

Original Article

Comparison of the effect of acceptance and commitment therapy and cognitive behavioral therapy on pain tolerance and intensity perception in patients with dental anxiety: A randomized trial

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ABSTRACT

Background: Dental anxiety has negative effects on dentists' pain management. Patients have different levels of pain tolerance. Therefore, providing psychological interventions can reduce treatment avoidance and promote oral health. This study compared the effect of acceptance and commitment therapy (ACT) and cognitive behavioral therapy (CBT) on pain coping strategies and pain perception intensity in patients with dental anxiety.

Materials and Methods: This clinical trial with a pretest–posttest control group design and a 3-month follow-up period was performed on 45 patients with dental anxiety. They were randomly selected by convenience sampling method and assigned to two experimental groups and one control group. The first experimental group underwent 10 sessions of ACT, the second experimental group underwent 10 sessions of CBT, and the control group underwent oral care training. Data were collected by the Rosenstiel and Keefe's Coping Strategies Questionnaire and McGill Pain Questionnaire and analyzed by SPSS (version 24) software. The considered significance level is 0.05.

Results: The results showed no significant difference between ACT and CBT in pain coping strategies and pain perception intensity ($P < 0.05$) but indicated a significant difference between the treatment groups and the control group. Moreover, the results showed a significant difference between posttest and follow-up and pretest in pain coping strategies and pain perception intensity ($P < 0.01$) but indicated no significant difference between posttest and follow-up ($P < 0.05$).

Conclusion: ACT and CBT can play an important role in the sustainable improvement of pain coping strategies and pain perception intensity in patients with dental anxiety.

Key Words: Acceptance and commitment therapy, cognitive behavioral therapy, dental anxiety, pain

Received: 22-Jun-2021
Revised: 23-Oct-2021
Accepted: 28-Dec-2021
Published: 18-Jan-2023

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INTRODUCTION

Oral health is one of the most important aspects of health, but visiting a dentist is not an easy task

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How to cite this article: Feizi G, Binandeh ES, Goli F, Seraj-Khorami N, Khalifehsoltani F. Comparison of the effect of acceptance and commitment therapy and cognitive behavioral therapy on pain tolerance and intensity perception in patients with dental anxiety: A randomized trial. Dent Res J 2023;20:11.

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for most people^[1] because there are obstacles in this regard, one of the most important of which is dental anxiety.^[2] Dental anxiety is one of the major reasons for panic, avoidance, and nonreferral of patients to dental care centers, which consequently increases oral health deterioration.^[3] Dental anxiety is a reaction to an unknown risk and is defined as a psychological reaction to the fear of dental interventions.^[4] This problem is ranked fifth among common anxiety-inducing situations and can even lead to social disability and reduced quality of life.^[5] The prevalence of dental anxiety in young adults has been reported to be 14.9% in Australia, 12.5% in Canada, and 12.6% in Russia.^[6] Morovati *et al.*^[7] surveyed 400 patients in 20 dental offices in Mashhad and reported that 16.8% had mild dental anxiety, 58.5% had moderate dental anxiety, and 24.8% had severe dental anxiety. Yaghouti and Sistani^[8] also reported that 333 participants (about 83%) were afraid of dental treatment and 161 (about 40%) had dental anxiety.

Since dental anxiety stems from a pervasive sense of fear of dental situations with a concern originating from a recurring thought,^[9] it seems that the use of ineffective pain coping strategies plays an essential role in the emergence of this form of anxiety. Coping refers to a person's mental, emotional, and behavioral efforts while encountering stress to overcome, tolerate, or minimize complications.^[10] Pain coping strategies are also defined as specific thoughts and behaviors that people use to manage their pain or emotional reactions to pain. These behaviors are observed as verbal and nonverbal messages in the person in pain. Nonverbal messages such as voice behaviors, facial expressions, body movements, fisting, and body pulling, in addition to completing verbal messages, better represent patients' true thoughts and feelings.^[11] Patients' differences in the use of pain coping strategies explain the differences between them in the range of adaptation to the situation and can anticipate the pain perception intensity.^[12]

Pain perception intensity is one of the extreme forms of maladaptive response. Most anxious people assume dentistry to be accompanied by pain, which is one of the factors affecting the increase of psychological reactions to the sensation of pain and its transmission.^[13] Some pieces of evidence indicate a relationship between dental anxiety and invasive treatment and painful experiences.^[14] De Jong *et al.*^[15] found that patients with high dental

anxiety reported about five times more pain than others. This anxiety is closely related to painful stimuli that lead to greater pain perception in people. The high pain perception intensity in people with dental anxiety marks the exaggerated memory of pain experience.

It seems that acceptance and commitment therapy (ACT) can be successful in improving pain variables related to dental anxiety, such as pain coping strategies and pain perception intensity. This treatment addresses ineffective control and avoidance strategies by developing techniques that promote psychological flexibility.^[16] Further, it helps people accept pain (the desire to experience pain or unpleasant events without trying to control them) or thoughts related to pain, promote the valuable aspects of life, and increase valuable activities. It also encourages patients with pain to accept pain and its consequences and to perform valuable activities to improve their psychological well-being instead of making a vain attempt against pain.^[17] Research in this field has shown that ACT improves pain indices such as pain perception intensity^[18,19] and pain acceptance.^[19]

Cognitive behavior therapy is also one of the practical therapies in this field owing to its strong empirical support in the improvement of anxiety disorders through regular desensitization. In this type of treatment, the patient is assisted to recognize distorted thinking patterns and dysfunctional behaviors. To be able to change these distorted and dysfunctional thoughts, regular discussions and organized behavioral tasks are used, which can have positive effects on pain variables.^[20] In other words, the cognitive behavioral approach to the formation of pain variables is based on the basic assumption that people involved with pain variables enter the treatment process believing that many of their problems are uncontrollable. Therefore, the goals of cognitive behavioral therapy (CBT) are to create this expectation in patients that they can control their problems effectively and to teach them skills to effectively deal with their current problems and respond to new problems that occur following the treatment. The cognitive behavioral approach to modifying pain variables explicitly seeks to assist individuals in identifying and altering beliefs, recognition, and nonconforming or unhelpful coping strategies, which, based on existing research, cause some of the problems observed among patients with dental anxiety.^[21] Research shows that CBT improves pain coping strategies,^[22] decreases the pain perception

intensity,^[23] and reduces psychosomatic problems caused by dental situations.^[3,24]

Therefore, considering the role of pain coping strategies and pain perception intensity in reducing the pain tolerance threshold of patients with dental anxiety, and the negative consequences of pain indices in exacerbating dental anxiety and avoiding treatment, this study was conducted to compare the effect of ACT and CBT on pain coping strategies and pain perception intensity in patients with dental anxiety to select appropriate treatments to help these people.

MATERIALS AND METHODS

The present study was an applied single-blind clinical trial with a pretest–posttest control group design and a 3-month follow-up period. The research project was approved by Isfahan University of Medical Sciences, with research code 298221 and ethics code IR.MUI.MED.REC.1398.626, and registered in Iranian Registry of Clinical Trials, with registration code IRCT20190505043473N2. The statistical population included patients with dental anxiety in Isfahan in the second half of 2020. Using the formula for research sample calculation with unknown population size, the sample size in this study was estimated to be 48 patients who were selected by convenience sampling and based on inclusion and exclusion criteria. They were randomly divided equally into two experimental groups and one control group.

The inclusion criteria comprised age range 19–50 years, education higher than junior high school, not studying dentistry and psychology, diagnosis of dental anxiety using Southard Dental Anxiety Questionnaire and patients suffering from dental anxiety, with a score of 130.5 ± 23.6 ,^[25] and supplementary confirmation of dental anxiety diagnosis by a pulse oximeter (number of heart rates), as the patient rested in the waiting room for 5 min, and then his/her heart rate was measured and averaged after being placed on a dental unit twice. If this number was reported with an increase of 7.3% beats/min,^[26] the patient was included in the study. This was done by a dentist. Other inclusion criteria were willingness to participate in intervention sessions, completion of informed written consent, additional review of psychiatric criteria using the Symptom Checklist-90-Revised (SCL-90-R), lack of systemic diseases and congenital syndromes, absence

of psychiatric disorders except a spectrum of anxiety disorders, minimum physical and cognitive ability to participate in psychological interventions through psychiatric interview according to DSM-5 criteria, having at least 20 natural teeth and at least one treated tooth, no need for emergency dental treatment via dental examination, lack of psychological interventions, and nonuse of psychiatric drugs since the past 6 months. The exclusion criteria included the use of various drugs and alcohol, lack of cooperation or unwillingness to continue the research, failure to complete the assignments presented in sessions, and absence of more than two sessions in treatment sessions. Ethical principles of confidentiality, use of data only in line with the research objectives, freedom and full authority of the participants to withdraw from the research, providing accurate results upon the request of the participants, and training the control group after the intervention were also taken into account.

Pretest was performed through the Coping Strategies Questionnaire (CSQ), McGill Pain Questionnaire, and Dental Anxiety Inventory. After the pretest, the first experimental group underwent CBT in 10 weekly sessions for 90 min for two and a half months [Table 1], and the second experimental group underwent ACT in 10 weekly sessions for 90 min for two and a half months [Table 2] in Pardis Clinic of Isfahan. The control group received oral health training during this treatment period. At the end of the treatment sessions, all three groups completed the research questionnaires again. Three months after the posttest, the follow-up was performed. The research tools included the following:

Coping strategies questionnaire

The CSQ was used to measure pain coping strategies. This questionnaire was designed by Rosenstiel and Keefe in 1983^[27] and has 42 items that measure pain coping strategies. Coping strategies include six cognitive strategies: attention-grabbing, reinterpretation of pain, self-talk, catastrophizing, prayer and hope, and a behavioral strategy to increase behavioral activity. Each coping strategy consists of 6 terms, and the respondent is asked to use a seven-point scale from 0 to 6 to determine how much they use each of the strategies when faced with pain. The scores of the six terms are added up and a combined score is obtained for each strategy, which can vary from 0 to 36. The overall score of the coping strategies is 0–252. This questionnaire was

Table 1: Acceptance and commitment therapy for dental anxiety

Session	Brief description
One	Welcoming, introduction, instructions for group work and clarifying the type of therapy, overall assessment and talking about the negative thoughts and feelings and concerns of treatment seekers, expressing the nature and features of normal dental fear and anxiety, focusing on the therapeutic objective and commitment of therapist, practicing concentration and introducing mindfulness, and practicing conscious breathing
Two	Practicing concentration, performance assessment of references in the past week, reviewing dental therapy avoidance models, efficacy and costs of this avoidance, and observing dental anxiety instead of reaction to it through practicing acceptance of thoughts and emotions
Three	Practicing concentration, performance assessment, reviewing the reactions of the treatment seekers to former sessions, re-practicing the acceptance of thoughts and emotions, introducing control as a problem and explaining whether the main problem is control or abandoning control is an alternative solution, metaphor: Challenging the dental anxiety monster, and assigning homework
Four	Practicing concentration, reviewing the acceptance of thoughts and emotions, practicing anxiety acceptance based on the knowledge through expression of the nature of acceptance and awareness, accepting anxiety and that acceptance is not a quick solution to anxiety, talking about controlling external events versus controlling internal issues, and homework: Life promotion tasks
Five	Practicing concentration, performance assessment, review of reactions to former sessions, introducing oneself as context versus oneself as content, metaphor "plying volleyball with thoughts and stressful emotions," metaphor "chess plate," metaphor "radio of anxiety news," life compass as the final cause for exposure, analyzing the valuable paths sheet, and assigning homework
Six	Practicing concentration, performance assessment, reviewing the reactions to former sessions, discussing emotional desires through attempts or actions along with pencil practice, parable: Thermostat of desire and exposure to thoughts and intense emotions along with the metaphor "bus driver," and assigning homework.
Seven, eight, nine	Practicing concentration, performance assessment, reviewing the reactions to former sessions, normal value-oriented behavioral activation via behavioral activation, defusion and mindfulness techniques, knowledge of mental and verbal traps, empirical practice of life promotion, including practicing anxiety acceptance, life sensing exercises (internal and/or visualization exercises) or activities related to valuable life objectives, monitoring the experiences related to anxiety and fear, and assigning homework
Ten	Practicing concentration, performance assessment, reviewing the reactions to former sessions, continuing the introduction of values, enhancing concentration on behavioral commitment, preparing the treatment seekers for the end of treatment, presenting a summary of treatment procedures, preparing for the recurrence of the problem and possible failures, identifying high-risk situations, asking the treatment seekers to implement these principles in their life, and giving a summary of metaphors used to the treatment seekers in a brochure and end of treatment

first normalized by Rosenstiel and Keefe^[27] in patients with chronic back pain, and its validity and reliability

Table 2: Cognitive behavioral therapy for dental anxiety

Session	Brief description
One	Introducing the therapist and group members, creating a secure and reliable environment for the members, and providing a ground for group coherence and relationship (techniques: Establishing rapport or therapeutic relationship, familiarity with the general rules of treatment, pretest components, familiarity with dental anxiety, assessment of therapeutic expectations, and assigning homework)
Two	Reviewing the homework of the former session, explaining dental anxiety vicious cycle, extensive analysis of negative psychological, cognitive, and physiologic effects associated with dental anxiety, assessment of dental anxiety in the members, and assigning homework
Three	Reviewing the homework of the former session, presenting the importance of thoughts and their role in inducing emotions, identifying the thoughts, identifying the negative spontaneous thoughts of patients, analyzing common cognitive distortions during the occurrence of dental anxiety and distinguishing the difference between thoughts and reality, expressing the importance of thoughts and their role in inducing emotions, presenting the three-component model of dentistry, presenting the therapy rationale, and assigning homework
Four	Reviewing the homework of the former session, finding the implication of thoughts, validating the negative thoughts and beliefs related to dental anxiety, presenting strategies for coping with negative thoughts related to dental anxiety, and assigning homework
Five	Reviewing the homework of the former session, evaluating the quality of evidence, creating adaptable thoughts and beliefs, evaluating the adaptable thoughts, introducing exposure, investigating the instructions of exposure and its practice, and assigning homework
Six	Reviewing the homework of the former session, teaching tensionless relaxation, practicing confrontation and imaginal exposure, and homework
Seven	Reviewing the homework of the former session, expressing anxiety changes in imaginal exposure, testing the indicators and analyzing the progress of patients, reviewing the negative memories related to dental situations, focusing on behavior rather on emotions, and assigning homework
Eight	Reviewing the homework of the former session, presenting the experiences of group members about their imaginal exposure, testing the remaining indicators, practicing imaginal exposure in group meetings, and assigning homework
Nine	Reviewing the homework of the former session, sharing the achievements and failures in imaginal exposure, emphasizing the common topics and issues, <i>in vivo</i> exposure, and assigning homework
Ten	Reviewing the homework of the former session, reviewing the progress of group members through a ranking from, expressing the thoughts and emotions about the end of sessions, and determining the probable future barriers and problems to prevent their recurrence

have been confirmed by various studies. In Iran, the psychometric properties of the questionnaire have been studied by Asghari Moghadam and Golk,^[28] with Cronbach's alpha coefficient of 0.80 for the whole questionnaire at 0.05 level. Nasimi Far *et al.*^[29] also

reported a Cronbach's alpha coefficient of 0.85 for this questionnaire.

McGill pain questionnaire

This questionnaire was developed by Melzack^[30] and has 20 sets of phrases to assess people's perception of pain.^[30] If the respondent does not consider any of the phrases to be consistent with his/her pain description, that set will be assigned a score of 0. To obtain the total score of the questionnaire, the sum of scores of all questions is calculated. A higher score indicates a higher degree of pain perception in the respondent and vice versa. Dworkin *et al.*^[31] confirmed the validity of this questionnaire. Its reliability was also calculated using Cronbach's alpha. The alpha coefficient for all dimensions was between 0.83 and 0.87. Naseri^[32] reported a Cronbach's alpha of 0.722 for the sensory perception of pain, 0.837 for the emotional perception of pain, 0.211 for the pain perception assessment, 0.648 for various pains, and 0.838 for the whole questionnaire.

Dental anxiety inventory

This inventory, which was developed by Stouthard *et al.*, was used to measure dental anxiety.^[25] It is a self-report questionnaire that consists of 36 items in the form of scary statements about dental situations. The items are answered on a five-point Likert scale (including completely false = score 1 to completely true = score 5). It takes 5–10 min to complete the questionnaire, and none of the items has a reverse score. The minimum score in this questionnaire is 36 and the maximum score is 180; a higher score indicates higher dental anxiety. This questionnaire was translated into Persian by Yousefi and Piri^[33] after obtaining permission from its developers, and the final version was prepared after performing the relevant review and evaluation.

According to the study of Stouthard *et al.*,^[25] people with an anxiety score of 130 ± 23.6 were considered anxious. Regarding the evaluation of psychometric properties, the main constructors of the Dental Anxiety Questionnaire showed that the internal consistency of the questionnaire through Cronbach's alpha ranged from 0.96 to 0.98, and the test–retest reliability of the questionnaire in different groups ranged from 0.84 to 0.87.^[34] Further, the structure of the Dental Anxiety Questionnaire in the Iranian population has been confirmed through confirmatory factor analysis. Moreover, the internal consistency of this questionnaire was evaluated by Cronbach's

alpha ($\alpha = 0.94$) and split-half method ($r = 0.94$), which indicated the high internal consistency of the questionnaire. The reliability coefficient of the instrument obtained by the test–retest method was equal to 0.71, which indicated the optimal reliability of the questionnaire.

Visual analog scale

This scale is used to determine the severity of pain in patients. The Visual Analog Scale uses a graded 10-cm line, with a score of 10 for the most severe pain and a score of 0 for no pain.^[34] The Visual Analog Scale is the most widely used instrument for pain measurement in the world. In addition to its confirmed validity and reliability, the most important feature of this instrument is its ease of use. A score of 1–3 indicates mild pain, 4–7 indicates moderate pain, and 8–10 indicates severe pain. Numerous studies have confirmed the validity and reliability of this tool.^[35] The reliability of this scale, with a correlation coefficient of 0.88, has also been confirmed in Iran.^[36]

Symptom checklist-90-revised

This questionnaire was first developed by Derogatis, Lipman, and Covi, and was then revised. This scale is a psychiatric self-assessment checklist in which respondents answer 90 questions on a five-point Likert scale. The score of each subscale is obtained by summing the scores of the items in that subscale divided by the number of items in that subscale. The scores obtained are interpreted as follows: a mean score of ≥ 1 indicates morbidity and a mean score of >3 shows psychosis. In the depression subscale, a score >3 usually indicates severe depression and psychosis. If a person does not answer more than 20% of the questionnaire questions or more than 40% of the questions of each subscale, the score of the questionnaire or subscale will not be valid. This scale includes 9 dimensions of physicality (12 items), obsessive-compulsive disorder (10 items), interpersonal sensitivity (9 items), depression (13 items), anxiety (10 items), hostility (6 items), morbid anxiety (7 items), paranoid thoughts (6 items), and psychosis (10 items) as well as 7 additional items that are not part of any of the nine dimensions, some of which measure sleep disorders and sexual desire. The SCL-90-R has been used in many studies as a brief indicator of mental health.^[37] Confirming its internal consistency, Derogatis *et al.* reported the test–retest reliability of 0.77–0.90 for this scale.^[37]

Pulse oximeter

It is a device used to measure the percentage of oxygen saturation in human arterial blood. Pulse oximetry is a noninvasive method that measures the number of hemoglobin molecules that are mixed with oxygen and expresses it as a percentage. Its normal rate is from 95% to 97%. If this rate is <90% in patients, an alarm will sound. It also displays the number of heart rates.^[38] Abbasi *et al.*^[38] reported that the accuracy and validity of the pulse oximeter device in measuring the heart rate of patients were directly confirmed by using electrodes on the patient's skin and measuring the electrical activity of contracted heart muscles (electrocardiogram). In addition, the heart rate was indirectly confirmed by listening to the heartbeat. The accuracy and validity of the pulse oximeter were also confirmed by a medical earphone and palpating the wrist pulse and counting the heart rate.^[38]

Data were analyzed by SPSS software (version 24). Mean and standard deviation were used for descriptive statistics. For inferential statistics, after examining the normality of data distribution through Shapiro–Wilk test, equality of error variances through Levene's test, and analysis of sphericity test via Mauchly's test, repeated measures ANOVA and Bonferroni *posthoc* tests were used. The significance level used in the present study was set at a minimum of 0.001 and a maximum of 0.05.

RESULTS

The results of demographic studies showed that the mean age of participants was 32.00 ± 6.11 in the ACT group, 33.34 ± 7.98 in the CBT group, and 32.43 ± 6.06 in the control group. Further, most of the participants were male, and more than 60% of them were married. Table 3 presents the descriptive statistics for pain coping strategies and pain perception intensity for each study group in three stages of research. As indicated, the scores of pain coping

strategies increased in the posttest and follow-up compared to the pretest in the experimental groups, and the scores of pain perception intensity decreased in the posttest and follow-up compared to the pretest.

Before performing repeated measures analysis of variance, to examine the assumptions of this type of analysis, the Shapiro–Wilk test showed that data were normally distributed in three stages of pretest, posttest, and follow-up ($P < 0.05$). Levene's test showed the equality of error variance among the three research groups ($P < 0.05$). Box's M test also confirmed the equality of the variance-covariance matrix ($P < 0.05$). Mauchly's test confirmed the sphericity assumption for all scores ($P < 0.05$).

Table 4 presents the results of multivariate tests for the test factor and the test group interaction (ACT, CBT, and control groups) for pain coping strategies and pain perception intensity. The results of this table show significant differences between pretest, posttest, and follow-up in pain coping strategies and pain perception intensity. There are also significant differences in pain coping strategies and pain perception intensity in terms of group membership between the pretest, posttest, and follow-up.

Table 5 presents the results of repeated measures analysis of variance for the test factor and the test group interaction for the research variables. The results of this table show a significant difference between pretest, posttest, and follow-up in pain coping strategies and pain perception intensity ($P < 0.01$). In addition, there is a significant difference between pre-test, posttest, and follow-up in the two experimental groups and the control group ($P < 0.01$).

Table 6 presents the results of the Bonferroni *post hoc* test for pairwise comparison between the experimental and control groups in coping strategies and pain perception intensity. As shown, there is no significant difference between the ACT and CBT groups in coping strategies and pain perception intensity ($P < 0.05$),

Table 3: Mean and standard deviation of pain coping strategies and pain perception in different study groups and test steps

Group	Statistical index	Pain coping strategies			Pain perception intensity		
		Pretest	Posttest	Follow-up	Pretest	Posttest	Follow-up
ACT	Mean±SD	86.25+ _{9.98}	92.25+ _{9.52}	93.12+ _{9.76}	35.87+ _{1.54}	33.06+ _{2.51}	31.81+ _{3.20}
CBT	Mean±SD	89.68+ _{9.10}	93.25+ _{10.65}	96.18+ _{8.15}	35.87+ _{1.25}	32.31+ _{2.05}	30.50+ _{3.26}
Control	Mean±SD	82.43+ _{6.19}	81.18+ _{6.16}	80.18+ _{6.51}	35.93+ _{1.56}	36.68+ _{2.91}	36.56+ _{3.26}

SD: Standard deviation; CBT: Cognitive behavioral therapy; ACT: Acceptance and commitment therapy

Table 4: Results of repeated measures MANOVA for pain coping strategies and pain intensity

Variable	Effect	Statistical index	Value	F	df hypothesis	df error	P
Pain coping strategies	Test	Pillai's trace	0.233	6.672	2	44	0.003
		Wilks' lambda	0.767	6.672	2	44	0.003
		Hotelling effect	0.303	6.672	2	44	0.003
		Roy's largest root	0.303	6.672	2	44	0.003
	Test group interaction	Pillai's trace	0.404	5.704	4	90	0.0001
		Wilks' lambda	0.628	5.755	4	88	0.0001
		Hotelling effect	0.539	5.798	4	86	0.0001
		Roy's largest root	0.413	9.288	2	45	0.0001
Pain perception intensity	Test	Pillai's trace	0.501	22.076	2	44	0.0001
		Wilks' lambda	0.499	22.076	2	44	0.0001
		Hotelling effect	1.003	22.076	2	44	0.0001
		Roy's largest root	1.003	22.076	2	44	0.0001
	Test group interaction	Pillai's trace	0.471	6.923	4	90	0.0001
		Wilks' lambda	0.531	8.180	4	88	0.0001
		Hotelling effect	0.878	9.440	4	86	0.0001
		Roy's largest root	0.874	19.662	2	45	0.0001

Table 5: Results of repeated measures ANOVA for intragroup factor and intragroup–intergroup interaction for pain coping strategies and pain perception intensity

Variable	Source of effect	Type of analysis	Sum of squares	df	Mean squares	F	P	η^2	Test power
Pain coping strategies	Test	Assumption of sphericity	356.931	2	178.465	11.717	0.001	0.207	0.993
		Greenhouse–Geisser	356.931	1.284	278.066	11.717	0.001	0.207	0.958
		Huynh–Feldt	356.931	1.364	261.747	11.717	0.001	0.207	0.966
		Low limit	356.931	1	356.931	11.717	0.01	0.207	0.918
	Test group interaction	Assumption of sphericity	470.944	4	117.736	7.730	0.001	0.256	0.997
		Greenhouse–Geisser	470.944	2.567	183.444	7.730	0.001	0.256	0.971
		Huynh–Feldt	470.944	2.727	172.678	7.730	0.001	0.256	0.977
		Low limit	470.944	2	235.472	7.730	0.001	0.256	0.936
Pain perception intensity	Test	Assumption of sphericity	212.375	2	106.188	36.338	0.001	0.393	1
		Greenhouse–Geisser	212.375	1.421	149.494	36.338	0.001	0.393	1
		Huynh–Feldt	212.375	1.519	139.827	36.338	0.001	0.393	1
		Low limit	212.375	1	212.375	36.338	0.001	0.393	1
	Test group interaction	Assumption of sphericity	170.625	4	42.656	14.597	0.001	0.393	1
		Greenhouse–Geisser	170.625	2.841	60.053	14.597	0.001	0.393	1
		Huynh–Feldt	170.625	3.038	56.170	14.597	0.001	0.393	1
		Low limit	170.625	2.00	85.313	14.597	0.001	0.393	0.998

but there is a significant difference between the two experimental groups and the control group. Furthermore, there is a significant difference between posttest and follow-up and pretest in pain coping strategies and pain perception intensity ($P < 0.01$), but there is no significant difference between posttest and follow-up ($P > 0.05$).

DISCUSSION

The main purpose of this study was to compare the effect of ACT and CBT on pain coping strategies and pain perception intensity in patients with dental anxiety. The results showed that ACT and CBT had a similar and positive effect on improving coping

strategies and reducing the pain perception intensity in patients with dental anxiety.

Although the effects of ACT and CBT on dental pain and anxiety have been confirmed so far, the comparison of these two approaches has received less attention, which indicates the innovative aspect of the present study. In line with the results of the present study, previous studies have confirmed the effect of CBT on dental anxiety,^[3,24] which can be cited indirectly. Moreover, it can be argued that this part of the results is consistent with the findings of the study of Dehestani *et al.*^[22] on the effect of CBT on coping strategies in patients with chronic pain. Saedi *et al.*^[23] also reported that CBT could reduce pain severity due

Table 6: Results of Bonferroni test for pair comparison of study groups in pain coping strategies and pain perception intensity

Baseline	Time of comparison	Mean difference	SE	P
Pain coping strategies				
Test				
Pretest	Posttest	-2.771	0.837	0.001
Pretest	Follow-up	-3.708	1.004	0.001
Posttest	Follow-up	0.938	0.441	0.059
Group membership				
Acceptance and commitment therapy	Cognitive behavioral therapy	-2.500	2.830	0.382
Acceptance and commitment therapy	Control	9.271	2.830	0.002
Cognitive behavioral therapy	Control	11.771	2.830	0.001
Pain intensity				
Test				
Pretest	Posttest	1.875	0.308	0.001
Pretest	Follow-up	2.938	0.445	0.001
Posttest	Follow-up	1.063	0.668	0.063
Group membership				
Acceptance and commitment therapy	Cognitive behavioral therapy	0.687	0.741	0.954
Acceptance and commitment therapy	Control	-2.812	0.741	0.001
Cognitive behavioral therapy	Control	-3.50	0.741	0.0001

SE: Standard error

to its positive effect on coping strategies. Vowles and McCracken^[17] also reported that ACT was effective in reducing pain perception. Fatemi and Manshei^[18] believed that ACT affected pain perception intensity in patients with rheumatoid arthritis. Sabour and Kakaberi^[19] also emphasized the positive effects of ACT on pain perception.

The positive effect of CBT on pain coping strategies and reducing pain perception severity in patients with dental anxiety is associated with enhanced ability to manage dental anxiety, possibly by reducing avoidance and inducing the ability to diagnose fear of dental interventions and increasing group self-efficacy. During CBT, the vicious circle of dental anxiety is broken by increasing the awareness of dental anxiety exacerbation and removing one of the components of this cycle, which consequently reduces the pain perception intensity.^[39] Expressing the role of thoughts in the type of emotions, identifying the negative thoughts and common cognitive distortions, and inducing the ability to distinguish thoughts from reality enabled the patients to improve dysfunctional coping strategies by correcting dysfunctional thoughts and cognitive distortions, thereby reducing their pain perception severity.

During the CBT, emotions and their relationship with preconceived thoughts were examined, and other facts were called upon to decrease the negative thoughts associated with dental anxiety. Replacing

adaptive, realistic, positive, and flexible thoughts and beliefs could help patients to transform their old and inefficient principles and assumptions into new and effective ones and ultimately refine their ineffective coping strategies.^[40]

Performing the virtual reality exposure technique, practicing it, and generalizing it to a real situation individually helped patients to gradually face the annoying anxiety-inducing stimuli and to gradually deal with those stimuli for a longer period. It also gave patients a chance to analyze the anxiety-inducing stimuli mentally, which played an important role in reducing the pain perception intensity. The implementation of this technique along with the stress-free relaxation technique reduced the patients' willingness to use inefficient and avoidant methods to deal with anxiety-inducing stimuli.^[23] In general, it can be argued that CBT made clients aware of the impact of negative thoughts and emotions on the use of ineffective coping strategies and intensification of pain perception in dental settings. It also assisted them to replace adaptive thoughts to reduce negative emotions by identifying common cognitive distortions from dental situations and challenging them, identifying destructive or disturbing thought patterns (rumination) that have negative effects on behavior, and finding the implication of thoughts and their relationship with emotions. Moreover, due to virtual reality exposure techniques, effective coping strategies were practiced

and repeated, and as a result, the estimation of perceived pain intensity was corrected.

The effect of ACT on modulating pain management strategies and reducing pain perception severity in patients with dental anxiety is probably linked with the basic principle of this treatment, which is to achieve psychological flexibility. During the treatment sessions, patients were taught the concept of acceptance through metaphors, allegories, and exercises. Acceptance of the problem led to the development and reinforcement of self-confidence and ultimately psychological flexibility, which was effective in applying coping strategies and reducing pain perception intensity. During this treatment, the patients explained the high cost of dysfunctional values in their lives and were asked to identify the efficient values of their lives, to determine appropriate goals to achieve them, and to promise to make an attempt to achieve those goals based on the value set.^[16] This helped patients to get rid of their past dysfunctional beliefs and values and increase their involvement in the present, thereby reducing conflict with dysfunctional thoughts and pain perception intensity. Cognitive fault and its practices made the thoughts less intrusive and made the individuals less involved with negative thoughts.^[33]

Given the important role of dysfunctional thoughts in using wrong coping strategies, this treatment helped the patients to find themselves free from dental anxiety and not to identify themselves with its associated thoughts and feelings. Further, to explain this finding, it can be argued that teaching acceptance and commitment rather than ignoring inner feelings and experiences helped the patients to become aware of their feelings and inner and emotional experiences, to accept them, and to use them properly and appropriately, making it possible for them to relate well to their situations and interactions and experience them with a new perspective,^[25] which led to the improvement of pain coping strategies and reduction of pain perception intensity.

Thus, it should be noted that in the ACT, no attempt is made to improve pain coping strategies and reduce pain perception intensity, rather these changes are the side effects of this treatment. Hence, by teaching acceptance to clients, ACT could help patients change their interpretation of the situation and offer an alternative to experiential avoidance, making them accept their inner experiences such as

thoughts, desires, feelings, and physical symptoms in dental situations without defense against them. That is, the clients learned to shift their focus from reducing anxiety to having a rich and fruitful life in accordance with their values, and by teaching cognitive fault, they were encouraged to change their relationship with thoughts and other inner experiences and see them as mental events that come and go one after another. During ACT, the clients learned to see thoughts only as thoughts, emotions only as emotions, and memories only as memories. Therefore, in areas where experiential avoidance occurs, such as dental situations, cognitive fault processes, and acceptance, it helps the individual to break the dysfunctional coping pattern and perceive less pain.

CONCLUSION

Based on the results of the study, both ACT and CBT can be used to improve pain coping strategies and reduce the pain perception intensity in patients with dental anxiety. It should be noted that the present study, like previous studies, had some limitations that should be considered in generalizing the results. One of the limitations was the multidisciplinary (psychological-medical) nature of the study, which made it impossible to control the medical treatment. Short-term quarterly follow-up was another limitation of the present study. Finally, experts are suggested to use these two treatments to increase preventive oral health measures.

Financial support and sponsorship
Nil.

Conflicts of interest

The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or nonfinancial in this article.

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