

The Effects of Deep Diaphragmatic Breathing and Focused Attention on Dental Anxiety in a Private Practice Setting

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Introduction

Dental fear is one of the most pervasive forms of fear. A survey of residents of Dallas, Texas found that approximately 12% of the population reported high dental fear and approximately 18% reported moderate dental fear.² According to Sprouls, approximately 35 million Americans experience dental anxiety or fear that is so severe that it prevents them from receiving needed care. Another 10 to 12 million people were dental phobics.³

General anxiety and fear is defined as a state of uneasiness, apprehension, and agitation about future uncertainties or the presence of danger.⁴ Dental anxiety/fear is more specific; it is the patient's response to the stress specific to the oral health care situation.⁵ Dental phobia also is fear, but it is unreasonable, irrational, and unwarranted. The fear is severe enough that it causes an individual to avoid the dental office.³

Review of the Literature

Anxious dental patients delay or cancel appointments significantly more often than low-fear individuals.⁶ These patients are more likely to avoid seeing the dentist.⁷ The longer the time lapse since the last dental visit, the greater the anxiety, since the last visit is useful as a predictor of dental anxiety.⁸

Anxious patients are less satisfied with their teeth, less satisfied with oral health care, more likely to be edentulous, and more likely to

Abstract

Purpose. High dental anxiety is pervasive and associated with treatment avoidance and poor oral health. Ideally, anxiety reduction techniques should be easy to use, low in cost, non-pharmacological, comfortable, and effective. This study compared the effectiveness of two self-taught anxiety reduction techniques—breathing and focused attention—with a control group.

Methods. Anxiety was assessed in 272 adult private dental practice patients with a modified dental anxiety scale-revised.¹ Frequency of oral health care visits in the last 10 years to all dentists, including the current dentist, was collected. Immediately prior to the dental procedure, participants in the two experimental groups were given written instructions outlining the respective anxiety reduction technique they were to use. Efficacy of technique was assessed by subjective comparison to anxiety during previous oral health treatment. Participants also listed techniques that they believed to be effective for anxiety reduction.

Results. Twenty-six participants (9.56%) scored high in dental anxiety. High anxiety was associated with infrequent oral health care visits. Compared to the recall of anxiety experienced during prior treatment, there were no significant differences in anxiety between breathing, focusing, and control groups. But there was a trend toward decreased anxiety overall. Controls who reported infrequent visits and use of their own anxiety reduction technique showed significantly reduced anxiety.

Conclusion. Dental patients employ numerous strategies for anxiety reduction. Anxiety reduction techniques not yet practiced may place unwanted expectations on patients. It is suggested that oral health care practitioners be aware of the patient's preferred technique for coping with anxiety and encourage them to use self-help techniques.

Keywords. Dental anxiety, behavioral dentistry, anxiety management, relaxation therapy, self-help techniques, dental anxiety surveys

perceive themselves as having poorer oral health.^{6,9} They report experiencing more oral health problems such as toothache, difficulty chewing, or bleeding gums in the last 12 months.⁶ Dental anxiety also may interfere with dental procedures and increase the stress asso-

ciated with oral health care for both the patient and oral health care professionals.¹⁰

Fear of pain has been identified as a primary cause of dental anxiety.¹¹ A survey of college students found that drilling, tooth extraction, injections, fitting braces, and rough han-

dling by a dentist were reported as the most painful oral health experiences.¹² Some of the most frequently identified fear-producing stimuli were the syringe, anesthetic injection, and the sound and sensation of the dentist's drill.¹³ In recent years, the possibility of infection (i.e., HIV/AIDS infection) during oral health procedures also has been identified as fear-provoking.¹⁴

Davey studied the relationship between pain and dental anxiety.¹² He found that of those who had always been anxious about oral health care treatment, 93% reported at least one painful treatment experience, and 70% reported multiple painful experiences. In comparison, of those who had never been anxious about oral health treatment, 60% reported at least one painful treatment experience, and 7% reported multiple painful experiences. Similarly, Locker, Shapiro, and Liddell found that 71% of the general population reported having a painful dental experience, 23% a frightening experience, and 9% an embarrassing dental experience, and that these negative experiences strongly related to dental anxiety.¹⁵ Locker and colleagues noted that individuals who reported all three types of experiences (painful, frightening, and embarrassing) had 22.4 times the risk of being anxious, compared to those with no negative experiences.

While there is a strong association between dental anxiety and negative oral health care experiences, one must be cautious in claiming that negative experiences cause anxiety. Kent found that anxious patients recalled greater pain three months after treatment than was reported immediately following the treatment.¹⁶ This suggests that anxiety may influence recall in such a way that memories of oral health treatment may be reconstructed over time to become consistent with existing levels of dental anxiety and the expectations of painful treatment. Unfortunately, once dental anxiety is acquired, it is persistent, and expectations of future pain are changed little by pain-free techniques.^{17,18}

In addition to a number of pharmacological and cognitive behavioral techniques, techniques that modify breathing also have been found to reduce dental anxiety.¹⁹⁻²¹ Breathing techniques are associated with reducing overall arousal, increasing a sense of well-being, and improving the body's ability to cope with anxiety. The relaxation response—a breathing technique that is combined with positive self-statements or affirmations (e.g., I am relaxed)—has been associated with reducing fatigue, improving sleep, conserving energy, relieving stress, and reducing the tendency to smoke, drink, or use drugs.²² Heitkemper, Layne, and Sullivan used audio-taped instructions for paced respiration with 8 to 11-year-old children.²³ The respiration technique produced significant reductions in anxiety and expected discomfort scores in these children. McCaul, Solomon, and Holmes found that for individuals who were threatened with electric shock, slowing respiration to approximately half the normal rate by matching breathing to a timed visual signal, reduced the self-reported level of anxiety, finger-pulse volume, and physiological arousal (as measured by skin resistance).²⁴ McCaul et al. suggest that when respiration rate is decreased, respiration depth is likely to increase, and changes in both respiration rate and depth may be responsible for reductions in arousal and anxiety.²⁴ However, it must be noted that breathing techniques are subtle in their influence and may not be the sole solution for high arousal and anxiety. For example, in the study by McCaul et al., subjects who were threatened with electric shock and who used the slowed-respiration technique, still showed higher arousal rates than control subjects who were not threatened.²⁴

Additionally, distraction techniques have been found to reduce dental anxiety. Such techniques may include playing video games, watching videotapes, or listening to music. In a study by Corah, Gale, and Illig, patients who played a video ping-

pong game during dental procedures were less anxious than a control group that did not play the game.²⁵ Frere, Crout, Yorty, and McNeil found that patients who watched a videotape through an audiovisual (AV) eyeglass system reported less anxiety when using the AV glasses than when they did not.²⁶ Anderson, Baron, and Logan found that either incidental music or patient self-selected music played through headphones—coupled with the suggestion that music would help reduce stress—was more effective at reducing stress than a group who had no music to listen to.²⁷ This research supports the theory that overall attentional capacity is limited and that attention to negative, stress-inducing content is diminished by distraction techniques, such as listening to music.²⁷ They suggest that distraction strategies requiring more attention will be most effective at reducing dental stress.

The present study compares the effectiveness of two anxiety reduction techniques—a breathing technique and a focusing technique—to that of a no-technique control group. The breathing and focusing techniques were selected for further study because they encompass many of the qualities an ideal anxiety reduction technique possesses. An ideal technique would be one that is low cost, non-pharmacological, and easy to teach or deliver to the identified anxious patient. The technique would quickly reduce anxiety to a level where oral health care treatment is unaffected by anxiety and where patient comfort is maximized. It also would be therapeutic by teaching the patient how to control self-behavior while reducing fears and anxieties.

The breathing technique is a method of deep diaphragmatic breathing, and participants have the option of pairing a calming word or phrase with the breath. The focusing technique asks participants to direct and maintain attention to a part of the body, preferably the feet. It is hypothesized that patients who use the breathing technique will report

significantly less dental anxiety following the dental treatment than a no-treatment control group. It is further hypothesized that patients using the focusing technique will report significantly less anxiety than the control group, but significantly more than the breathing group. While both the breathing and focusing techniques recommend that a patient attend to an aspect of self (i.e., breath or feet), the breathing technique is anticipated to be more effective at reducing anxiety. In addition to occupying attention, the breathing technique alters the rate and rhythm of respiration, which may have increased the benefit.

The breathing and focusing techniques are low cost and non-pharmacological, but could be used in conjunction with mild anesthesia. Compared to a technique like systematic desensitization, which typically requires 8 to 10 training sessions, breathing and focusing techniques may require minimal training with instructions delivered by any of the oral health care team prior to dental treatment. These techniques rely on self-help/self-education with the patient learning how to control his or her own behavior and offers a sense of self-control, and mastery over anxiety.

Methods and Materials

Participants

Two hundred seventy-two patients, aged 17 to 79, seeking treatment at a private practice dental office agreed to participate. All adult patients were eligible for participation, regardless of prior or current oral health care procedure (dental hygiene and dental treatment including routine prophylaxis, extraction, root canal, etc.) or medication (anti-anxiety medication, nitrous oxide, local anesthesia, etc.). Adherence to federal and state regulations concerning the protection of rights and welfare of human subjects was maintained throughout this research.

Questionnaires

Pretreatment questionnaire packets included informed consent, demographics, oral health history, anxiety measures, and anxiety reduction techniques (for breathing and focusing groups only). Demographic data recorded gender and age. Oral health history data recorded approximate frequency of visits to the dentist (any dentist) in the last 10 years. Three categorical response choices were provided in regards to dental visit history: infrequent (0 to 5 times), regular (6 to 25 times), or frequent (26 or more times). Participants also reported the approximate frequency of visits to the current dentist (dentist in whose office data were collected) in the last 10 years.

The post-treatment questionnaire included a scale for rating the level of anxiety experienced during the current treatment, compared to anxiety experienced during prior oral health treatments. Participants also reported whether they used an anxiety reduction technique and whether the technique helped to reduce anxiety. Participants who did not use an anxiety reduction technique were asked to state their reasons for not doing so. Finally, participants were asked to describe other techniques that had been effective in reducing anxiety during previous oral health care visits.

Anxiety measures

Dental anxiety was measured with a modified version of the Dental Anxiety Scale-Revised (DAS-R).¹ The DAS-R is based on the Corah Dental Anxiety Scale (DAS).²⁸ The DAS and DAS-R have both been found to be reliable and valid measures of dental anxiety.^{5,29} Ronis revised the DAS in order to eliminate the implication that all dentists are male, to acknowledge the role of dental hygienists in oral health care, and to clarify the meaning of the first scale item (see below).¹ The DAS-R, like the DAS, is a four-item scale, which allows

scores in the range of 4 to 20. Scores of 13 or 14 indicate an anxious patient, while scores of 15 or higher indicate a highly anxious patient.²⁹

For use in this research, item one of the DAS-R was modified in tense and reference to a dental hygienist was added. Item one of the DAS-R initially read: "If you had to go to the dentist tomorrow for a checkup, how would you feel about it?" This item was modified to read: "How did you feel yesterday about coming in for your checkup today?" The responses were modified in tense to match the question. For example, response three was changed from, "I would be a little uneasy about it" to read "I was a little uneasy about it." Item one, response five was also modified to add the words "or hygienist." In its modified form it read: "I was very frightened of what the dentist or hygienist would do."

Given that the changes to the DAS-R were not construct-related (e.g., a verb tense modification and addition of the word "hygienist"), it was determined that use of the DAS-R norms was valid. Corah, Gale, and Illig's normative data suggest that private dental practice patients have the lowest mean values ($m=6.40$, $SD=2.80$), college students have moderate values ($m=9.33$, $SD=3.17$), and dental phobics have the highest values ($m=17.18$, $SD=1.80$).⁵

Anxiety reduction techniques

The breathing and focusing techniques were self-taught from written instructions that were printed on a single page and included in the questionnaire packet of the respective treatment group. As previously stated, the breathing technique was a method of deep diaphragmatic breathing. Participants had the option of pairing a calming word or phrase with each breath. The breathing technique was designed to occupy the participant's attention as well as reduce anxiety through the physiological means of slower and deeper breathing. The focusing technique required that the partici-

pant direct and maintain attention on a neutral part of the body (i.e., part of the body not undergoing the dental procedure). It was suggested that the feet may be used as a focus of attention.

Following treatment, each participant completed a post-treatment questionnaire, according to his or her respective treatment group. While the control group was not offered an anxiety reduction technique, control group participants were to state whether they had used an anxiety reduction technique. A positive response to this question was thought to indicate that the participant had used an anxiety reduction technique of his or her own.

Procedure

As patients arrived for oral health treatment, they were asked to participate voluntarily in the study and were provided informed consent documents. All consenting participants were assigned to the breathing, focusing, or control groups by random questionnaire packet delivery. In the wait time (approximately 10 to 30 minutes) immediately prior to oral health treatment, participants completed the demographic, dental history, and anxiety scale questionnaires, and participants in the breathing and focusing groups received written instructions for using either the breathing or the focusing technique. Verbal instructions were neither offered nor prompted (from participants). The oral health care staff were blind to study participation, although they answered participants' questions as needed. Immediately following treatment, each participant completed a post-treatment questionnaire. All participant responses were confidential.

Results

Of the 272 participants, 157 were female and 112 were male, (3 individuals did not offer gender information). Participants ranged in age from 17 to 79 with a mean age of

38.81 (11 individuals did not offer age information). For visits to any dentist in the last 10 years (3 categorical choices were provided), 32 participants reported 0 to 5 visits, 178 reported 6 to 25 visits, and 62 reported 26 or more visits. For number of visits to the current dentist in the last 10 years, 263 participants responded with a mean of 7.56 (SD=8.07). Thirty-five participants reported that this was their first visit to this office, 44 reported they had been one time, and 19 had been two times.

Scores on the DAS-R ranged from 4 to 19 (m=7.85, SD=2.91). Twenty-six participants (9.56%) scored 13 or higher (m=14.27, SD=1.56), indicating a significant level of dental anxiety.²⁹ The mean DAS-R score for females was 7.92 (SD=3.09, n=157), and the mean for males was 7.77 (SD=2.69, n=112). While the mean for females was higher than for males, the difference was not statistically significant ($P>0.05$). (The probability of a Type I error was maintained at $\alpha=0.05$ for this and all other analyses.)

Random assignment to treatment group yielded 88 participants in the diaphragmatic breathing group, 94 in the focused attention group, and 90 in the control group. When considering frequency of response to post-treatment anxiety level compared to other dental visits, one participant reported very much more anxiety, 13 reported somewhat more anxiety, 121 reported about the same anxiety, 60 reported somewhat less anxiety, and 77 reported very much less anxiety.

Eighty-nine participants reported using either the recommended anxiety reduction technique (breathing or focusing group) or an anxiety reduction technique of their own (control group). One hundred eighty-three did not use any anxiety reduction technique. One hundred nineteen participants responded to the question: "Did the technique help?" Seventy-four reported that the technique helped and 45 reported that it did not help. It should be noted that more partici-

pants responded to this question than should have. Four participants in the focusing group and two participants in the control group reported that they had not used an anxiety reduction technique, but also reported that the technique had helped. However, because participants in the control group were not offered an anxiety reduction technique and may have used an anxiety reduction technique of their own, their responses may be valid. Another 25 participants reported that they had not used an anxiety reduction technique and also noted that the technique did not help, which is a consistent response set for patients attempting to complete all questions on the post-treatment questionnaire. Importantly, of the 89 participants who reported using the anxiety reduction technique, 88 appropriately responded to the question: "Did the technique help?" Sixty-eight reported that the technique helped and 20 reported that it did not help.

An analysis of variance revealed no significant differences on DAS-R scores [$F(2; 69)=0.41, P=0.67$] between the breathing, focusing, and control groups. However, there were significant differences in DAS-R scores for number of visits [$F(2; 269)=6.10, P=0.003$]. Participants who reported 0 to 5 visits in the last 10 years were most anxious (n=32, m=9.44, SD=3.15), those reporting 6 to 25 visits were less anxious (n=178, m=7.74, SD=2.89), and those with 26 or more visits were least anxious (n=62, m=7.32, SD=2.60). Post hoc contrasts, with Bonferroni correction, indicated that participants who reported 0 to 5 visits were significantly more likely to have high DAS-R scores (indicating anxiety) than participants who reported either 6 to 25 ($P=0.007$) or 26 or more ($P=0.02$) visits. No significant difference was found between the DAS-R scores of those who reported 6 to 25 visits and 26 or more visits ($P=0.96$).

Not surprisingly, the correlation between participants who scored 13 or higher on the DAS-R (n=26) and

Table I. Analysis of variance comparisons of participants in the diaphragmatic breathing and focusing attention groups who used an anxiety reduction technique versus various controls (see Figure 1)

		n	M*	SD	df	F	P	Significance
All Participants								
Breathing	A	42	3.52	0.80				
Focusing	B	35	3.51	0.89				
Control	C	12	3.67	1.07	2; 86	0.148	0.863	n/s
	D	78	3.85	0.95	2;152	2.548	0.082	n/s
	E	90	3.82	0.97	2;164	2.288	0.105	n/s
Participants with 0 to 5 dental visits in the last 10 years								
Breathing	A	7	3.43	0.79				
Focusing	B	4	3.00	0.82				
Control	C	3	4.67	0.58	2; 11	4.351	0.041	Sign**
	D	9	3.44	0.73	2; 17	0.525	0.601	n/s
	E	12	3.75	0.87	2; 20	1.271	0.302	n/s

* Mean range: 1 = very much more anxiety to 5 = very much less anxiety
 ** $P < 0.05$

A = Breathing group participants who used the anxiety reduction technique.
B = Focusing group participants who used the anxiety reduction technique.
C = Control group participants who used an anxiety reduction technique of their own.
D = Control group participants who did not use an anxiety reduction technique.
E = All Control group participants (those who used an anxiety reduction technique and those who didn't).

participants who reported 0 to 5 visits to a dentist in the last 10 years ($n=32$) was significant ($n=51$, $r=0.64$, $P < 0.001$). Frequency of visits to the current dentist in the last 10 years was negatively correlated with dental anxiety ($n=263$, $r=-0.127$, $P=0.04$), such that participants were significantly more likely to be anxious if they had few or no prior visits to the current dentist. There were no significant differences between the breathing, focusing, and control groups on the post-treatment subjective anxiety scale [$F(2; 269)=0.771$, $P=0.46$] and post-treatment subjective anxiety scale scores were not significantly correlated with DAS-R scores ($n=272$, $r=-0.084$, $P=0.16$).

The post-treatment anxiety level for the current treatment (as compared to recalled anxiety of prior

oral health treatment) for participants in the breathing ($n=42$) and focusing ($n=35$) groups who reported using an anxiety reduction technique, compared with combined controls who did ($n=12$) and did not ($n=78$) use a technique of their own was not significant [$F(2; 164)=2.288$, $P=0.10$]. (See A, B, and E of Table I and Figure 1.) Although not significantly different from each other, the main values for the control group ($m=3.82$, $SD=0.98$) were higher than those in either the breathing ($m=3.52$, $SD=0.80$) or focusing ($M=3.51$, $SD=0.89$) groups. This difference was slightly more pronounced, although still was not significant, when those in the breathing and focusing groups who used the anxiety reduction technique were compared with the controls ($n=78$; $m=3.85$, $SD=0.95$) who did

not use an anxiety reduction technique [$F(2; 152)=2.548$, $P=0.08$]. (See A, B, and D of Table I and Figure 1.) These combined results suggest a trend toward decreased anxiety in the control group.

The post-treatment anxiety level for participants in the breathing and focus groups were not significantly different for those who scored 13 or higher on the DAS-R and used the anxiety reduction technique, when compared to all controls with similar DAS-R scores [$F(2; 18)=0.337$; $P=0.71$].

However, there was a significance for participants in the breathing and focusing groups who reported 0 to 5 oral health care visits in the last 10 years and employed the anxiety reduction technique, when compared to control groups with 0 to 5 visits in the last decade

Discussion

The present study compared the effects of a breathing technique, a focusing technique, and a no-technique control group on dental anxiety in a population of adult private dental practice patients. In contrast to earlier research, this study did not find the breathing and focusing techniques clearly effective at reducing dental anxiety. All reviewed breathing or focusing techniques—audio-taped-paced respiration, video-paced respiration, video ping pong, audiovisual eyeglass system, music through headphones, with the exception of the relaxation response—used equipment to assist in the intervention.²²⁻²⁷ The breathing and focusing techniques chosen for use in this study, however, relied solely on patients' concentration and personal intervention. This difference was likely critical. Performing an unassisted technique, particularly an unpracticed one, in the midst of an oral health procedure may have been too difficult for most patients.

According to scores on the DAS-R, 26 of the 272 participants had significantly high dental anxiety. Mean scores were higher for women than for men, although not significantly higher. This is consistent with prior research that shows mean scores on dental anxiety scales are generally higher for women than for men—sometimes the difference is statistically significant³⁰ and sometimes it is not.⁵ High anxiety was associated with infrequent dental visits (0 to 5 visits) in the last 10 years; participants who reported infrequent visits were significantly more likely to have high dental anxiety than those who reported regular (6 to 25) or frequent (26 or more) dental visits. The fact that participants with high anxiety might visit the oral health care practitioners less frequently is not surprising. This phenomenon is usually attributed to dental treatment avoidance. For example, Gatchel found that 46.0 to 56.8% of individuals with high dental anxiety avoided dental treatment, compared with only 28.6 to 37.1% of individuals

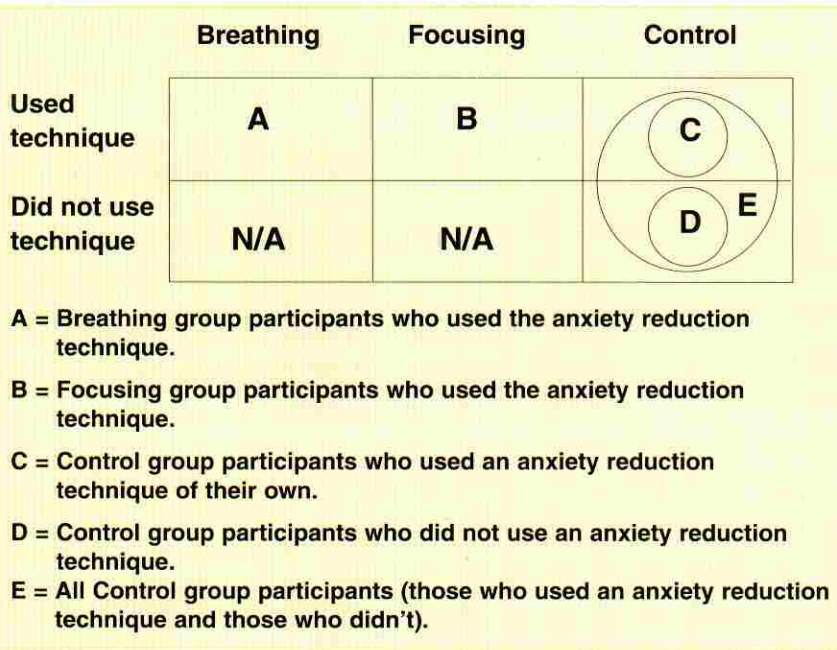


Figure 1. Participants in the diaphragmatic breathing and focusing attention groups who used an anxiety reduction technique and various controls (see Table I)

Table II. Reported reasons for not using an anxiety reduction technique

Reason	n (N =167)	%
Not anxious/didn't need it	121	72.4
Forgot to try it	10	6.0
Not anxious (due to specific qualities/care of dental staff)	8	4.8
Don't know a technique (i.e., control group)	6	3.6
Nonresponse/didn't answer question	5	3.0
Used another relaxation technique	4	2.4
Too difficult during treatment	2	1.2
Too anxious to try it	1	0.6
Various other reasons	10	6.0

[F (2; 11)=4.351; $P=0.04$]. (See Table I, A-C and Figure 1.) In this case, participants in the control group who reported using an anxiety reduction technique of their own reported significantly less dental anxiety than those in the breathing or focusing groups who used the offered anxiety reduction technique.

One hundred sixty-seven participants (61.3%) responded to the question: "If you did not use the [breathing, focusing, an anxiety reduction] technique, why not?" Frequent responses included not anxious/didn't

need it, forgot to try it, the dental staff relaxed me, or used another technique (see Table II).

Ninety participants responded to the question: "Have you used other techniques that have been effective in reducing your dental anxiety on other visits? If yes, please describe the most effective techniques." Some of the most frequent responses included use medication (i.e., nitrous oxide), mental distraction, concentrate on or modify breathing, move or focus on a part of the body, and listen to music or watch TV (Table III)."

Table III. Reported techniques for reducing anxiety

Techniques	n (N = 90)	%
Use medication (i.e., nitrous oxide)	15	16.0
Mental distraction (i.e., thinking about work, life events)	13	14.4
Concentrate on or modify breathing	12	13.0
Move or focus on a part of the body	9	10.0
Listen to music/watch TV	8	8.9
Focus on objects in the environment	7	7.8
Mental imagery (specific, pleasant—i.e., being at beach)	7	7.8
Mental control (self-coaching, reinterpretation of threat)	7	7.8
Communicate with dental staff	4	4.4
Sleep	1	1.1
Prayer	1	1.1
Rearrange/reschedule other stressful life events	1	1.1
Avoid dental work	1	1.1
Nonresponse/didn't answer question	4	4.4

with low dental anxiety.² Other studies have found similar results.^{6,7,31,32}

The frequency of visits to the current dentist also correlated significantly to dental anxiety. In fact, the participants with few or no visits to the current dentist were more likely to be anxious compared to those with a high frequency of prior visits. This relationship is likely to reflect the anxiety of those who avoid oral health treatment, as well as participants who may be experiencing anxiety because they are entering into a new dental treatment situation. The relationship also suggests that participants with a higher number of visits to their current dentist are likely to feel more comfortable with the treatment they receive.

Post-treatment subjective anxiety scores indicated no significant difference in anxiety reduction between the two treatment groups (breathing and focusing) and the control group. The reasons for a lack of group differences are unclear. The breathing and focusing techniques—as presented in brief written form with the opportunity to ask questions—may have been ineffective due to a lack of participant practice and sense of personal mastery. It also may be possible that the presentation of an anxiety reduction technique for participants in the breathing and focusing groups was not seen as beneficial. Rather, the unexpected presentation of the tech-

nique may have imposed additional anxiety, provoking expectations that were not shared by participants in the control group.

Additionally, the post-treatment subjective anxiety scale, on which group comparisons were made, may have flaws that differentially affected the accuracy of the participants' responses. As stated earlier, Kent found that anxious patients recall greater pain three months after treatment than was reported immediately following treatment.¹⁶ Furthermore, anxiety may influence subsequent dental visits such that memories of oral health treatment may be reconstructed over time to become consistent with existing levels of dental anxiety. The post-treatment subjective anxiety scale used in this study asked participants to recall the level of anxiety felt during previous dental treatment and to compare it with the current level of anxiety. According to Kent's research, participants with persistent high dental anxiety may over report the level of anxiety felt during previous oral health treatments, while participants with less anxiety may be more accurate in their recall of previous dental anxiety. It should be noted that this problem also is present in the anxiety scale used to measure pretreatment anxiety in the current study. Most dental anxiety scales, including the DAS or DAS-R, rely on the

memory of past treatment for the evaluation of current dental anxiety. For example, item two of the DAS reads: "When you are waiting in the dentist's office for your turn in the chair, how do you feel?" Participants must rely on their memory of past treatment experiences to answer such questions, and research has indicated memories concerning anxiety may not be accurate.¹⁶

Despite a lack of differences between treatment groups, there was a trend toward decreased anxiety across all three groups. For example, 137 participants responded that they were very much less (n=77) or somewhat less (n=60) anxious than at other dental visits, compared to only 14 participants who responded that they were very much more (n=1) or somewhat more (n=13) anxious than at other dental visits. This trend may reflect the aforementioned bias in memory for recall of greater anxiety during past treatment. On average, a participant's current level of dental anxiety was rated as lower than at past dental treatment. But according to Kent's research, at some time in the future the same participants may rate the anxiety of the current visit as higher, bringing the memory of anxiety in line with high dental anxiety expectations.¹⁶ This is, however, not the only possible explanation for a trend toward decreased anxiety. It also may be due to increased attention to dental anxiety or the participant's attempt to comply with the perceived demands of the study.

When the post-treatment subjective anxiety scores of participants who reported infrequent oral health care visits (0 to 5) were considered, control participants who used an anxiety reduction technique of their own were significantly more likely to have reduced dental anxiety, compared to participants in either the breathing or focusing group. This finding is surprising and in direct contrast to the hypothesized relationship of the treatment groups. It does, however, support the idea that the breathing and focusing techniques may have imposed anxiety

provoking expectations that were not felt by the control group. Since anxiety reduction was greatest for the controls that used a technique of their own, it suggests that anxiety reduction techniques must be practiced to some level of comfort and mastery before being used effectively during dental treatment. While these explanations are reasonable, it is puzzling that participants who infrequently visit the dentist would have an effective anxiety reduction technique and, yet, continue to avoid the dentist.

Although infrequent dental visits and high anxiety were correlated, significant treatment group differences were not found when group comparisons included only highly anxious participants. This difference may be due to varying characteristics between highly anxious participants who visit the dentist regularly and those who visit infrequently. Participants with infrequent oral health care visits not only reported high anxiety, but displayed their anxiety through the behavior of oral health treatment avoidance. Inconsistencies arise in participants who report high anxiety and yet continue to visit the dentist with regular frequency. Perhaps, in this case, avoidance behavior is a better indicator of anxiety than self-report.

There were several reasons cited for not using the offered breathing or focusing anxiety reduction techniques. Ten participants stated that they forgot to try it. This suggests that it may be beneficial for oral health professionals to remind patients of the importance of using anxiety coping techniques during treatment. Additionally, four participants reported that they preferred to use other relaxation techniques. These participants may have perceived the breathing or focusing techniques as interfering with their normal method of coping. Finally, two participants noted that the anxiety reduction technique was too difficult to perform during oral health treatment.

Ninety participants responded to the question regarding other effective anxiety reduction techniques. Thirty-

percent reported that concentrating on or modifying breathing was an effective means of anxiety reduction, and 10% reported that focusing on or moving a part of the body was effective (Table III). Another 7.8% reported that focusing on objects in the environment reduced anxiety, and 8.9% reported that listening to music or watching TV (external focus) reduced anxiety. These responses provide some support for the effectiveness of breathing and focusing techniques. However, the participants who reported the effectiveness of these techniques must have felt some level of proficiency in using these techniques. Thus, these techniques were unlikely to place anxiety provoking demands if employed in the oral health care setting.

Some dental procedures are likely to be more painful and/or invasive than others (e.g., extraction, injection vs. routine prophylaxis) and may be more anxiety provoking. It is possible that certain anxiety reduction techniques will be more effective in higher pain/higher anxiety situations, while others will be more effective in lower pain/lower anxiety situations. Unfortunately, this study was unable to explore these possibilities as participants were included regardless of the type of dental procedure they were to receive. It may be beneficial for future studies to determine the effectiveness of breathing and focusing techniques with specific dental procedures (e.g., extraction, root canal, or prophylaxis) so that technique and procedure can be most appropriately matched.

It is likely that a lack of practice influenced the effectiveness of these techniques. Future studies might seek to find the optimal number of practice sessions required to gain a sense of mastery of the anxiety reduction technique so that it may effectively be used in the oral health care setting. While the results of this study are limited to one private practice locale, future studies may explore the effectiveness of breathing and focusing techniques in dental and dental hygiene schools, clinics, or other private practice settings.

Conclusion

While prior studies have found breathing and focusing techniques to be clearly effective for dental anxiety, the current study did not. Results of this study show some support for the effectiveness of breathing and focusing techniques, but do not reproduce the positive findings of previous studies as closely as expected. It is hypothesized that unpracticed anxiety reduction techniques may place expectations on patients that increase anxiety. Practice of these techniques, prior to oral health treatment, should influence their effectiveness.

Finally, it is recommended that oral health care professionals inquire about anxiety and the patient's preferred anxiety reduction technique. If the patient has a practiced technique, they should be encouraged to use it if needed, as it may be effective at reducing anxiety during the current visit.

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