

Effect of Muscle Relaxation Training on Perceived Stress and Rumination in Patients with Dental Anxiety

Mina Saei Nia^a, Parviz Asgari^b, Naser Saraj Khorrami^c, Farah Naderi^b, Sahar Safarzadeh^d

^aPhD Student, Dept. of Psychology, Ahvaz Branch, Islamic Azad University, Ahvaz, Iran.

^bProfessor, Dept. of Psychology, Ahvaz Branch, Islamic Azad University, Ahvaz, Iran.

^cAssistant Professor, Dept. of Psychology, Dezful Branch, Islamic Azad University, Dezful, Iran.

^dAssistant Professor, Dept. of Psychology, Ahvaz Branch, Islamic Azad University, Ahvaz, Iran.

Correspondence to Parviz Asgari (email: p.askary@iauahvaz.ac.ir).

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Objectives The present study aimed to investigate the effect of muscle relaxation training on perceived stress and rumination in patients with dental anxiety.

Methods This was a quasi-experimental study (pretest-posttest design and a control group). The statistical population comprised of all patients with dental anxiety who visited dental clinics in Ahvaz city (Iran) in 2019. The sample consisted of 30 patients with dental anxiety selected through convenience sampling. The participants were randomly divided into experimental and control groups (15 participants per group). The experimental group received six 90-minute sessions of muscle relaxation, while the control group received no intervention. The research instruments included the Perceived Stress Scale (PSS), the Ruminative Responses Scale (RRS), and the Modified Dental Anxiety Scale (MDAS). The data were analyzed by MANCOVA and ANCOVA.

Results The mean \pm standard deviation (SD) of the post-test scores of perceived stress and rumination in the experimental group were 21.53 ± 5.60 and 29.06 ± 6.70 , respectively which were significantly different from the scores in the control group (54.33 ± 3.71 and 70.86 ± 7.55 , respectively). The muscle relaxation training reduced the perceived stress and rumination in patients with dental anxiety in the experimental group compared with the control group ($P < 0.001$).

Conclusion Muscle relaxation training may thus be administered as an effective approach to mitigate perceived stress and rumination in patients with dental anxiety.

Keywords Muscle Relaxation; Rumination, Cognitive; Stress, Psychological; Dental anxiety

Introduction

Dental anxiety is a health-threatening disorder. Severe stress can also cause anxiety in patients.^{1, 2} Anxiety, in turn, creates unpleasant experiences, further stress, discomfort, fear, distress, and anticipation of unfortunate events, which lead to restlessness.^{3, 4} According to studies, perceived stress is a risk factor independent of age, sex, and other classic physical risk factors for diseases.^{5, 6} Perceived stress is a serious risk factor for mental health problems and can increase anxiety disorders.^{7, 8} Saatchi et al.⁹ reported that people with dental anxiety perceive high levels of stress. Stress perception can affect mental capacity depending on how stressful one perceives a situation. Stress includes physical, mental, and affective reactions that exacerbate anxiety.¹⁰ When people perceive stress, they find their physical and mental well-being threatened. In other words, perceived stress challenges people's perceived ability and confidence.¹¹

Rumination is a key predictor of anxiety and causes constant preoccupation with a notion or idea. Such thoughts enter people's consciousness, distract their attention from goals, and cause a great deal of anxiety.¹² In people with dental anxiety, rumination about their physical oral and dental status causes passive repetitive thoughts, hinders the adaptive solution, and increases negative thoughts. As a cognitive basis for anxiety, rumination involves thoughts that are endlessly reviewed, increase negative appraisals, affect mood, and exacerbate anxiety.¹³ One way to deal with anxiety is through muscle relaxation

training, which is shown to alleviate disorders and promote the quality of life.¹⁴ The use of muscle relaxation technique mitigates the adverse physiological impacts of stress.^{15, 16} This method prevents the emergence of symptoms caused by harmful factors. It strikes a balance between the activity of the anterior and posterior hypothalamus, thereby preventing adverse effects caused by stress and anxiety.^{17, 18} According to Ramasamy et al.,¹⁹ muscle relaxation training is an effective intervention to alleviate stress and anxiety disorders. Park et al.¹ reported that progressive muscle relaxation therapy relieves tension and anxiety in dental patients.

People with dental anxiety perceive a great deal of stress. Due to dental anxiety, patients who need treatment do not seek dental treatment and therefore, may suffer from advanced periodontal disease, dental caries, pulp involvement, dental and periodontal infections, and abscess. Moreover, mental rumination negatively impacts their treatment process and disrupts their mental balance. If their anxiety is not controlled, physical problems may develop and threaten their physical and mental health. Still, the challenge is to identify treatments that can mitigate the perceived stress and mental rumination, motivate people to seek treatment, and improve their quality of life. The useful outcomes of studying the psychological variables in patients with dental anxiety may encourage them to visit a dentist without fear and anxiety, and this can promote their quality of life. Accordingly, the present study aimed to investigate the effect of muscle relaxation training on perceived stress and rumination in patients with dental

anxiety.

Methods and Materials

Design and participants:

This was a quasi-experimental study with a pretest-posttest design and a control group. The study population included all patients with dental anxiety who visited dental clinics in Ahvaz city (Iran) in 2019. The sample consisted of 30 patients with dental anxiety selected through convenience sampling. In this study, the sample size was calculated to be 30 patients with dental anxiety based on G-Power (effect size of 1.68, $\alpha=0.05$, and power of 0.90). Moreover, a random number table was used to randomly allocated the participants into experimental and control groups. The inclusion criteria were scoring 15 or above on the Modified Dental Anxiety Scale (MDAS) and absence of cognitive-personality disorders. The exclusion criteria were missing more than two sessions of the intervention program and having an outlier score in the MDAS. To comply with ethical considerations, informed consent was obtained from the participants, and the participants were allowed to quit whenever they desired, and their information was kept confidential. In addition, those in the control group also received the intervention at the end of the study. The Ethics Review Board of Islamic Azad University, Ahvaz branch, approved the present study (code: IR.IAU.AHVAZ.REC.1401.177).

Procedure:

First, the MDAS was administered, and participants who scored 15 or above were identified as having dental anxiety. Overall, 137 patients filled out this scale; of whom, 61 were found to have anxiety. Then, 30 patients were selected and randomly assigned to the experimental or control group (15 participants per group) (Figure 1). Before the implementation of the intervention program, a pre-test was conducted for both the experimental and control groups. Next, the experimental group was treated with muscle relaxation; while, the control group did not receive any intervention. After the end of the treatment sessions, a post-test was held for both the experimental and control groups. In the present study, the Perceived Stress Scale (PSS) and the Ruminative Responses Scale (RRS) were used to examine the variables of perceived stress and

ruminations in the participants.

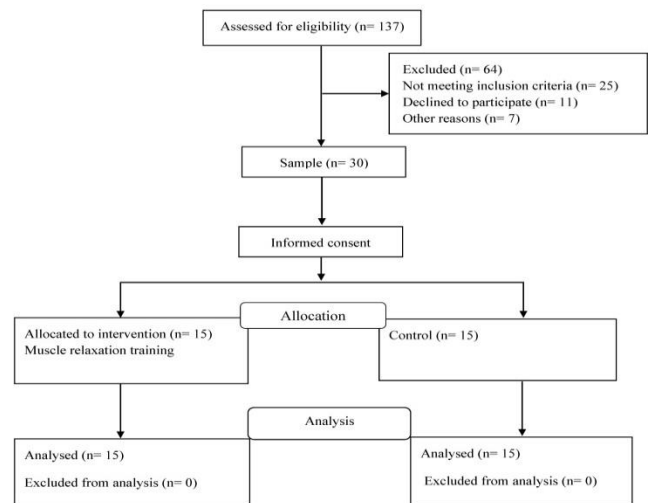


Figure 1. Flow-chart of participant selection

Instruments:

PSS: This 14-item scale was developed by Cohen et al (20). The items were scored using a five-point Likert scale from 1 (never) to 5 (very often). Items 4, 5, 6, 7, 9, 10, and 13 were reverse-scored. The minimum and maximum scores of this scale are 14 and 70, respectively. Maroufizadeh et al.²¹ reported a Cronbach alpha coefficient of 0.90 for this questionnaire.

RRS: This scale was developed by Nolen-Hoeksema and Morrow.²² It contains 22 statements scored by a Likert scale from 1 (almost never) to 4 (almost always). Tanhayeh Reshvanloo et al.²³ reported a Cronbach alpha coefficient of 0.86 for this questionnaire.

MDAS: This scale was developed by Corah in 1969 and revised by Clarke in 1993. It is comprised of four 5-choice questions about different dental situations. Each question was scored from 1 (not anxious) to 5 (extremely anxious), and the final score ranged from 4 to 20. Humphris et al.²⁴ added a question about local anesthesia and introduced the MDAS. The scores in this scale range from 5 to 25, and scores of 15 or above indicate severe anxiety.²⁴ The authors reported the reliability of this tool to be 0.83.⁹

Intervention program:

The experimental group received six 90-minute sessions of muscle relaxation.²⁵ A summary of the muscle relaxation training program sessions is presented in Table 1.

Table 1- A summary of muscle relaxation training sessions

Session	Content
1	Briefly introducing the history of muscle relaxation techniques, the role of stress in mental health, the role of muscle relaxation in mitigating anxiety and fear.
2	Dividing the muscles into 16 groups, explaining how to contract and relax them, performing contraction and release exercises for several muscle groups, doing progressive contraction and release exercises for 16 muscle groups in a specific sequence, using the relaxation technique by examining individual muscles, providing relaxing suggestions, ending the exercise with a countdown, moving the muscles along with the countdown
3	Training, performing contraction exercise, seven-muscle release, evaluation of experiences, discussion, post-exercise review, talking about feelings, resolving problems related to training.
4	Training, recall exercise, evaluation of experiences, four-muscle release (neck, abdomen, thigh, forearm), evaluation of experiences.
5	Recall training along with progressive muscle relaxation countdown, relaxing mental imagery, evaluation of experiences.
6	A summary of muscle relaxation exercises, wrapping up, administering the posttest.

Statistical analyses:

Data were analyzed by descriptive and inferential statistics, such as mean, standard deviation, analysis of covariance (ANCOVA), and one-way ANCOVA. SPSS version 21.0 was used for data analysis.

Results

Table 2 lists the mean and standard deviation (SD) of perceived stress and rumination scores of the experimental and control groups in the pre-test and posttest.

Table 2- Mean (\pm SD) pre-test and posttest scores of perceived stress and rumination in the experimental and control groups

Variables	Test	Experimental	Control
		Mean \pm SD	Mean \pm SD
Perceived stress	Pretest	50.20 \pm 6.29	52.06 \pm 2.71
	Posttest	21.53 \pm 5.60	54.33 \pm 3.71
Rumination	Pretest	68.20 \pm 7.75	72.06 \pm 8.10
	Posttest	29.06 \pm 6.70	70.86 \pm 7.55

The assumption of normality of distribution of scores in both groups was examined and confirmed by the Kolmogorov-Smirnov test. Based on the Levene's test results, the variance of scores of perceived stress and rumination did not significantly differ in the two groups, which confirmed the assumption of homogeneity of variances. Furthermore, the null hypothesis of the equality of variances of the scores of the two groups in the posttest was confirmed; that is, the assumption of equal variances of scores in the experimental and control groups was confirmed.

According to the results of MANCOVA, there was a significant difference between the experimental and control groups in terms of perceived stress and rumination ($F=132.24$, $P<0.001$), with an effect size of 0.98. Based on the findings, there was a significant difference between the experimental and control groups in terms of perceived stress ($F= 265.20$, $P<0.001$) and rumination ($F= 203.97$, $P<0.001$). In other words, the muscle relaxation training significantly alleviated the perceived stress and rumination of participants with dental anxiety in the experimental group. The effect size for the perceived stress and rumination was 0.92 and 0.91, respectively.

Discussion

The present study aimed to investigate the effect of muscle relaxation training on perceived stress and rumination in patients with dental anxiety. According to the results, the experimental and control groups significantly differed in terms of perceived stress and rumination. In other words, muscle relaxation training significantly mitigated the severity of perceived stress and rumination in patients with dental anxiety in the experimental compared with the control group. The findings are consistent with the results of previous studies.^{1, 26, 27} Sabherwal et al.²⁶ reported that progressive muscle relaxation is an effective technique for anxiolysis and pain control in pediatric dental patients.

In the present study, muscle relaxation training was proven to be effective on the mean perceived stress of patients with dental anxiety and reduced the severity of their perceived

stress. The nature of the techniques led to muscle relaxation, regulated the vital signs, put the participants in a relaxed state, and thus reduced their perceived stress, anxiety, and distress. By creating a state of relaxation and balancing the muscles, muscle relaxation training eliminates the state caused by severe perceived stress. Since this technique is quickly learned, it is fully conscious.¹ This training significantly improves the coping skills of people with dental anxiety and reduces stress symptoms associated with dental procedures. The muscle relaxation training intervention mentally empowers the participants and makes them flexible to stressful and challenging situations; in this way, it controls the dimensions of perceived stress against unforeseen conditions by regulating heart rate, respiration, abdominal heat, and body temperature, and alleviates the stress and anxiety of people with dental anxiety.¹⁷

In this training, people with dental anxiety also achieve mental peace by adjusting and organizing stressful processes and incorrect cognitive maps. Muscle relaxation creates flexibility in the face of challenges and sufferings, thereby mitigating the disturbing thoughts, visualizations, and intrusive impulses related to stress perception.¹⁸ Learning how to perform muscle contraction and release reduces the perceived stress. Performing contraction and release exercises and the relaxation technique by examining each muscle also decrease stress. In this way, this intervention increases the participants' adaptation to stressful conditions and reduces their mental pressure. The muscle relaxation training protocol focused on promoting self-help and peace in different stressful situations. People with dental anxiety received proper feedback from muscle training in this type of training, and thus overcame their problem and showed less stress and unwanted negative thoughts. Eventually, their perceived stress, which disturbs the mental balance, declined, and they experienced less negative emotions.¹⁹

In the present study, muscle relaxation training effectively decreased rumination in people suffering from dental anxiety. Muscle relaxation induced a peaceful and pleasant image in people's mind, which alleviated ruminative

thoughts. This method helped people imagine a very strong or enjoyable scene, so strong as to divert their attention from the painful and anxiety-provoking experiences. This therapeutic approach thus decreased the negative outcomes and metacognitive beliefs about dentistry and the associated pain, and reduced anxiety and low mood, which are the basis of rumination in anxious people. This intervention also controlled the unreasonable beliefs and ruminations of people with dental anxiety. Muscle relaxation training decreased negative emotional outcomes such as anxiety, and rumination via the seated meditation technique and breathing while paying attention to the senses, which leads to mental relaxation. This training protocol encouraged the participants to pay attention to the differences in the feelings of muscle tension (contraction) and relaxation (release). By establishing a state of deep relaxation or release, this training relaxed the muscles of patients with dental anxiety and alleviated their ruminative responses.²⁹ Therefore, this training is an effective approach for mitigating rumination in people with dental anxiety by establishing deep mental relaxation.

The statistical population of the current study comprised of people suffering from dental anxiety visiting the dental clinics of Ahvaz city (Iran); thus, caution should be exercised in generalizing the results to other populations. The limitations of this study were failing to control important social, familial, and economic variables that might have affected the research variables, and the heterogeneity of the sample in terms of general characteristics in the experimental group.

Conclusion

Muscle relaxation training was an effective approach and decreased the perceived stress and rumination of patients with dental anxiety. Dental centers are thus advised to implement this method to better manage dental anxiety of patients. In educational workshops, specialists should teach this method to dentists and their assistants to alleviate patients' dental anxiety. Hospitals and dental clinics should also be notified about the positive effects of muscle relaxation training on alleviating the perceived stress and rumination so that patients can learn how to curb their stress.

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Ethical Approval

Written consent was obtained from all patients. Also, the authors affirm their observance of ethical rules when processing the results of the studies. The Ethics Review Board of Islamic Azad University, Ahvaz branch, approved the present study (code: IR.IAU.AHVAZ.REC.1401.177).

Authors' Contributions

The authors contributed equally to this research

Conflict of Interest

No Conflict of Interest Declared ■

References

1. Park ES, Yim HW, Lee KS. Progressive muscle relaxation therapy to relieve dental anxiety: a randomized controlled trial. *Eur J Oral Sci.* 2019;127(1):45-51.
2. Mousavi S, Narimani S, Farhoudi I, Hekmatfar S. Effect of awareness and reassurance on anxiety of dental implant candidates. *J Dent Sch.* 2019;35(1):12-5.
3. Wide U, Hakeberg M. Treatment of Dental Anxiety and Phobia-Diagnostic Criteria and Conceptual Model of Behavioural Treatment. *Dent J (Basel).* 2021;9(12):153.
4. Kumar S, Bhargav P, Patel A, Bhati M, Balasubramanyam G, Duraiswamy P, et al. Does dental anxiety influence oral health-related quality of life? Observations from a cross-sectional study among adults in Udaipur district, India. *J Oral Sci.* 2009;51(2):245-54.
5. Halboub E, Alhadj MN, AlKhairat AM, Sahaqi AM, Quadri MFA. Perceived Stress among Undergraduate Dental Students in Relation to Gender, Clinical Training and Academic Performance. *Acta Stomatol Croat.* 2018;52(1):37-45.
6. Emamikhah Abarghooii S, Golparvar M, Zare Jahromi M. Relationship between Level of Stress Experienced by Dental Students during Endodontic Treatment and Their Coping Strategies. *J Iran Dent Assoc.* 2016;28(2):52-56.
7. Astill S, Ricketts N, Singh LA, Kurtz D, Gim YH, Huang B. Environmental and perceived stress in Australian dental undergraduates: Preliminary outcomes. *J Dent Res Clin Dent Prospects.* 2016;10(4):270-9.
8. Zinke A, Hannig C, Berth H. Psychological distress and anxiety compared amongst dental patients- results of a cross-sectional study in 1549 adults. *BMC Oral Health.* 2019;19(1):27.
9. Saatchi M, Abtahi M, Mohammadi G, Mirdamadi M, Binandeh ES. The prevalence of dental anxiety and fear in patients referred to Isfahan Dental School, Iran. *Dent Res J (Isfahan).* 2015;12(3):248-53.
10. Koltuniuk A, Kazimierska-Zajac M, Cisek K, Chojudak-Lukasiewicz J. The Role of Stress Perception and Coping with Stress and the Quality of Life Among Multiple Sclerosis Patients. *Psychol Res Behav Manag.* 2021;14:805-15.
11. Siddharthan GM, Reddy MM, Sunil BN. "Perceived stress" and its associated factors among diabetic patients receiving care from a rural tertiary health care center in South India. *J Educ Health Promot.* 2021;10:11.
12. Murray HB, Juarascio AS, Di Lorenzo C, Drossman DA, Thomas JJ. Diagnosis and Treatment of Rumination Syndrome: A Critical Review. *Am J Gastroenterol.* 2019;114(4):562-78.
13. Addicks SH, McNeil DW, Randall CL, Goddard A, Romito LM, Sirbu C, et al. Dental Care-Related Fear and Anxiety: Distress Tolerance as a Possible Mechanism. *JDR Clin Trans Res.* 2017;2(3):304-11.
14. Toussaint L, Nguyen QA, Roettger C, Dixon K, Offenbacher M, Kohls N, et al. Effectiveness of Progressive Muscle

- Relaxation, Deep Breathing, and Guided Imagery in Promoting Psychological and Physiological States of Relaxation. *Evid Based Complement Alternat Med*. 2021;2021:5924040.
15. Toqan D, Ayed A, Joudallah H, Amoudi M, Malak MZ, Thultheen I, et al. Effect of Progressive Muscle Relaxation Exercise on Anxiety Reduction Among Nursing Students During Their Initial Clinical Training: A Quasi-Experimental Study. *Inquiry*. 2022;59:469580221097425.
 16. Tsai ML, Cheng TH, Yang YK, Wang CJ. A School-Based Progressive Muscle Relaxation Program for Female Adolescents: Development and the Effectiveness on Physiological and Psychological Evidence. *Healthcare (Basel)*. 2021;9(10):1319.
 17. Akbari A, Shamsaei F, Sadeghian E, Mazdeh M, Tapak L. Effect of progressive muscle relaxation technique on self-esteem and self-efficacy in multiple sclerosis patients: A clinical trial study. *J Educ Health Promot*. 2022;11:8.
 18. Zargarzadeh M, Shirazi M. The effect of progressive muscle relaxation method on test anxiety in nursing students. *Iran J Nurs Midwifery Res*. 2014;19(6):607-12.
 19. Ramasamy S, Panneerselvam S, Govindharaj P, Kumar A, Nayak R. Progressive muscle relaxation technique on anxiety and depression among persons affected by leprosy. *J Exerc Rehabil*. 2018;14(3):375-81.
 20. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav*. 1983;24(4):385-96.
 21. Maroufizadeh S, Zareian A, Sigari N. Psychometric properties of the 14, 10 and 4-item "Perceived Stress Scale" among asthmatic patients in Iran. *Payesh*. 2014;13(4):457-65.
 22. Nolen-Hoeksema S, Morrow J. A prospective study of depression and posttraumatic stress symptoms after a natural disaster: the 1989 Loma Prieta Earthquake. *Journal of personality and social psychology*. 1991;61(1):115-21.
 23. Tanhaye Reshvanloo F, Torkamani M, Mirshahi S, Hajibakloo N, Kareshki H. Validity and Reliability Assessment of the Persian Version of the Co-Rumination Questionnaire. *Journal of Clinical Psychology*. 2021;13(1):79-87.
 24. Humphris GM, Morrison T, Lindsay SJ. The Modified Dental Anxiety Scale: validation and United Kingdom norms. *Community Dent Health*. 1995;12(3):143-50.
 25. Irnich C. Relaxation techniques: body and mind. In: Irnich D, editor. *Myofascial Trigger Points*. Oxford: Churchill Livingstone. 2013; Chap24:p:245-52.
 26. Sabherwal P, Kalra N, Tyagi R, Khatri A, Srivastava S. Hypnosis and progressive muscle relaxation for anxiety and pain control during extraction procedure in 8-12-year-old children: a randomized control trial. *Eur Arch Paediatr Dent*. 2021;22(5):823-32.
 27. Feldman G, Greeson J, Senville J. Differential effects of mindful breathing, progressive muscle relaxation, and loving-kindness meditation on decentering and negative reactions to repetitive thoughts. *Behav Res Ther*. 2010;48(10):1002-11.
 28. Xiao CX, Lin YJ, Lin RQ, Liu AN, Zhong GQ, Lan CF. Effects of progressive muscle relaxation training on negative emotions and sleep quality in COVID-19 patients: A clinical observational study. *Medicine (Baltimore)*. 2020;99(47):e23185.

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