

The Effectiveness of Cognitive-behavioral Therapy on Anger in Female Students with Misophonia: A Single-Case Study

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Abstract

Background: Misophonia is an unpleasant condition, in which the feeling of excessive anger is triggered by specific sounds. The main objective of the present study was to investigate the effectiveness of cognitive-behavioral therapy (CBT) on anger in female students with misophonia.

Methods: A study based on a non-concurrent multiple baseline design was conducted in 2018 at the School of Education and Psychology, Shahid Chamran University of Ahvaz, Ahvaz, Iran. Three female students aged 20-22 years were recruited using the multi-stage random sampling method. The study was conducted in three stages, namely baseline, intervention, and follow-up sessions. The Novaco anger questionnaire was used during the baseline sessions, intervention sessions (sessions three, six, and eight), and six weeks follow-up (two, four, and six weeks after the last intervention session). Data were analyzed using visual analysis, reliability change index (RCI), and recovery percentage formula.

Results: CBT reduced the feeling of anger after the intervention and follow-up sessions. The recovery percentage at the end of the intervention sessions were 43.82, 42.28, and 9.09 for the first, second, and third participants, respectively.

Conclusion: The findings of the present study confirm the effectiveness of CBT in reducing the feeling of anger in female students with misophonia.

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Keywords • Misophonia • Cognitive-behavioral therapy • Anger • Sound

What's Known

- Misophonia is triggered by auditory stimuli and characterized by an extreme emotional response (e.g., anxiety, agitation, and annoyance) to specific patterns of sound.
- Despite the adverse effects of misophonia on patients' quality of life, only a few studies have addressed the effect of psychological treatments on its symptoms.

What's New

- The effectiveness of cognitive-behavioral therapy on anger, as the main symptom of individuals with misophonia, was investigated.
- Effectiveness of psychological interventions in treating misophonic individuals was confirmed.

Introduction

The term misophonia was introduced by Jastreboff and others in 2001.^{1, 2} It describes a condition that causes individuals to experience a negative emotional reaction (e.g., anxiety, agitation, and annoyance) to specific patterns of sound in certain situations, despite tolerance for other louder sounds.³ Triggered by auditory stimuli, anger, and rage are the most common emotional reactions of misophonic individuals.⁴ Anger is a normal human reaction in response to stress and hostility and is usually associated with involuntary responses such as increased blood pressure, heartbeat, sweat, and blood sugar.⁵ The feeling is provoked by various real or imaginary conditions such as frustration, injuries, humiliations, or injustices. Typically, an individual with misophonia will react with body language, e.g., stare or a verbal response to the source of the noise. In general, those in direct

contact with such individuals such as family and friends tend to avoid making irritating sounds while eating (slurping and chewing).⁶ Physical aggression by individuals with misophonia has also been reported. A previous study among 42 such patients reported the incidence of verbal abuse (28.6%), throwing of objects (16.7%), and physical aggression (11.9%).⁷

Various studies have addressed the effectiveness of cognitive-behavioral therapy (CBT) on anger management.^{5, 8, 9} However, there are no controlled studies on the treatment of anger in individuals with misophonia, and the publications are limited to a few case studies. In a study in 90 patients with misophonia, eight CBT group sessions were performed every two weeks resulting in a significant reduction of the symptoms in 48% of the patients.¹⁰ A couple of other studies also reported the effectiveness of CBT.^{11, 12} An article in a medical journal indicated that CBT may help individuals with misophonia to manage their emotions, when exposed to irritating noise.¹³ Individuals with misophonia find trigger noises produced by their close relatives more distressing than by strangers.¹¹ An interesting study examined the effect of misophonia on students living in dormitories.¹⁴ They showed that a switch from living in a home environment to dormitories could interfere with their adaptation to misophonia with other roommates. This was particularly the case in female students, as they are more sensitive to environmental factors and are more vulnerable to psychological problems.

Most clinical studies on misophonia have been conducted in female patients,^{11, 15-17} but there is no information about the prevalence of the disorder. It has been shown that misophonia is not an auditory impairment caused by anatomical anomalies, instead, it is due to a highly sensitive association between the limbic and sympathetic nervous systems.^{18, 19} Such excessive sensitivity of the sympathetic nervous system leads to alteration of cognition and behavior. The main objective of the present study was to investigate the effectiveness of CBT on anger in female students with misophonia.

Materials and Methods

A study based on a non-concurrent multiple baseline single-case experimental design was conducted in 2018 at the School of Education and Psychology, Shahid Chamran University of Ahvaz, Ahvaz, Iran (Ethical code: 49752). The target population was female students living in dormitories of Ahvaz University of Medical Sciences (Ahvaz, Iran). The sample size was

determined in accordance with the Krejcie and Morgan table.²⁰ Based on the multi-stage random sampling method, 320 female students living in the dormitories were recruited. To identify students with misophonia, we made a random selection of the dormitories (two out of six), two floors in each dormitory, and 15 rooms per floor. For the initial diagnosis, the misophonia questionnaire (MQ) was handed out to the female students. Out of the 320 students, 65 students achieved the score ≥ 7 (cut off point based on a previous study²¹). These students were approached for an interview, however, the majority either did not respond to phone calls, refused to fill in the required information, or did not attend the meeting. Eventually, 27 students were enrolled for the interview in accordance with the diagnostic criteria of Schroder and others.⁷ The inclusion criteria were misophonia score ≥ 7 , diagnosed with misophonia, and willingness to participate in the study. The exclusion criteria were psychiatric or psychotropic drug consumption at the start of or during the last six months prior to the study and attending psychotherapy sessions. Out of the 27 students, 11 fulfilled the criteria, among which four students were randomly selected for participation. During the study, one student decided to withdraw and the remaining students ($n=3$) followed the study stages, namely baseline, intervention, and follow-up sessions. The Novaco anger questionnaire was used during the baseline sessions, intervention sessions (sessions three, six, and eight), and six weeks follow-up (two, four, and six weeks after the last intervention session).²² Based on the study design, the participants entered the baseline stage at the same time, but each followed the intervention stage with a one-week interval. The intervention sessions were conducted weekly over eight weeks period, each lasting 60 minutes. The assignments and exercises of the sessions were mainly in accordance with the technique proposed by Schroder and colleagues (relaxation, task concentration exercise, audio clips, and cognitive-behavioral therapy).^{10, 23} The content of the therapeutic sessions was:

Baseline: Familiarization with the topic and exchange of information, interviewing in accordance with Schroder criteria,⁷ and filling out the questionnaires for baseline assessment.

Session 1: Introduction to misophonia and intervention methodology, description of intervention goals, defining a systematic hierarchical system to examine a range of auditory stimuli triggers, and homework.

Session 2: Homework review, open discussion on the personal experiences with

misophonia, and participants' moral values related to misophonic triggers, identifying adaptive and maladaptive coping strategies, task concentration exercise, and homework.

Session 3: Homework review, relaxation and breathing training, and homework.

Session 4: Introduction to manipulation of auditory stimuli and instruction on how to manipulate auditory misophonic triggers by altering the pitch or interval of audio clips.

Sessions 5-7: Homework review and direct exposure to aversive sounds (i.e., dining with family members or those who produce such sounds).

Session 8: Homework review, assessment of therapeutic effects, and guidelines for additional exercises.

Prior to the study, written informed consent was obtained from the participants.

Instruments

Misophonia Questionnaire (MQ)

MQ is a self-report questionnaire developed by Wu and colleagues.²¹ It consists of three scales, namely a 7-item misophonia symptom scale (MSS), 10-item misophonia emotions and behaviors scale (MEBS), and a single item misophonia severity scale. The misophonia severity scale is based on a modified version of the National Institute of Mental Health Global Obsessive-compulsive Scale,²⁴ which evaluates the overall severity of misophonia symptoms. The reliability by Cronbach's alpha of the MSS, MEBS, and the total scale was 0.86, 0.86, and 0.89, respectively.²¹ A previous study in Iran examined the psychometric properties of the MQ on 350 students; and the reported reliability by Cronbach's alpha for MSS, MEBS, and the total scale was 0.80, 0.89, and 0.90, respectively.²⁵ In the present study, the reliability by Cronbach's alpha for the total scale was 0.90, and for the MSS and MEBS was 0.75 and 0.90, respectively.

Novaco Anger Scale (NAS)

This tool consists of 25 items and rated on a 5-point scale from 0 to 4. The total score ranges

from 0 to 100. The reported validity and reliability of the scale were 0.86 and 0.96, respectively.²⁶ A previous study in Iran correlated NAS with the Buss-Perry aggression questionnaire and reported a correlation coefficient of 0.78. The reliability of NAS by Cronbach's alpha was 0.86 whereas by test-retest was 0.73.²² In the present study, the reliability of NAS by Cronbach's alpha was 0.91.

In addition to the above-mentioned instruments, a clinical interview with the participants was conducted. The diagnostic criteria for misophonia as described by Schroder and colleagues⁷ were used to better understand the underlying reasons for misophonia, i.e., obsessive-compulsive disorder (OCD) or post-traumatic stress disorder (PTSD).

Data Analysis

Since the study was based on a single-case design, data obtained from the three participants during the baseline, intervention, and follow-up stages were analyzed using descriptive statistical methods. The data were analyzed using visual analysis, recovery percentage formula, and reliability change index (RCI). RCI was calculated to determine the clinical significance of the results and the cut-off score. In addition, trends of stability indices, and the percentage of non-overlapping and overlapping data points were calculated.

Results

The effectiveness of CBT on anger scores of the participants is listed in table 1. During the follow-up stage, the anger score of each participant reduced with fluctuations. After the baseline stage, the mean anger score of the first, second, and third participants was 73.0, 65.25, and 48.4, respectively. After the intervention, these scores were 41.0, 37.66, and 44.0; and in the follow-up stage were 21.33, 28.33, and 45.66, respectively. Overall, the results showed that the intensity of anger in the first and second participants decreased after the intervention and

Table 1: The anger score during baseline, intervention, and follow-up stages

Stages	Participant 1	Participant 2	Participant 3
Intervention			
RCI	6.55	6.56	2.73
Recovery percentage after intervention	43.83	42.28	9.09
Overall recovery percentage after intervention	31.73		
Follow-up			
RCI	10.58	8.79	1.70
Recovery percentage after follow-up	70.78	56.58	5.66
Overall recovery percentage after follow-up	44.34		

RCI: Reliability change index

follow-up stages. However, in the case of the third participant, at the start of the intervention stage, the trend of anger reduction was slow with fewer fluctuations than the other two participants. Surprisingly, the score increased during the follow-up stage.

At the end of the intervention, the recovery percentages (i.e., therapeutic and recovery effects) of the first, second, and third participants were 43.83, 42.28, and 9.09, respectively, with an overall recovery rate of 31.73. Note that the value associated with the third participant was lower than the other two. After the follow-up stage, the recovery percentages of the first, second, and third participants were 70.78, 56.58, and 5.66, respectively, with an overall recovery rate of 44.34. These indicated the effectiveness of the interventions, resulting in improvements.

The RCI values for the first, second, and third participants at the end of the intervention stage were 6.55, 6.56, and 2.73, respectively. This meant that the score for each participant was significant and higher than the Z score of 1.96 (representing 95% confidence interval), due to the therapeutic effect of the intervention. At the end of the follow-up phase, the RCI values for the first, second, and third participants were 10.58, 8.79, and 1.70 respectively. Considering the Z score of 1.96, changes in the first and second participants were acceptable, and the intervention was effective. Overall, we found that the anger score at the end of the follow-up stage was below the score at baseline. For better visualization, the trend of the anger scores of each participant in all stages (baseline, intervention, and follow-up) is presented in figure 1. It is evident that the intensity of anger in the first and second participants continually declined from one stage to the next, whereas the intensity of anger in the third participant remained constant.

The indices for inter- and intra-situation visual analysis such as level change,

trend, percentage of overlapping data, and percentage of non-overlapping data were calculated for each participant (tables 2, 3, and 4). The latter represents the percentage of non-overlapping data of the two experimental situations (baseline and intervention). The degree of experimental control in single-case research depends on the change in level from one stage to another and the percentage of non-overlapping data in both stages.

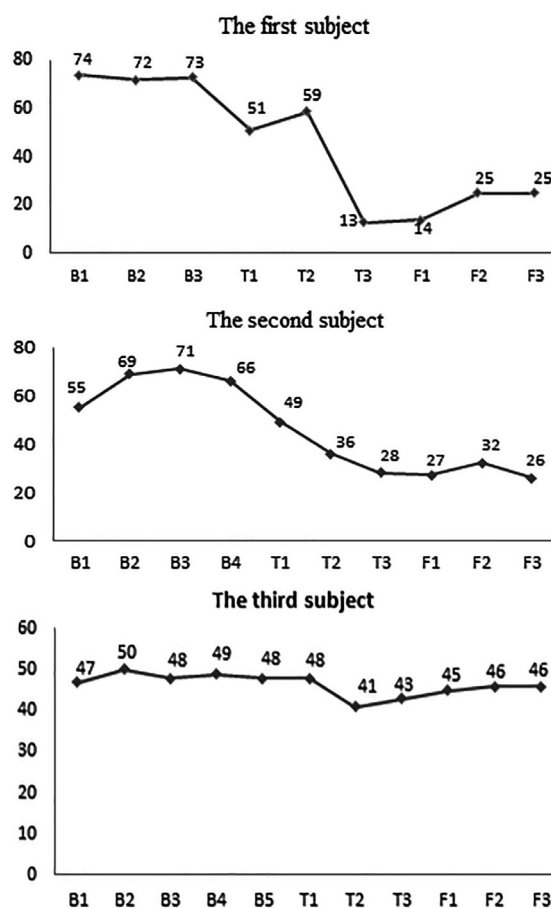


Figure 1: The graphs show the trend of anger score for each participant in all stages (baseline, intervention, and follow-up).

Table 2: The variables for inter- and intra-situational visual analysis for the first participant with misophonia

Inter-situational			Intra-situational	
Sequence of situations	A	B	Comparison of situations	B/A
Duration of situations	3	3	Trend changes	
Level			Target-related effect	Positive
Median	73	51	Change in stability	Stable/Stable
Range	(72-74)	(13-59)	Change in level	
Change in level			Relative change	0.36-73.5
Relative change	(-55-36)	(-72.5-73.5)	Absolute change	0.13-74
Absolute change	73-74	13-51	Median change	0.51-73
Trending			Mean change	0.41-73
Direction	Ascending	Descending	Overlap	
Stability	Stable	Stable	PND	100%
Multiple routes	No	No	POD	0%

PND: Percentage of non-overlapping data, POD: Percentage of overlapping data

Table 3: The variables for inter- and intra-situational visual analysis for the second participant with misophonia

Inter-situational			Intra-situational	
Sequence of situations	A	B	Comparison of situations	B/A
Duration of situations	3	3	Trend changes	
Level			Target-related effect	Positive
Median	67.75	36	Change in stability	Stable/Stable
Range	(55-71)	(28-49)	Change in level	
Change in level			Relative change	0.32-70
Relative change	(32-42.5)	(-60.5-70)	Absolute change	0.66-28
Absolute change	55-66	49-28	Median change	0.67.75-36
Trending			Mean change	0.65.25-37.66
Direction	Ascending	Descending	Overlap	
Stability	Stable	Stable	PND	100%
Multiple routes	No	No	POD	0%

PND: Percentage of non-overlapping data, POD: Percentage of overlapping data

Table 4: The variables for inter- and intra-situational visual analysis for the third participant with misophonia

Inter-situational			Intra-situational	
Sequence of situations	A	B	Comparison of situations	B/A
Duration of situations	3	3	Trend changes	
Level			Target-related effect	Positive
Median	48.25	36	Change in stability	Stable/Stable
Range	(47-50)	(28-49)	Change in level	
Change in level			Relative change	0.42-49
Relative change	(-42-45.5)	(-60.5-70)	Absolute change	0.43-48
Absolute change	47-48	49-28	Median change	0.48.25-43
Trending			Mean change	0.48.4-44
Direction	Ascending	Descending	Overlap	
Stability	Stable	Stable	PND	100%
Multiple routes	No	No	POD	0%

PND: Percentage of non-overlapping data, POD: Percentage of overlapping data

Discussion

The results of the present study showed that CBT was effective in reducing the feeling of anger in individuals with misophonia. The anger score of all three participants decreased at the end of the follow-up stage to below the baseline levels. Although in one participant the intervention did not produce a positive effect at the end of the follow-up stage, the recovery percentage of all participants indicated improvement and effectiveness of the intervention.

Considering the novelty of misophonia, no studies to date have directly addressed the effectiveness of CBT on anger in individuals with misophonia. However, in support of our findings, some studies have indicated the efficacy of CBT on the symptoms of misophonia¹⁰⁻¹² and the effect of CBT on anger in individuals with other spectrum disorders.^{8, 9} Anger is an unpleasant inner emotional state with various intensities and frequencies, which is often characterized by inaccurate thoughts, physical arousal, and an increased tendency towards verbal or non-verbal behaviors, which are not culturally accepted.^{27, 28} In this emotional state, individuals

may interpret events in certain ways and enter the state of self-talk or inner dialogue. Kabosi and Ghorbani showed that cognitive training of anger management reduces a variety of aggressive behaviors (thoughts, behavior, feeling) and helps to identify useful and useless thoughts followed by the ability to correct the latter.⁸ Jamil and Yousef also showed that CBT changed aggressive behavior by promoting a relationship between the therapist and the patient, and through changes in cognitions and definition of errors.⁹ When an individual gets angry, the nervous system is stimulated, and it becomes difficult to suppress the feeling of anger. In the present study, training to change negative self-talk in combination with relaxation techniques (e.g., deep breathing) was used to control anger. Relaxation reduces irritability and increases the individual's tolerance to situations where misophonic triggers may be present.¹⁰ These exercises reduce aggression, especially when combined with cognitive self-control techniques.^{29, 30} The misophonia model described by Schroder and colleagues emphasizes that individuals with misophonia have a high focus on misophonic triggers, which

could be due to impaired attentional control.¹⁰ Therefore, task concentration exercises trained the ability of such individuals to divert their attention to other sensory inputs. In the present study, we showed that CBT reduced the feeling of anger in individuals with misophonia through reducing automatic negative thinking, increasing objective understanding of events, and employing behavioral techniques.

As in other psychological studies, limitations of the present study were the single-sex sample and single-case intervention approach, which undermined the generalizability of our findings. For a more comprehensive assessment of CBT effectiveness, future studies to include male patients and other settings such as schools and family environment, are recommended. In addition, to verify the effectiveness and applicability of CBT on individuals with misophonia, we suggest conducting randomized controlled trials with larger sample sizes. Considering the limited studies on misophonia, it is recommended to investigate its prevalence, association with other disorders (e.g., obsessive-compulsive disorder, depression, etc.), and treatments of misophonia.

Conclusion

With a varying degree of effectiveness, CBT successfully reduced the symptoms of misophonia among the participants. Discontinuation of the prescribed exercises over time can be a factor for the reduced effectiveness of CBT. Additional focus on psychological principles is required to further verify our findings.

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Conflict of Interest: None declared.

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