to manage psychological anxiety and physiological complications due to dental anxiety. Further, PE is effective because it provides verbal support and reassurance to the patient while the clinical procedure is explained (Hmud & Walsh, 2009). The MT used in the present study can be useful to reduce dental anxiety since patients who were exposed to the dental treatment room and dental instruments before their treatment were able to overcome their dental anxiety. Regarding the use of BRT and MT, our results were consistent with results from a previous study where patients receiving BRT and MT were able to control their perception of stress and thereby reduce their pain sensitivity (Armfield, Stewart, & Spencer, 2007).

Results of the present study partially supported our third hypothesis that patients who received psychological intervention would show significant reduction in their scores of concern and anxiety towards having dental treatment compared with the control group. Patients in the experimental group had significant reductions in their dental anxiety concerns regarding extraction, injection, and sound or vibration of the drill for the post-assessment. By allowing patients access to the dental treatment room and having them watch videos of the dental treatment, our psychological intervention eased their dental anxiety. However, the cost of dental treatment and the fear of being injured during dental procedures were not reduced in the post-assessment for the experimental group.

Control group patients showed a significant reduction in dental anxiety concern only for extraction. Therefore, patients with dental anxiety would benefit from psychological interventions to reduce their anxiety about treatment procedures. Results of the present study suggest that dentists should screen for dental anxiety in their patients since these patients have poor treatment adherence because of anxiety (Jaafar et al., 1992).

Although the results of the present study suggested the psychological interventions used were effective for reducing dental anxiety, the feasibility of psychological interventions in clinical practice may still be questionable. Dental students may not be receiving training in dental school about how to manage dental anxiety patients using psychological assessment and interventions. Although many psychological treatments and assessments are available, choosing which psychological treatment and assessment is suitable for the patient is a challenging task (Armfield & Heaton, 2013). Further, completing the psychological questionnaire may aggravate a patient's anxiety and choosing long-term psychological treatment may hamper the patient's adherence to the treatment. Thus, we recommend that future dentists practice how to manage the dental anxiety of their patients by using a brief psychological intervention. This kind of intervention would be useful because PE and MT do not require a long treatment time for effect (Moore, 1991). Some practitioners may have a shortage of time because of a large volume of patients and be unable to provide psychological counseling to reduce dental anxiety. We believe the psychological techniques of the present study would be useful for this situation since our intervention is a single session and the content was easy for patients to understand. We also recommend that dental students and dental hygienists learn these techniques during their dental training because these techniques effectively reduced dental anxiety during the pre-operative stage in the present study.

5. Conclusion

Overall, the present study found that a combination of psychological interventions was effective for reducing dental anxiety and dental concerns, such as injection, extraction, and sound of the drill. We believe these techniques are useful for dentists and patients because patients are more willing to follow dental treatment modalities and attend follow-up appointments when their dental anxiety is under control.

Conflict of Interests

This study authors declare that there is no conflict of interests regarding the publication of this article in International Journal of Psychological Studies.

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