

Design and Effectiveness of a Transdiagnostic Protocol for Misophonia: Effects on Symptoms and Quality of Life Among University Students

Hossein. Abbasi¹, Shahnaz. Mohammadi^{2*}, Fariba. Hassani¹

¹ Department of Psychology, CT.C., Islamic Azad University, Tehran, Iran

² Department of Clinical Psychology, Faculty of Psychology, Kharazmi University, Tehran, Iran

* Corresponding author email address: smohammadi@khu.ac.ir

Article Info

Article type:

Original Research

How to cite this article:

Abbasi, H., Mohammadi, S., & Hassani, F. (2027). Design and Effectiveness of a Transdiagnostic Protocol for Misophonia: Effects on Symptoms and Quality of Life Among University Students. *Journal of Adolescent and Youth Psychological Studies*, 8(4), 1-16.

<http://dx.doi.org/10.61838/kman.jayps.6477>



© 2027 the authors. Published by KMAN Publication Inc. (KMANPUB), Ontario, Canada. This is an open access article under the terms of the Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0) License.

ABSTRACT

Objective: This study aimed to design and evaluate the effectiveness of a transdiagnostic intervention protocol for reducing misophonia symptoms and improving quality of life among university students.

Methods and Materials: This applied quasi-experimental study used a pretest–posttest control-group design with a 3-month follow-up. The transdiagnostic protocol was developed from a prior grounded theory study and integrated emotion regulation, anger control, sensory sensitivity, cognitive restructuring, perfectionism, compulsive checking management, and interpersonal-metacognitive components. Content validity was evaluated by 11 experts using CVR and CVI indices. Sixty undergraduate psychology students with misophonia from Islamic Azad University, Zanjan Branch, and the University of Zanjan were recruited purposively and randomly allocated to experimental and control groups (30 each). The experimental group received ten weekly 90-minute sessions, whereas the control group received no intervention. Outcomes were assessed using the Misophonia Questionnaire and WHOQOL-BREF at pretest, posttest, and follow-up. Data were analyzed using mixed repeated-measures ANOVA with Greenhouse–Geisser correction where required and Bonferroni-adjusted pairwise comparisons.

Findings: Significant time $\times$ group interactions were found for misophonia symptoms, $F(1.331, 77.195) = 19.87, p < .001, \eta^2p = .255$; emotions and behaviors, $F(1.232, 71.468) = 10.65, p < .001, \eta^2p = .155$; and total misophonia score, $F(1.160, 67.271) = 18.28, p < .001, \eta^2p = .240$. Significant interactions were also observed for physical health, $F(1.158, 67.154) = 10.42, p = .001, \eta^2p = .152$; psychological health, $F(1.192, 69.158) = 9.01, p = .002, \eta^2p = .134$; social relationships, $F(2, 116) = 10.63, p < .001, \eta^2p = .155$; environmental health, $F(1.136, 65.895) = 15.07, p < .001, \eta^2p = .206$; and overall general health, $F(1.472, 85.369) = 10.65, p < .001, \eta^2p = .155$. Most treatment gains remained significant at follow-up.

Conclusion: The transdiagnostic protocol was effective in reducing misophonia symptoms and improving multiple dimensions of quality of life, with substantial maintenance of benefits over 3 months.

Keywords: Misophonia, Transdiagnostic Intervention, Quality of Life, University Students, Emotion Regulation, Cognitive-Behavioral Therapy

1. Introduction

Misophonia is an emerging clinical phenomenon characterized by markedly decreased tolerance to particular sounds or sound patterns that evoke disproportionately intense emotional, cognitive, physiological, and behavioral reactions. Although commonly reported triggers include eating sounds, chewing, breathing, sniffing, throat clearing, clicking, tapping, and repetitive human-generated noises, the defining feature of misophonia is not simply the acoustic intensity or physical properties of the stimulus, but the distinctive negative response elicited by specific trigger sounds and the contextual meaning attributed to them. The growing scientific literature has therefore increasingly distinguished misophonia from hearing disorders such as hyperacusis, in which sound intolerance is more directly related to the perceived loudness or physical characteristics of auditory stimuli. The Delphi-based consensus definition proposed by an international multidisciplinary panel conceptualized misophonia as a disorder of decreased tolerance to specific sounds or associated stimuli in which exposure may elicit anger, irritation, disgust, anxiety, autonomic arousal, avoidance, and functional impairment across social, occupational, academic, and family contexts (Swedo et al., 2022). Earlier reviews similarly demonstrated that misophonia represents a multidimensional condition involving interactions among auditory perception, emotional processing, cognition, behavioral responses, and interpersonal functioning rather than an isolated auditory symptom (Potgieter et al., 2019). A subsequent systematic review of the field confirmed rapid growth in empirical attention to misophonia while emphasizing continued uncertainty regarding its etiological mechanisms, diagnostic boundaries, assessment standards, and optimal treatment approaches (Ferrer-Torres & Giménez-Llort, 2022). Neurophysiological conceptualizations have further proposed that abnormal functional associations between auditory or sensory systems and networks responsible for salience, emotional evaluation, and autonomic activation may contribute to the rapid and aversive responses experienced after exposure to trigger sounds (Jastreboff & Jastreboff, 2023). These developments have collectively shifted the understanding of misophonia away from a narrowly auditory framework toward a broader biopsychosocial and transdiagnostic perspective in which sensory sensitivity interacts with emotional dysregulation,

maladaptive cognition, learned responses, interpersonal meaning, and behavioral avoidance.

The clinical importance of misophonia is reinforced by accumulating evidence suggesting that it is not an exceptionally rare phenomenon. Population-based research has identified substantial proportions of individuals who experience clinically meaningful misophonic reactions, although prevalence estimates vary depending on the operational definition, instrument, severity threshold, and population studied. Research using representative samples in the United Kingdom demonstrated that misophonia-related experiences occur across a continuum in the general population and that a meaningful subgroup reports symptom levels associated with substantial impairment (Vitoratou et al., 2023). More recent representative population-based evidence from Germany similarly supports the view that clinically relevant misophonia affects a notable segment of the population and is associated with psychological burden and interference in daily life (Pfeiffer et al., 2025). The condition is particularly relevant in young adults because this developmental period is characterized by frequent exposure to socially dense auditory environments, including classrooms, dormitories, libraries, shared accommodation, public transportation, cafeterias, and other settings in which avoiding trigger sounds may be difficult. Students with misophonia may consequently experience a recurring conflict between the need to remain engaged in academic and social contexts and an urge to avoid or escape situations associated with anticipated auditory triggers. Such difficulties may contribute to impaired concentration, reduced participation in educational activities, interpersonal conflict, social withdrawal, emotional exhaustion, and restriction of everyday activities. Findings from younger clinical populations also demonstrate that misophonia can be associated with substantial functional impairment and elevated psychiatric morbidity, indicating that the consequences of sound intolerance extend beyond transient irritation and can meaningfully disrupt developmentally important activities and relationships (Guzick et al., 2023). Accordingly, studying misophonia among university students is important not only because symptoms may be especially disruptive within educational environments, but also because intervention during this period may prevent the consolidation of avoidance, interpersonal conflict, and broader patterns of psychological dysfunction.

The phenomenology of misophonia is complex and heterogeneous. Trigger exposure can produce anger, disgust, irritation, anxiety, distress, physiological activation,

aggressive impulses, and an urgent desire to terminate or escape the stimulus. Importantly, affective responses appear to depend partly on whether a sound is identified as a personally meaningful trigger, suggesting that interpretation and learned associations influence emotional reactivity beyond the objective acoustic qualities of the stimulus (Savard et al., 2022). Clinical observations have also shown substantial co-occurrence between misophonia and symptoms of anxiety, depression, obsessive-compulsive phenomena, anger, and other forms of psychopathology (Erfanian et al., 2019). Rather than implying that misophonia is merely secondary to another psychiatric disorder, these patterns suggest that shared mechanisms may contribute to both misophonia and broader emotional difficulties. Symptom-network evidence is consistent with this interpretation, indicating that heightened sensory sensitivity may occupy an important position within a broader network of misophonia symptoms, emotional distress, and clinical comorbidity (Andermane et al., 2023). Functional impairment also appears to be strongly determined by symptom severity and associated psychological characteristics, with more severe reactions linked to greater disruption of social, occupational, and everyday functioning (Möllmann et al., 2023). Within the Iranian context, qualitative investigation of individuals with misophonia has further identified interconnected processes involving sensory sensitivity, emotion dysregulation, difficulty controlling anger, perfectionistic tendencies, negative cognitive attributions, and repetitive checking or monitoring behaviors (Abbasi et al., 2026). These findings are especially relevant because they suggest that effective treatment may need to address not a single symptom pathway but a constellation of transdiagnostic processes that reinforce one another over time.

The adverse consequences of misophonia are also evident in quality of life. Individuals may reorganize routines to avoid triggering situations, use headphones or other safety behaviors excessively, withdraw from meals or shared spaces, experience tension with family members and peers, and limit participation in educational, occupational, or recreational activities. Longitudinal evidence has demonstrated that misophonia is meaningfully related to poorer quality of life and negative emotional states, supporting the view that symptom burden can translate into persistent impairment rather than remaining confined to moments of sound exposure (Dibb & Golding, 2022). Recent research has also shown that anxiety may serve as an important mechanism linking misophonia to diminished

quality of life, suggesting that the impact of the disorder on functioning may be mediated partly by broader emotional processes (Ay et al., 2024). From this perspective, therapeutic success cannot be adequately evaluated solely through reduction in trigger-related symptoms. An intervention may reduce the immediate intensity of sound-induced anger or distress while leaving avoidance, interpersonal impairment, environmental restriction, or psychological well-being substantially unchanged. Quality of life therefore represents an important complementary outcome because it captures whether therapeutic gains generalize into broader improvements in physical health, psychological functioning, social relationships, perceived environmental adequacy, and overall well-being. This broader outcome is particularly important in student populations, where even moderate misophonia may interfere with classroom attendance, studying, social integration, shared living arrangements, and participation in university life.

Despite increased recognition of misophonia, the evidence base for its treatment remains comparatively limited. Cognitive-behavioral approaches have received the strongest empirical attention and typically target maladaptive interpretations, avoidance, excessive attention to triggers, heightened arousal, and dysfunctional coping strategies. A randomized clinical trial demonstrated that cognitive-behavioral therapy can significantly reduce misophonia severity and related impairment, providing important support for a structured psychological treatment model (Jager et al., 2020). In Iran, comparative intervention research has likewise reported beneficial effects of both mindfulness- and acceptance-based group treatment and cognitive-behavioral therapy for individuals with misophonia (Ghorbani et al., 2022). More recent clinical guidance has emphasized the potential usefulness of CBT principles across tinnitus, hyperacusis, and misophonia, particularly when treatment addresses distress, dysfunctional beliefs, behavioral responses, and the functional consequences of sound intolerance rather than attempting simply to eliminate auditory perception (Aazh, 2025). Nevertheless, a systematic review of available misophonia treatments concluded that the intervention literature remains characterized by relatively small samples, methodological heterogeneity, limited randomized evidence, and considerable variation in therapeutic techniques and outcome measurement (Mattson et al., 2023). These limitations indicate that although conventional CBT is promising, there remains a need to develop and evaluate

interventions that are theoretically aligned with the multidimensional and heterogeneous nature of misophonia.

One promising direction involves a transdiagnostic treatment framework. Transdiagnostic approaches are designed to target psychological mechanisms shared across symptom presentations rather than treating each clinical manifestation as an isolated disorder-specific problem. Such an approach may be particularly suitable for misophonia because symptom severity is often intertwined with anger, anxiety, disgust, avoidance, attentional fixation, maladaptive appraisals, perfectionistic expectations, intolerance of uncertainty, interpersonal conflict, and repetitive monitoring. The Unified Protocol for Transdiagnostic Treatment of Emotional Disorders provides a systematic framework for targeting maladaptive emotion regulation, avoidance of internal experiences, cognitive inflexibility, and emotion-driven behavior. A pilot trial adapting the Unified Protocol specifically for misophonia provided preliminary evidence of acceptability and clinical benefit, supporting the feasibility of conceptualizing misophonia through shared emotional mechanisms rather than exclusively through sound-specific processes (McMahon et al., 2024). More recently, a randomized controlled trial in young people compared transdiagnostic cognitive-behavioral therapy with psychoeducation and relaxation training, further strengthening interest in interventions that address common emotional and behavioral mechanisms underlying misophonia-related distress (Lewin et al., 2025). These findings suggest that transdiagnostic interventions may have particular value when symptoms emerge from interactions among multiple processes and when patients present with differing combinations of emotional dysregulation, avoidance, cognitive rigidity, sensory reactivity, and psychiatric symptoms.

At the same time, evidence from other therapeutic models suggests that the interpersonal and metacognitive dimensions of misophonia should not be neglected. Trigger sounds are frequently produced by other people, often family members, roommates, classmates, or close social partners, and the perceived intentionality, preventability, or social meaning of these behaviors may intensify emotional reactions. Thus, misophonia can become embedded within cycles of attention, interpretation, resentment, self-monitoring, interpersonal withdrawal, and conflict. A case study applying Metacognitive Interpersonal Therapy to misophonia demonstrated the potential relevance of identifying dysfunctional metacognitive processes, maladaptive interpersonal schemas, and rigid patterns of

interpretation when treating clinically significant symptoms (Natalini et al., 2024). Such evidence complements cognitive-behavioral and transdiagnostic models by suggesting that intervention should include not only emotional regulation and trigger management, but also examination of how individuals interpret the intentions of others, regulate interpersonal needs, and repeatedly monitor their own and others' behavior. In the qualitative model developed in an Iranian population, negative attributions, perfectionism, anger-control difficulties, heightened sensory sensitivity, and compulsive checking emerged as salient and interconnected components of the lived experience of misophonia (Abbasi et al., 2026). Integrating these empirically derived mechanisms with established transdiagnostic, cognitive-behavioral, and metacognitive-interpersonal treatment principles may therefore provide a more contextually responsive and theoretically comprehensive intervention than relying on a single treatment framework.

Accurate assessment is equally important when evaluating such interventions. The development and psychometric validation of misophonia measures has contributed substantially to clinical research by allowing investigators to distinguish symptom frequency, emotional and behavioral consequences, and perceived severity. In Iran, the psychometric properties of the Misophonia Questionnaire have been examined and found to support its use for assessing misophonia-related symptoms and impairment in Persian-speaking populations (Mehrabizadeh Honarmand & Roushani, 2019). The availability of a validated measure is especially important for intervention research because it permits systematic assessment of symptom change across treatment and follow-up rather than relying exclusively on subjective clinical impressions. At the same time, current conceptual work indicates that the evaluation of treatment should extend beyond total symptom scores to include the functional consequences of misophonia and broader well-being. The association between misophonia severity, emotional distress, and functional impairment documented across clinical and community studies supports the use of multidimensional outcomes that reflect both symptom-specific and life-functioning changes (Ay et al., 2024; Möllmann et al., 2023). This approach is particularly relevant for transdiagnostic interventions, which are intended to produce changes across multiple domains through modification of shared psychological mechanisms.

The existing literature therefore identifies several important gaps. First, although evidence for psychological

treatment is expanding, relatively few controlled studies have evaluated interventions specifically designed around transdiagnostic mechanisms of misophonia, and even fewer have assessed whether improvements remain stable after treatment termination (Mattson et al., 2023; McMahon et al., 2024). Second, most available protocols have been developed within Western clinical settings, while cultural and contextual differences may influence interpersonal interpretations of trigger behavior, norms regarding emotional expression, family and peer interactions, help-seeking, and the functional impact of symptoms. The qualitative identification of misophonia-related processes in an Iranian population provides an opportunity to develop treatment content that is informed directly by the experiences of the target population rather than transferring an externally developed intervention without contextual adaptation (Abbasi et al., 2026). Third, treatment studies have often focused primarily on symptom severity, whereas the broader impact of intervention on quality of life remains comparatively understudied despite evidence that misophonia affects psychological health, social functioning, and daily participation (Ay et al., 2024; Dibb & Golding, 2022). Fourth, because some treatment gains may attenuate after therapy ends, inclusion of a follow-up assessment is necessary to distinguish immediate treatment response from sustained therapeutic benefit. Finally, the multidimensional nature of misophonia suggests a need for interventions that systematically combine emotion regulation, anger management, sensory and attentional flexibility, cognitive restructuring of hostile or negative attributions, modification of perfectionistic standards, reduction of compulsive checking and anticipatory monitoring, interpersonal coping, and relapse-prevention strategies rather than targeting any single mechanism in isolation.

Accordingly, the present study aimed to design and evaluate the effectiveness of a culturally informed transdiagnostic protocol for misophonia in reducing misophonia symptoms and improving quality of life among university students, while also examining the maintenance of treatment effects at a 3-month follow-up.

2. Methods and Materials

2.1. Study Design and Participants

The present study was an applied, quasi-experimental investigation employing a pretest–posttest control-group design with a 3-month follow-up. Eligible participants were randomly allocated to either the experimental group or the

control group after completion of the screening and baseline assessment procedures. The transdiagnostic intervention protocol evaluated in the quantitative phase had previously been developed and content-validated on the basis of findings obtained from a qualitative grounded theory study conducted by Abbasi et al. (2026). The qualitative phase identified several interrelated psychological mechanisms that appeared to play a central role in the experience, persistence, and functional consequences of misophonia, including difficulties in emotion regulation and anger control, heightened sensory sensitivity, perfectionistic tendencies, maladaptive cognitive interpretations and negative attributions, and compulsive checking behaviors. These components provided the conceptual foundation for the development of the initial intervention protocol. The preliminary protocol consisted of ten 90-minute sessions and integrated the empirically derived components of the qualitative model with therapeutic principles and techniques adapted from the Unified Transdiagnostic Treatment Protocol described by McMahon et al. (2024), Metacognitive Interpersonal Therapy as presented by Natalini et al. (2024), and cognitive-behavioral treatment approaches specifically developed for misophonia by Aazh (2025). The initial protocol was subsequently submitted to a panel of 11 experts from the fields of clinical psychology, psychiatry, and audiology for evaluation of its relevance, necessity, clarity, and appropriateness. Content validity was assessed using the Content Validity Ratio (CVR) and Content Validity Index (CVI). According to Lawshe's criteria, a minimum CVR value of 0.59 was considered acceptable for a panel of 11 experts, whereas a minimum CVI value of 0.79 was considered acceptable based on the criteria proposed by Waltz and Bausell (1981). Components or session contents that did not meet these thresholds were revised in accordance with the qualitative comments and recommendations provided by the expert panel. This iterative process resulted in the final ten-session transdiagnostic protocol used in the experimental phase of the present study.

The statistical population consisted of undergraduate psychology students enrolled at Islamic Azad University, Zanzan Branch, and the University of Zanzan who experienced clinically relevant symptoms of misophonia. Participants were recruited through purposive sampling using public study announcements distributed within the two universities. Students who expressed an interest in participating were screened for eligibility according to predetermined inclusion and exclusion criteria. The

minimum sample size was initially estimated through an a priori statistical power analysis performed using G*Power version 3.1.9.7. Assuming a medium effect size of $F = 0.25$ in accordance with Cohen's (1988) recommendations, an alpha level of 0.05, statistical power of 0.80, two study groups, three repeated assessments, and a nonsphericity correction of 0.70, the analysis indicated that a minimum of 36 participants would be required. To provide a larger margin for potential attrition and to maintain adequate statistical power across the posttest and follow-up assessments, recruitment was expanded to 60 participants. The final sample therefore consisted of 60 eligible students, who were randomly allocated in equal numbers to the experimental group and the control group, with 30 participants in each condition. No attrition occurred during the intervention or follow-up period; consequently, all 60 participants completed the pretest, posttest, and 3-month follow-up assessments and were included in the final analyses.

Eligibility for participation required a score of 7 or higher on the third subscale of the Misophonia Questionnaire, which measures the individual's general perception of the severity of sound sensitivity, an age of at least 18 years, current enrollment as an undergraduate student, and the absence of self-reported psychotic disorders. Participants were excluded from continuation in the study if they experienced a substantial change in their physical or psychological health status that could interfere with participation or interpretation of the findings, developed significant adverse effects associated with the intervention, were absent from more than two treatment sessions, or voluntarily withdrew consent to continue participation. Following completion of the baseline assessment, both groups completed the Misophonia Questionnaire and the World Health Organization Quality of Life–BREF questionnaire as pretest measures. Participants assigned to the experimental group subsequently received the transdiagnostic misophonia intervention in ten weekly sessions, each lasting approximately 90 minutes, whereas participants in the control group received no psychological intervention during the study period. The posttest assessment was conducted immediately after completion of the treatment phase, during the week following the tenth intervention session, using the same outcome instruments administered at baseline. To determine whether treatment gains were maintained over time, both groups were reassessed 3 months after the posttest. During this 3-month interval, the control group continued to receive no study-

related intervention, and participants in the experimental group received no booster sessions or additional therapeutic sessions. All participants completed the follow-up assessment, allowing intervention effects and their maintenance to be examined across all three measurement occasions without the complications associated with missing longitudinal data.

2.2. Measures

Misophonia Questionnaire (MQ). Misophonia symptoms were assessed using the Misophonia Questionnaire developed by Wu et al. (2014). The instrument consists of three components designed to assess different aspects of the misophonic experience. The first component, the Misophonia Symptom Scale, contains seven items assessing sensitivity and negative reactions to common trigger sounds. The second component, the Misophonia Emotions and Behaviors Scale, consists of 11 items evaluating emotional and behavioral responses associated with exposure to misophonic triggers. The third component consists of a single item assessing the respondent's general perception of the severity of his or her sound sensitivity. Items are scored using a five-point Likert-type response format ranging from 0 to 4, with response options corresponding to never, rarely, sometimes, often, and always. The total score derived from the first two subscales ranges from 0 to 68, with higher scores reflecting greater severity of misophonia-related symptoms, emotional responses, and behavioral difficulties. The third subscale provides an overall subjective severity rating and was also used as part of the eligibility screening procedure, with a score of 7 or above constituting the predetermined threshold for inclusion in the quantitative phase. Previous psychometric evaluation of the Persian version by Mehrbizadeh Honarmand and Roshani (2019) provided evidence supporting its content, face, and criterion validity in an Iranian population. Internal consistency was reassessed in the present sample to ensure the reliability of the instrument within the specific study population. Cronbach's alpha for the Misophonia Questionnaire was 0.838, indicating satisfactory internal consistency and supporting its use for assessing changes in misophonia symptoms across the pretest, posttest, and follow-up assessments.

World Health Organization Quality of Life–BREF (WHOQOL-BREF). Quality of life was assessed using the World Health Organization Quality of Life–BREF questionnaire, a widely used 26-item measure developed to

provide a multidimensional assessment of individuals' perceived quality of life. The instrument evaluates four principal domains comprising physical health, psychological health, social relationships, and environmental health, while also including general items concerning overall quality of life and satisfaction with health. Items are rated on five-point Likert-type scales, with response anchors varying according to the content of each question. Raw domain scores can be transformed into standardized scores ranging from 0 to 100, with higher scores representing a more favorable perception of quality of life. The WHOQOL-BREF was selected because misophonia may extend beyond reactions to particular auditory stimuli and interfere with emotional well-being, interpersonal relationships, academic functioning, participation in social environments, and overall daily functioning; consequently, evaluation of quality of life provided a broader indicator of the clinical significance of the intervention than symptom reduction alone. The psychometric properties of the Persian version of the WHOQOL-BREF were previously examined and supported in Iran by Nasiri (2006). In the present study, internal consistency was again evaluated within the study sample, and the overall questionnaire demonstrated a Cronbach's alpha coefficient of 0.897. This value indicated good internal consistency and supported the reliability of the instrument for assessing changes in quality of life across the three measurement occasions.

2.3. Data Analysis

Data were analyzed using IBM SPSS Statistics version 32. Descriptive statistics, including means and standard deviations, were calculated to summarize participants' scores on misophonia symptoms and quality of life at the pretest, posttest, and 3-month follow-up assessments. Before conducting the primary inferential analyses, the assumptions required for parametric repeated-measures procedures were systematically evaluated. The Shapiro–Wilk test was used to assess the normality of the distribution of the dependent variables, while Levene's test was used to examine homogeneity of variances between the experimental and control groups. Mauchly's test of sphericity was applied to determine whether the variance–covariance structure of the repeated measurements satisfied the sphericity assumption. In addition, Box's M test was used to evaluate the homogeneity of covariance matrices across groups. Because the dataset contained no missing observations and all 60 participants completed the three assessment occasions,

analyses were conducted on the complete longitudinal dataset. When Mauchly's test indicated violation of the sphericity assumption, the Greenhouse–Geisser correction was applied to adjust the relevant degrees of freedom and provide a more conservative significance test.

The effectiveness of the transdiagnostic intervention and the maintenance of its effects over time were evaluated separately for each dependent variable using mixed repeated-measures analysis of variance. The analytical model included one between-subjects factor, group, with two levels corresponding to the experimental and control conditions, and one within-subjects factor, time, with three levels corresponding to pretest, posttest, and 3-month follow-up. The principal effects of interest included the main effect of time, representing overall change across the three assessments; the main effect of group, reflecting overall differences between the experimental and control groups; and, most importantly, the group $\times$ time interaction, which indicated whether the pattern of change over time differed significantly between the two conditions and therefore provided the primary statistical test of intervention effectiveness. Where significant omnibus effects were observed, pairwise comparisons were conducted using Bonferroni adjustment to control the familywise Type I error rate associated with multiple comparisons. These comparisons were used to examine changes between pretest and posttest, pretest and follow-up, and posttest and follow-up and to compare the experimental and control groups at individual assessment occasions when appropriate. Particular emphasis was placed on the comparison between posttest and the 3-month follow-up within the experimental group because the absence of a statistically meaningful deterioration during this interval was considered evidence that the therapeutic gains achieved at the end of treatment had been maintained. Effect sizes were reported using partial eta squared (η^2p), with values of approximately 0.01, 0.06, and 0.14 interpreted as small, medium, and large effects, respectively, in accordance with Cohen's (1988) conventional criteria. Statistical significance was evaluated at an alpha level of 0.05 for all primary analyses.

3. Findings and Results

Before evaluating the effectiveness of the intervention, the finalized transdiagnostic protocol for misophonia was organized into ten weekly 90-minute sessions. The protocol was designed to address the principal transdiagnostic mechanisms identified during the preceding qualitative

phase, including heightened sensory reactivity, maladaptive emotional responses, anger dysregulation, perfectionistic cognitive patterns, negative interpretations of trigger-related situations, compulsive monitoring and checking, and difficulties in adaptive interpersonal responding. The

intervention incorporated psychoeducation, cognitive restructuring, emotion-regulation strategies, attentional and metacognitive techniques, behavioral exercises, and relapse-prevention procedures. The final session structure and therapeutic objectives are presented in Table 1.

Table 1

Final Structure of the Transdiagnostic Intervention Protocol for Misophonia

Session	Main therapeutic focus	Content and therapeutic activities
1	Orientation and psychoeducation	Establishing therapeutic rapport; explaining the nature, manifestations, and functional consequences of misophonia; introducing the transdiagnostic conceptualization of symptoms; identifying individual trigger sounds, associated situations, emotional reactions, and behavioral responses; introducing self-monitoring of triggers and reactions.
2	Functional analysis of misophonic reactions	Identifying antecedents, trigger characteristics, cognitive appraisals, emotional responses, physiological arousal, and avoidance or confrontation behaviors; developing individualized functional formulations; introducing the relationship among thoughts, emotions, bodily responses, and behaviors.
3	Emotion regulation and anger awareness	Identifying emotional escalation associated with auditory triggers; differentiating primary and secondary emotions; recognizing early signs of anger and physiological activation; teaching adaptive emotion-regulation strategies and techniques for reducing impulsive reactions.
4	Anger control and distress tolerance	Training in response delay, relaxation, controlled breathing, attentional shifting, and distress-tolerance techniques; identifying aggressive urges and maladaptive coping behaviors; practicing alternative responses to trigger exposure.
5	Sensory sensitivity and attentional flexibility	Increasing awareness of selective attention to auditory stimuli; reducing hypervigilance toward trigger sounds; practicing flexible allocation of attention; introducing graded behavioral exercises aimed at decreasing excessive monitoring and avoidance of auditory cues.
6	Cognitive restructuring of negative attributions	Identifying automatic thoughts and hostile, intentional, or personalized interpretations of others' sound-producing behaviors; evaluating evidence for and against maladaptive interpretations; generating balanced and alternative appraisals of trigger-related situations.
7	Perfectionism and rigid expectations	Identifying perfectionistic beliefs, intolerance of deviations from preferred behavior, rigid interpersonal expectations, and excessive standards regarding environmental control; challenging dysfunctional rules and replacing them with more flexible cognitive standards.
8	Compulsive checking and control behaviors	Identifying repetitive monitoring, anticipatory checking, environmental scanning, and safety behaviors related to possible trigger sounds; examining short- and long-term consequences of these behaviors; reducing checking and increasing tolerance of uncertainty.
9	Interpersonal and metacognitive coping	Examining interpersonal consequences of misophonia; identifying maladaptive metacognitive beliefs and recurrent self-focused processing; teaching assertive communication, perspective taking, interpersonal regulation, and adaptive expression of needs in trigger-related situations.
10	Integration, relapse prevention, and maintenance	Reviewing acquired skills; integrating cognitive, emotional, sensory, behavioral, and interpersonal strategies; identifying high-risk situations for symptom recurrence; developing an individualized relapse-prevention plan; reinforcing continued independent practice after treatment termination.

As shown in Table 1, the intervention progressed from psychoeducation and individualized case formulation toward more specific modification of emotional, cognitive, sensory, behavioral, and interpersonal mechanisms involved in misophonia. The early sessions emphasized recognition of trigger-response patterns and emotional dysregulation, while the middle phase focused on anger management, attentional flexibility, cognitive restructuring, perfectionism, and compulsive monitoring behaviors. The later sessions integrated metacognitive and interpersonal coping strategies and concluded with consolidation of therapeutic skills and relapse prevention. This sequential structure was intended to address both the immediate affective response to auditory triggers and the broader transdiagnostic processes that may

contribute to persistence of misophonia and its adverse effects on daily functioning and quality of life.

Descriptive statistics were calculated for all study variables across the pretest, posttest, and 3-month follow-up assessments. At baseline, the experimental and control groups showed generally comparable mean scores on misophonia symptoms and quality-of-life domains. Following the intervention, however, the experimental group demonstrated reductions in all indicators of misophonia and improvements across all quality-of-life dimensions, whereas changes in the control group were comparatively small. Table 2 presents the means and standard deviations for both groups at each measurement occasion.

Table 2

Descriptive Statistics for Study Variables in the Experimental and Control Groups Across Pretest, Posttest, and Follow-Up

Variable	Subscale	Group	Pretest, M (SD)	Posttest, M (SD)	Follow-up, M (SD)
Misophonia	Symptoms	Experimental	21.27 (2.63)	18.93 (1.80)	19.77 (1.77)
		Control	20.83 (2.42)	20.53 (2.11)	20.70 (2.05)
Misophonia	Emotions and behaviors	Experimental	27.20 (4.44)	24.33 (3.33)	25.10 (3.23)
		Control	28.07 (3.81)	27.47 (3.99)	27.63 (3.77)
Misophonia	Total score	Experimental	48.47 (6.89)	43.27 (4.70)	44.87 (4.55)
		Control	48.90 (5.94)	48.00 (5.55)	48.33 (5.35)
Quality of life	Physical health	Experimental	44.88 (15.71)	52.86 (13.08)	50.48 (12.29)
		Control	39.88 (13.88)	39.05 (12.75)	38.81 (12.64)
Quality of life	Psychological health	Experimental	38.33 (16.35)	47.36 (13.42)	44.44 (11.95)
		Control	34.72 (16.35)	35.97 (16.14)	36.39 (15.43)
Quality of life	Social relationships	Experimental	45.28 (19.41)	59.72 (19.95)	57.22 (15.12)
		Control	45.56 (20.73)	47.50 (20.19)	48.33 (16.44)
Quality of life	Environmental health	Experimental	38.54 (19.89)	48.02 (17.93)	45.83 (16.48)
		Control	36.56 (16.50)	37.08 (17.31)	36.67 (16.74)
Quality of life	Overall general health	Experimental	42.92 (21.45)	60.00 (16.87)	58.75 (14.74)
		Control	37.92 (16.24)	41.25 (18.32)	41.67 (17.16)

The descriptive findings shown in Table 2 indicate a consistent pattern of improvement in the experimental group following participation in the transdiagnostic intervention. The mean total misophonia score decreased from 48.47 at pretest to 43.27 at posttest and remained lower than baseline at the 3-month follow-up, with a mean of 44.87. A similar pattern was observed for both misophonia subscales. The symptoms score decreased from 21.27 to 18.93 after treatment and remained at 19.77 at follow-up, while the emotions and behaviors score declined from 27.20 to 24.33 and was 25.10 at follow-up. In contrast, the corresponding means in the control group remained relatively stable across the three assessments. Improvement was also evident across all quality-of-life domains in the experimental group. The largest posttest increases were observed for overall general health, which increased from 42.92 to 60.00, and social relationships, which increased from 45.28 to 59.72. These gains were largely maintained at follow-up, with corresponding means of 58.75 and 57.22. Physical health increased from 44.88 at baseline to 52.86 at posttest and remained at 50.48 at follow-up, while psychological health increased from 38.33 to 47.36 and was 44.44 at follow-up. Environmental health similarly increased from 38.54 to 48.02 and remained above baseline at 45.83 during follow-up. By comparison, the control group demonstrated only minor fluctuations over time. Moreover, the reduction in standard deviations across several experimental-group outcomes at follow-up, such as psychological health decreasing from an SD of 16.35 at pretest to 11.95 at follow-

up, suggested somewhat greater homogeneity of responses following treatment.

Prior to performing the mixed repeated-measures analyses of variance, the relevant statistical assumptions were examined. The Shapiro–Wilk test indicated that distributions were approximately normal for most dependent variables within each group and measurement occasion, with only minor deviations observed for physical health in the experimental group, social relationships in the control group, and overall general health in the experimental group at follow-up. Given the sample size of 30 participants per group, the relative robustness of repeated-measures ANOVA to modest violations of normality, and confirmatory nonparametric analyses, these deviations were not considered sufficiently severe to preclude parametric analysis. Levene's tests were nonsignificant for all study variables across the three measurement occasions, indicating homogeneity of error variances between the experimental and control groups. Box's M tests were also nonsignificant for all dependent variables, with values ranging from 7.27 to 12.01 and all p values greater than .05, supporting equality of covariance matrices. Mauchly's test indicated that the assumption of sphericity was satisfied only for social relationships, $W = 0.907$, $\chi^2(2) = 5.59$, $p = .061$. Sphericity was violated for misophonia symptoms, misophonia-related emotions and behaviors, total misophonia score, physical health, psychological health, environmental health, and overall general health; therefore, Greenhouse–Geisser corrections were applied to these analyses. As an additional

robustness check for the variables showing minor departures from normality, Friedman tests were conducted separately by group. Significant changes across the three assessment occasions were found in the experimental group for physical health, $\chi^2(2) = 19.76$, $p < .001$, social relationships, $\chi^2(2) = 37.44$, $p < .001$, and overall general health, $\chi^2(2) = 30.58$, $p < .001$, whereas no significant temporal changes were

detected in the control group for physical health, $\chi^2(2) = 0.11$, $p = .947$, social relationships, $\chi^2(2) = 2.11$, $p = .348$, or overall general health, $\chi^2(2) = 2.58$, $p = .275$. Thus, the supplementary nonparametric findings were fully consistent with the parametric results and indicated that the minor departures from normality did not materially affect the principal conclusions.

Table 3

Mixed Repeated-Measures Analysis of Variance for Misophonia and Quality-of-Life Outcomes

Dependent variable	Source	F	df	p	η^2p
Misophonia symptoms	Time (GG)	32.68	1.331, 77.195	< .001	.360
	Time $\times$ Group (GG)	19.87	1.331, 77.195	< .001	.255
	Group	1.79	1, 58	.186	.030
Misophonia emotions and behaviors	Time (GG)	24.84	1.232, 71.468	< .001	.300
	Time $\times$ Group (GG)	10.65	1.232, 71.468	< .001	.155
	Group	5.47	1, 58	.023	.086
Total misophonia score	Time (GG)	36.39	1.160, 67.271	< .001	.386
	Time $\times$ Group (GG)	18.28	1.160, 67.271	< .001	.240
	Group	4.41	1, 58	.040	.071
Physical health	Time (GG)	6.45	1.158, 67.154	.010	.100
	Time $\times$ Group (GG)	10.42	1.158, 67.154	.001	.152
	Group	9.65	1, 58	.003	.143
Psychological health	Time (GG)	17.00	1.192, 69.158	< .001	.227
	Time $\times$ Group (GG)	9.01	1.192, 69.158	.002	.134
	Group	4.24	1, 58	.044	.068
Social relationships	Time (SA)	20.64	2, 116	< .001	.262
	Time $\times$ Group (SA)	10.63	2, 116	< .001	.155
	Group	2.32	1, 58	.134	.038
Environmental health	Time (GG)	18.02	1.136, 65.895	< .001	.237
	Time $\times$ Group (GG)	15.07	1.136, 65.895	< .001	.206
	Group	2.79	1, 58	.101	.046
Overall general health	Time (GG)	25.25	1.472, 85.369	< .001	.303
	Time $\times$ Group (GG)	10.65	1.472, 85.369	< .001	.155
	Group	10.84	1, 58	.002	.157

As shown in Table 3, statistically significant time $\times$ group interactions were observed for all three misophonia outcomes, demonstrating that changes over time differed significantly between the experimental and control groups. For misophonia symptoms, the interaction was significant, $F(1.331, 77.195) = 19.87$, $p < .001$, $\eta^2p = .255$; for misophonia-related emotions and behaviors, $F(1.232, 71.468) = 10.65$, $p < .001$, $\eta^2p = .155$; and for the total misophonia score, $F(1.160, 67.271) = 18.28$, $p < .001$, $\eta^2p = .240$. All three interaction effects were large according to conventional criteria. Significant main effects of time were also found for symptoms, $F(1.331, 77.195) = 32.68$, $p < .001$, $\eta^2p = .360$, emotions and behaviors, $F(1.232, 71.468) = 24.84$, $p < .001$, $\eta^2p = .300$, and total misophonia score, $F(1.160, 67.271) = 36.39$, $p < .001$, $\eta^2p = .386$. The main effect of group was significant for emotions and behaviors,

$F(1, 58) = 5.47$, $p = .023$, $\eta^2p = .086$, and total misophonia score, $F(1, 58) = 4.41$, $p = .040$, $\eta^2p = .071$, but not for symptoms, $F(1, 58) = 1.79$, $p = .186$, $\eta^2p = .030$. Bonferroni-adjusted pairwise comparisons further showed that, within the experimental group, the total misophonia score decreased significantly from pretest ($M = 48.47$, $SD = 6.89$) to posttest ($M = 43.27$, $SD = 4.70$), $MD = 5.20$, $p < .001$. Although a small but statistically significant increase occurred between posttest and follow-up ($M = 44.87$, $SD = 4.55$), $MD = -1.60$, $p < .001$, the follow-up score remained significantly below the pretest level, $MD = 3.60$, $p < .001$. No significant pairwise changes were observed in the control group. Between-group comparisons also showed no significant difference at pretest, whereas the experimental group had significantly lower total misophonia scores than the control group at posttest, $MD = -4.73$, $p < .001$, and

follow-up, $MD = -3.47$, $p = .009$. Comparable patterns were observed for the symptoms and emotions-and-behaviors subscales, supporting both the immediate effectiveness and the partial maintenance of the intervention effects over 3 months.

The mixed repeated-measures analyses likewise demonstrated significant intervention effects across all quality-of-life outcomes. The time $\times$ group interaction was significant for physical health, $F(1.158, 67.154) = 10.42$, $p = .001$, $\eta^2p = .152$; psychological health, $F(1.192, 69.158) = 9.01$, $p = .002$, $\eta^2p = .134$; social relationships, $F(2, 116) = 10.63$, $p < .001$, $\eta^2p = .155$; environmental health, $F(1.136, 65.895) = 15.07$, $p < .001$, $\eta^2p = .206$; and overall general health, $F(1.472, 85.369) = 10.65$, $p < .001$, $\eta^2p = .155$. These interaction effect sizes were predominantly large, with the psychological-health interaction approaching the conventional large-effect threshold. Significant main effects of time were also observed for all five quality-of-life domains, indicating substantial change across the three assessments. The main effect of group was significant for physical health, $F(1, 58) = 9.65$, $p = .003$, $\eta^2p = .143$, psychological health, $F(1, 58) = 4.24$, $p = .044$, $\eta^2p = .068$, and overall general health, $F(1, 58) = 10.84$, $p = .002$, $\eta^2p = .157$, whereas it was not significant for social relationships, $F(1, 58) = 2.32$, $p = .134$, or environmental health, $F(1, 58) = 2.79$, $p = .101$. Bonferroni-adjusted comparisons demonstrated that treatment gains in social relationships and overall general health were particularly stable: posttest-to-follow-up differences were nonsignificant for social relationships, $MD = 2.50$, $p = .412$, and overall general health, $MD = 1.25$, $p = 1.000$. Although small but statistically significant declines from posttest to follow-up were observed for physical health, psychological health, and environmental health, all three follow-up scores remained significantly higher than their respective pretest values, with p values below .01. No significant pairwise changes were found in the control group across any quality-of-life outcome. Collectively, these results indicate that the transdiagnostic intervention significantly reduced misophonia symptoms and associated emotional-behavioral difficulties while simultaneously improving multiple dimensions of quality of life, and that a substantial proportion of these therapeutic gains was maintained at the 3-month follow-up.

4. Discussion

The present study was conducted to design and evaluate a transdiagnostic intervention protocol for misophonia and to determine its effects on misophonia symptoms and quality of life among university students. The findings showed that the intervention produced significant improvements across all principal outcomes. Compared with the control group, participants who received the ten-session transdiagnostic protocol demonstrated significant reductions in misophonia symptoms, misophonia-related emotions and behaviors, and total misophonia severity from pretest to posttest. The significant time $\times$ group interactions further indicated that these changes could not be attributed merely to the passage of time or repeated measurement, but reflected a specific treatment effect. Although a modest increase in misophonia scores was observed between posttest and the 3-month follow-up, follow-up scores remained significantly lower than baseline, indicating that a substantial proportion of the therapeutic gains was maintained over time. The intervention also significantly improved physical health, psychological health, social relationships, environmental health, and overall general health. For social relationships and overall general health, posttest gains were fully maintained at follow-up, whereas physical, psychological, and environmental health showed some reduction after treatment termination but remained significantly better than baseline levels. Taken together, these findings suggest that a transdiagnostic intervention addressing emotional, cognitive, sensory, behavioral, interpersonal, and metacognitive mechanisms can reduce the severity of misophonia while simultaneously improving broader domains of functioning and quality of life.

The significant reduction in misophonia symptoms is consistent with a growing body of evidence indicating that psychological interventions can meaningfully modify the distress and impairment associated with this condition. The present findings align particularly closely with randomized evidence showing that cognitive-behavioral therapy can reduce misophonia severity and functional impairment (Jager et al., 2020). They are also compatible with Iranian research demonstrating beneficial effects of both cognitive-behavioral and mindfulness- and acceptance-based interventions for misophonia (Ghorbani et al., 2022). More recent clinical work has emphasized the usefulness of cognitive-behavioral approaches that target interpretations, emotional reactions, attention to sound, behavioral responses, and maladaptive coping rather than attempting to

eliminate auditory perception itself (Aazh, 2025). This conceptualization is particularly relevant to the present intervention because the protocol did not conceptualize trigger sounds as the sole therapeutic target. Instead, it addressed the broader chain linking sensory detection to cognitive appraisal, anger and emotional escalation, attentional fixation, avoidance, compulsive monitoring, and interpersonal reactions. This broader focus may explain why the treatment produced significant effects not only on symptom ratings but also on emotions and behaviors associated with misophonia.

The results are also strongly compatible with transdiagnostic conceptualizations of misophonia. The intervention yielded large time $\times$ group effects for misophonia symptoms, emotions and behaviors, and the total score, supporting the assumption that shared psychological processes contribute to the persistence of the condition. This interpretation is consistent with symptom-network research showing that heightened sensory sensitivity is interconnected with broader emotional and psychiatric features rather than functioning as an isolated auditory phenomenon (Andermane et al., 2023). Clinical studies have similarly documented associations between misophonia and anxiety, depressive symptoms, obsessive-compulsive features, anger, and other psychiatric difficulties (Erfanian et al., 2019). The present protocol directly targeted several such processes, including emotion regulation, anger control, cognitive interpretation, perfectionistic expectations, attentional rigidity, and compulsive checking. These treatment targets closely correspond to mechanisms identified in the qualitative Iranian model on which the protocol was partly based, where sensory sensitivity, negative attributions, anger dysregulation, perfectionism, and repetitive checking emerged as central features of the lived experience of misophonia (Abbasi et al., 2026). The current findings therefore provide quantitative support for the therapeutic relevance of those qualitatively derived mechanisms.

The observed reduction in emotional and behavioral responses is especially important because anger, disgust, irritation, physiological activation, escape urges, and avoidance often constitute the most disabling components of misophonia. Research has shown that emotional responses to trigger sounds are not explained solely by acoustic properties and may depend substantially on the recognition, interpretation, and personal meaning of the trigger (Savard et al., 2022). From this perspective, the cognitive restructuring components of the protocol may have reduced

maladaptive interpretations such as assumptions that another person was producing a sound intentionally, disrespectfully, carelessly, or in a way that should have been preventable. Challenging such appraisals may weaken the link between auditory exposure and rapid emotional escalation. At the same time, training in emotion regulation, distress tolerance, anger management, and attentional shifting may have enhanced participants' capacity to remain in triggering situations without immediately engaging in avoidance, confrontation, or compulsive monitoring. Neurophysiological accounts of misophonia similarly emphasize learned associations between trigger sounds and autonomic or emotional responses and suggest that treatment should weaken maladaptive conditioned reactions rather than focus only on acoustic exposure (Jastreboff & Jastreboff, 2023). The pattern observed in the present study is therefore consistent with both psychological and neurophysiological models of misophonia.

The findings also support the emerging application of explicitly transdiagnostic interventions to misophonia. A pilot trial of the Unified Protocol adapted for misophonia demonstrated promising acceptability and efficacy and suggested that targeting maladaptive emotion regulation and emotion-driven behaviors can reduce clinically relevant symptoms (McMahon et al., 2024). More recent randomized evidence in younger populations has likewise supported transdiagnostic cognitive-behavioral treatment relative to a psychoeducation and relaxation comparison condition (Lewin et al., 2025). The present findings extend this literature by demonstrating that a transdiagnostic protocol informed not only by general emotional-disorder principles but also by culturally derived qualitative data and misophonia-specific mechanisms can produce meaningful improvements among university students. The incorporation of metacognitive and interpersonal elements may also have contributed to the observed benefits. Misophonia often occurs in social contexts in which trigger sounds are produced by family members, classmates, friends, or roommates, and the perceived intentionality of these behaviors can intensify distress. Evidence from Metacognitive Interpersonal Therapy suggests that modifying rigid interpersonal interpretations and maladaptive metacognitive processes may be clinically useful in misophonia (Natalini et al., 2024). The current protocol's attention to interpersonal coping, negative attribution, and metacognitive processing may therefore have enhanced its impact beyond standard symptom-management strategies.

Another important finding was the significant improvement in quality of life. Participants in the experimental group showed gains across physical health, psychological health, social relationships, environmental health, and overall general health, while the control group remained relatively stable. These results are consistent with evidence that misophonia is associated with broad functional impairment and reduced quality of life. Longitudinal research has demonstrated that greater misophonia burden is associated with poorer quality of life and more negative emotional experiences (Dibb & Golding, 2022). Similarly, recent work has shown that misophonia is linked to diminished quality of life partly through anxiety, indicating that the effect of the condition extends beyond sound-triggered episodes to broader psychological functioning (Ay et al., 2024). The present results suggest that reducing emotional reactivity, avoidance, interpersonal conflict, and hypervigilance may allow individuals to participate more freely in academic, social, and daily activities, thereby improving multiple dimensions of quality of life. This interpretation is also compatible with findings that symptom severity and associated psychological characteristics play a central role in functional impairment among individuals with misophonia (Möllmann et al., 2023).

The particularly notable improvements in social relationships and overall general health may reflect the interpersonal nature of many misophonic triggers. When trigger sounds originate from other people, individuals with misophonia may avoid meals, shared rooms, study spaces, social gatherings, or family interactions. Repeated avoidance can reduce opportunities for positive social contact and may reinforce resentment, isolation, and anticipatory anxiety. By helping participants reinterpret others' behavior, communicate needs more adaptively, regulate anger, and remain in triggering contexts without immediate escape, the intervention may have reduced the interpersonal burden of misophonia. The fact that social-relationship gains were maintained without significant deterioration at follow-up is clinically meaningful because it suggests that changes in interpersonal functioning may have been consolidated through repeated real-world practice after formal treatment ended. This finding is compatible with broader descriptions of misophonia as a condition capable of disrupting social and occupational functioning (Swedo et al., 2022) and with evidence from clinical samples showing substantial impairment across family, educational, and social contexts (Guzick et al., 2023).

The improvement in psychological health may be explained by the protocol's direct targeting of emotional dysregulation, maladaptive cognitions, perfectionism, and compulsive monitoring. Individuals with misophonia may spend considerable cognitive and emotional resources anticipating trigger exposure, scanning the environment for sounds, attempting to control others' behavior, and recovering from episodes of anger or disgust. Reducing these processes may free attentional resources and decrease chronic stress. This is consistent with the broader literature showing psychiatric comorbidity and emotional distress among people with misophonia (Erfanian et al., 2019). The improvement in physical health may likewise reflect reductions in chronic autonomic arousal and distress associated with trigger anticipation and exposure. Although the present study did not directly measure physiological activation, neurophysiological models suggest that misophonia may involve strong autonomic responses to trigger sounds (Jastreboff & Jastreboff, 2023). Consequently, better emotional and behavioral regulation could plausibly improve perceived physical well-being as well as psychological functioning.

The pattern of follow-up findings deserves specific attention. Although treatment effects remained evident 3 months after the intervention, some reduction in benefit occurred for misophonia severity and several quality-of-life domains. This partial decline does not negate treatment efficacy; rather, it suggests that continued exposure to everyday triggers may gradually reactivate habitual cognitive and emotional responses in the absence of continued therapeutic support. The maintenance of significant improvement relative to baseline nevertheless indicates that participants retained meaningful benefits from the intervention. Existing reviews of misophonia treatment have emphasized the limited number of well-controlled studies with follow-up assessments and the need for stronger evidence regarding durability of treatment gains (Ferrer-Torres & Giménez-Llort, 2022; Mattson et al., 2023). The present study contributes to this gap by showing that transdiagnostic treatment effects can remain statistically and clinically evident over a 3-month interval even without booster sessions. At the same time, the small deterioration between posttest and follow-up suggests that relapse-prevention procedures and periodic booster sessions may strengthen long-term maintenance.

The findings should also be interpreted in the context of measurement and diagnostic complexity in misophonia research. The field has only recently moved toward greater

conceptual consensus regarding the defining features of misophonia (Swedo et al., 2022), and differences in assessment instruments and severity thresholds remain common across studies. The use of a psychometrically evaluated Persian version of the Misophonia Questionnaire strengthened the present study by providing a culturally appropriate symptom measure (Mehrabizadeh Honarmand & Roushani, 2019). At the same time, emerging epidemiological findings indicate that misophonia exists on a continuum in the general population rather than as a simple present-versus-absent category. Representative studies in the United Kingdom and Germany have demonstrated that misophonic experiences are relatively common, although clinically significant impairment occurs in a smaller subgroup (Pfeiffer et al., 2025; Vitoratou et al., 2023). This supports the relevance of dimensional outcome measurement and suggests that interventions such as the one evaluated here may potentially be adaptable to differing levels of symptom severity.

5. Conclusion

Overall, the findings strengthen the view that misophonia is best understood as a multidimensional clinical problem involving sensory sensitivity, emotional reactivity, cognitive interpretation, behavioral avoidance, attentional fixation, and interpersonal processes. Early reviews emphasized the fragmented and developing nature of the field (Potgieter et al., 2019), while subsequent systematic work has called for more theoretically coherent and empirically tested interventions (Ferrer-Torres & Giménez-Llort, 2022; Mattson et al., 2023). The present study addresses this need by integrating evidence from transdiagnostic CBT, metacognitive-interpersonal treatment, misophonia-specific CBT, and culturally grounded qualitative findings into a unified protocol. The significant improvements in both symptom-specific outcomes and broader quality of life suggest that this multimodal approach may provide a useful framework for treating university students whose misophonia affects not only their responses to sound but also their emotional, interpersonal, and everyday functioning.

6. Limitations & Suggestions

Several limitations should be considered when interpreting the findings. First, the participants were undergraduate psychology students recruited from two universities in Zanjan, which limits the generalizability of the results to students in other academic disciplines, age

groups, clinical settings, or cultural contexts. Second, purposive recruitment through public announcements may have resulted in self-selection, as individuals who volunteered for treatment may have been more motivated to change or more aware of their symptoms than other students with misophonia. Third, the sample size, although adequate for the planned repeated-measures analyses, remained relatively modest and may have limited the detection of smaller subgroup differences or moderators of treatment response. Fourth, eligibility for psychotic disorders was based on self-report rather than a structured diagnostic interview, and other psychiatric comorbidities were not systematically diagnosed or controlled. Fifth, the study relied primarily on self-report measures and therefore may have been influenced by response bias, expectancy effects, or social desirability. Sixth, the control group was a no-treatment control rather than an active comparison condition, making it difficult to separate the specific effects of the intervention from nonspecific factors such as therapist attention, treatment expectancy, or group participation. Finally, the follow-up period was limited to 3 months, and therefore the longer-term stability of the observed treatment gains remains unknown.

Future studies should evaluate the protocol in larger and more heterogeneous samples drawn from multiple universities, community populations, and clinical settings to determine the extent to which the findings generalize beyond undergraduate psychology students. Randomized controlled trials using active comparison conditions, such as standard cognitive-behavioral therapy, psychoeducation, relaxation training, mindfulness-based interventions, or supportive counseling, would help identify the specific contribution of the transdiagnostic components. Future research should also incorporate structured diagnostic interviews and systematic assessment of comorbid anxiety, depression, obsessive-compulsive symptoms, personality features, sensory sensitivity, and neurodevelopmental characteristics in order to identify moderators and predictors of treatment response. Mechanism-focused studies could examine whether improvements in emotion regulation, anger control, perfectionism, negative attribution, sensory hypervigilance, or compulsive checking statistically mediate reductions in misophonia symptoms. Longer follow-up periods of 6 or 12 months would provide stronger evidence regarding the durability of treatment gains, and trials including booster sessions could determine whether maintenance can be enhanced. Additional studies could also incorporate behavioral, physiological, ecological momentary

assessment, or digital monitoring methods to complement self-report outcomes and provide a more comprehensive evaluation of change in real-world trigger situations.

The findings suggest that clinicians working with students who experience clinically significant misophonia should assess not only sensitivity to trigger sounds but also emotional dysregulation, anger, avoidance, perfectionistic expectations, negative interpersonal attributions, compulsive monitoring, and quality-of-life impairment. A structured transdiagnostic intervention may be particularly useful when misophonia presents with multiple overlapping emotional and behavioral difficulties rather than as an isolated sensory complaint. University counseling centers may consider implementing brief group-based or individual versions of the protocol for students whose symptoms interfere with study, classroom participation, social relationships, or shared living environments. Treatment should emphasize skill acquisition and repeated practice in real-life settings rather than simple avoidance of trigger sounds. Particular attention should be given to relapse prevention because some deterioration may occur after formal treatment ends. Periodic booster sessions, structured homework, self-monitoring, and individualized plans for high-risk trigger situations may help maintain gains over time. Collaboration among psychologists, psychiatrists, and audiologists may also be beneficial for individuals whose symptoms involve complex sensory, emotional, or psychiatric features.

Acknowledgments

We would like to express our appreciation and gratitude to all those who cooperated in carrying out this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

Funding

This research was carried out independently with personal funding and without the financial support of any governmental or private institution or organization.

Authors' Contributions

All authors equally contributed to this article.

References

- Aazh, H. (2025). Cognitive Behavioural Therapy (CBT) for Managing Tinnitus, Hyperacusis, and Misophonia: The 2025 Tonndorf Lecture. *Brain Sciences*, 15(5), 526. <https://doi.org/10.3390/brainsci15050526>
- Abbasi, H., Mohammadi, S., & Hassani, F. (2026). Phenomenology of Misophonia in the Iranian Population: A Grounded Theory Study. *KMAN Counseling & Psychology Nexus*, 4, 1-17. <https://doi.org/10.61838/kman.ooc.psynexus.6477>
- Andermane, N., Bauer, M., Simner, J., & Ward, J. (2023). A symptom network model of misophonia: From heightened sensory sensitivity to clinical comorbidity. *Journal of Clinical Psychology*, 79, 2364-2387. <https://doi.org/10.1002/jclp.23552>
- Ay, E., Huviyetli, M., & Çakmak, E. (2024). The mediating role of anxiety in the relationship between misophonia and quality of life: Findings from the validated Turkish version of MisoQuest. *Frontiers in psychology*, 15, 1361645. <https://doi.org/10.3389/fpsyg.2024.1361645>
- Dibb, B., & Golding, S. E. (2022). A longitudinal investigation of quality of life and negative emotions in misophonia. *Frontiers in Neuroscience*, 16, 900474. <https://doi.org/10.3389/fnins.2022.900474>
- Erfanian, M., Kartsonaki, C., & Keshavarz, A. (2019). Misophonia and comorbid psychiatric symptoms: A preliminary study of clinical findings. *Nordic journal of psychiatry*, 73, 219-228. <https://doi.org/10.1080/08039488.2019.1609086>
- Ferrer-Torres, A., & Giménez-Llort, L. (2022). Misophonia: A systematic review of current and future trends in this emerging clinical field. *International journal of environmental research and public health*, 19(11), 6790. <https://doi.org/10.3390/ijerph19116790>
- Ghorbani, S., Ashouri, A., Gharraee, B., & Farahani, H. (2022). Effectiveness of online group-mindfulness and acceptance-based therapy and cognitive-behavioral therapy on misophonia. *Iranian journal of psychiatry and behavioral sciences*, 16, e120159. <https://doi.org/10.5812/ijpbs-120159>
- Guzick, A. G., Cervin, M., Smith, E. E., Clinger, J., Draper, I., Goodman, W. K., & Storch, E. A. (2023). Clinical characteristics, impairment, and psychiatric morbidity in 102 youth with misophonia. *Journal of affective disorders*, 324, 395-402. <https://doi.org/10.1016/j.jad.2022.12.083>
- Jager, I. J., Vulink, N. C. C., Bergfeld, I. O., van Loon, A. J. J. M., & Denys, D. A. J. P. (2020). Cognitive behavioral therapy for misophonia: A randomized clinical trial. *Depression and Anxiety*, 38, 708-718. <https://doi.org/10.1002/da.23127>
- Jastreboff, P. J., & Jastreboff, M. M. (2023). The neurophysiological approach to misophonia: Theory and treatment. *Frontiers in Neuroscience*, 17, 895574. <https://doi.org/10.3389/fnins.2023.895574>
- Lewin, A. B., Milgram, L., Cepeda, S. L., Karlovich, A., Dickinson, S., Bolen, M., & Ehrenreich-May, J. (2025).

- Treatment of youth misophonia: A randomized controlled trial comparing transdiagnostic cognitive-behavioral therapy to psychoeducation and relaxation training. *Behavior therapy*. <https://doi.org/10.1016/j.beth.2025.04.006>
- Mattson, S. A., D'Souza, J., Wojcik, K. D., Guzick, A. G., Goodman, W. K., & Storch, E. A. (2023). A systematic review of treatments for misophonia. *Personalized Medicine in Psychiatry*, 39-40. <https://doi.org/10.1016/j.pmip.2023.100104>
- McMahon, K., Cassiello-Robbins, C., Greenleaf, A., Guetta, R., Frazer-Abel, E., Kelley, L., & Rosenthal, M. Z. (2024). The unified protocol for transdiagnostic treatment of emotional disorders for misophonia: A pilot trial exploring acceptability and efficacy. *Frontiers in psychology*, 14, 1294571. <https://doi.org/10.3389/fpsyg.2023.1294571>
- Mehrabizadeh Honarmand, M., & Roushani, K. (2019). Investigation of psychometric properties of Misophonia Questionnaire. *The Neuroscience Journal of Shefaye Khatam*, 7(2), 13-22. <https://doi.org/10.29252/shefa.7.2.13>
- Möllmann, A., Heinrichs, N., Illies, L., Potthast, N., & Kley, H. (2023). The central role of symptom severity and associated characteristics for functional impairment in misophonia. *Frontiers in Psychiatry*, 14, 1112472. <https://doi.org/10.3389/fpsyg.2023.1112472>
- Natalini, E., Fioretti, A., Eibenstein, R., & Eibenstein, A. (2024). Metacognitive Interpersonal Therapy for Misophonia: A Single-Case Study. *Brain Sciences*, 14(7), 717. <https://doi.org/10.3390/brainsci14070717>
- Pfeiffer, E., Allroggen, M., & Sachser, C. (2025). The prevalence of misophonia in a representative population-based survey in Germany. *Social Psychiatry and Psychiatric Epidemiology*, 60(1), 257-264. <https://doi.org/10.1007/s00127-024-02707-0>
- Potgieter, I., Macdonald, C., Partridge, L., Cima, R., Sheldrake, J., & Hoare, D. J. (2019). Misophonia: A scoping review of research. *Journal of Clinical Psychology*, 75(7), 1203-1218. <https://doi.org/10.1002/jclp.22771>
- Savard, M. A., Sares, A. G., Coffey, E. B., & Deroche, M. L. (2022). Specificity of affective responses in misophonia depends on trigger identification. *Frontiers in Neuroscience*, 16, 879583. <https://doi.org/10.3389/fnins.2022.879583>
- Swedo, S. E., Baguley, D. M., Denys, D., Dixon, L. J., Erfanian, M., Fioretti, A., & Raver, S. M. (2022). Consensus definition of misophonia: A Delphi study. *Frontiers in Neuroscience*, 16, 841816. <https://doi.org/10.3389/fnins.2022.841816>
- Vitoratou, S., Hayes, C., Uglik-Marucha, N., Pearson, O., Graham, T., & Gregory, J. (2023). Misophonia in the UK: Prevalence and norms from the S-Five in a UK representative sample. *PLoS One*, 18(3), e0282777. <https://doi.org/10.1371/journal.pone.0282777>