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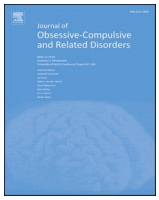

Clinical characteristics of a treatment seeking sample of adults with misophonia: Onset, course, triggers, context, and comorbidity

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ABSTRACT

Misophonia is characterized by intense emotional reactions to specific repetitive sounds. The clinical characteristics and developmental course of misophonia remain underexplored, particularly in treatment-seeking adults. In this study, we characterized the onset, symptom progression, trigger noises, and psychiatric comorbidities associated with misophonia. Additionally, we investigated the relationships between these clinical attributes and the severity of self- and clinician-rated misophonia symptoms. The sample included 60 adults with misophonia enrolled in a randomized controlled trial. Most participants (79%) reported symptom onset in childhood and early adolescence, with symptoms often worsening over time. All participants reported being bothered by human produced sounds. However, responses to trigger noises vary based on the context surrounding the sound. Those who reported equivalent distress across misophonic triggers –regardless of the individual producing the sound—endorsed significantly higher self-reported misophonia symptoms. Approximately half of the sample met diagnostic criteria for another psychiatric condition, with attention-deficit hyperactivity disorder and generalized anxiety disorder being the most prevalent. These findings underscore the complexity of misophonia and highlight the importance of considering the individual clinical histories and contextual factors influencing reactions to misophonic sounds.

Misophonia is characterized by intense emotional responses (e.g., anger, hatred, disgust) and physiological arousal in response to specific sounds (Swedo et al., 2022). Common misophonic trigger sounds include chewing, swallowing, breathing, or non-human produced repetitive sounds such as clock ticking (Jager et al., 2020). Misophonia is a multidisciplinary problem involving audiological and psychological features. Current literature does not yet provide enough evidence to classify misophonia strictly as a psychological, neurological, or audiological disorder. As research continues to build, experts have agreed to frame misophonia as a disorder of decreased sound tolerance (Swedo et al., 2022). In the interim, continued research is needed to deepen our knowledge of misophonia and its clinical characteristics.

Between 33 and 79% of the population is estimated to experience some level of sensitivity to misophonia trigger sounds (Kılıç et al., 2021; Pfeiffer et al., 2024). However, the prevalence of moderate to severe or clinically significant misophonia symptoms in population-based samples is currently estimated to be between 2.1% and 12.8% (Pfeiffer et al., 2024; Dixon et al., 2024; Kılıç et al., 2021). The level of functional impairment due to misophonia symptoms is essential in identifying clinically significant cases. Functional impairment in misophonia may manifest as the avoidance of going to restaurants with family or friends to prevent the distress associated with hearing chewing and mouth sounds. Individuals with misophonia who experience such functional impairments report significantly higher levels of general psychopathology, including anxiety and depression, lower quality of life, and poorer interpersonal emotion regulation skills (Möllmann et al., 2023). Given the complex and impairing nature of misophonia, more research is needed to understand and characterize its clinical presentation.

Misophonia typically emerges in childhood and fluctuates in severity over time, contributing to impairment across the lifespan (Jager et al., 2020). Misophonic symptoms are variable, with trigger sounds and contexts significantly differing between individuals (Jager et al., 2020). Some people report that misophonic reactions are only triggered by certain individuals such as their loved ones, while others report distress

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related to sounds from any source, including strangers (Claiborn et al., 2020). Research indicates that misophonia triggers produced by family and friends, and humans in-general, can lead to particularly intense misophonic reactions (Samermit et al., 2022; Siepsiak et al., 2023).

Cowan et al. (2022) proposed that the intense reactions to human-made noises might be explained by the perceived control that individuals assume others have over these triggering sounds. Human-produced noises, unlike some "impersonal" sounds (e.g., environmental sounds or noises produced by strangers), often carry an expectation of control, exacerbating emotional responses when these expectations are unmet. Banker et al. (2022) found supporting evidence that individuals with heightened misophonia symptoms often overestimate their control in uncontrollable situations, which exacerbates emotional distress when their expectations are unmet. The disparity in control perception and emotional investment may explain why misophonia symptoms are less intense with non-human sounds and underscores the role of context in misophonia-related distress. Additionally, Hansen et al. (2024) demonstrated that trigger sounds can significantly influence social judgments, with misophonic participants rating faces paired with uncomfortable trigger sounds as less likeable. Gaining a deeper insight into these situational (e.g., specific social contexts) and heterogeneous influences on misophonic reactions is a crucial step in characterizing misophonia.

Understanding the psychological conditions that co-occur with misophonia is also important. However, previous studies have primarily relied on participants' self-reports of prior diagnoses to gauge comorbidities (e.g., Rouw & Erfanian, 2018). Few studies have employed structured clinical interviews to assess the prevalence of psychiatric comorbidity among individuals with misophonia. A notable exception is a recent large-scale study of 207 adults by Rosenthal et al. (2022), where researchers conducted structured clinical interviews to examine current and lifetime psychiatric disorders using the structured clinical interview for DSM-5 (SCID-5; First, Williams, Karg, & Spitzer, 2015a) and the structured clinical interview for DSM-5 personality disorders (SCID-5-PD; First, Williams, Benjamin, & Spitzer, 2015). Their study found that approximately 57% of participants presenting with misophonia symptoms were affected by anxiety disorders, with social anxiety disorder and generalized anxiety disorder being the most prevalent. Mood disorders were the second most common comorbid conditions, with nearly half of the sample diagnosed with major depressive disorder. Similarly, other studies utilizing diagnostic interviews have consistently identified anxiety and mood disorders as the most common psychiatric comorbidities in individuals with misophonia (see Guzick et al., 2023; Jager et al., 2020).

Misophonia is also suspected to co-occur at high rates with neurodevelopmental disorders, such as attention-deficit hyperactivity disorder (ADHD) and autism spectrum disorder (ASD). However, these disorders are less commonly assessed using appropriate diagnostic tools in misophonic samples. However, Jager et al. (2020) utilized the MINI-International Neuropsychiatric Interview Plus (MINI-plus) to assess the prevalence of ADHD and ASD in a sample of psychiatric patients with suspected misophonia, finding prevalence rates of 5% and 3%, respectively. Self-report studies have suggested that ADHD may occur in roughly 12–18% of individuals with misophonia (e.g., Rouw & Erfanian, 2018). Schroder et al. (2013) hypothesized a potential overlap between ADHD and misophonia given both disorders are marked by challenges in distractibility and fluctuating attention across visual and auditory stimuli. Supporting this hypothesis, recent neurological studies support the notion that misophonia symptoms may be associated with difficulties in sustained attention (Abramovitch et al., 2024).

Additionally, misophonia has historically been suggested as a variant of (OCD; e.g., Schröder et al., 2013), but the existing data do not strongly support this association (McKay et al., 2018). In fact, across studies utilizing semi-structured diagnostic interviews, OCD has emerged as a rarer co-morbidity (e.g., prevalence rates between 2.8% and 8.2% Rosenthal et al., 2022; Jager et al., 2020). Thus, the relationship between misophonia, and as previous findings have demonstrated, misophonia may be more closely related to other psychiatric conditions.

The growing need to accurately characterize misophonia is evident, yet the current state of the literature remains constrained by methodological limitations that must be addressed as we move closer to formal diagnostic classification and effective interventions. A substantial portion of existing research has relied on online self-report questionnaires and platforms like MTurk (e.g.,Cusack et al., 2018). Although online research allows for sampling from a wide range of people and locations, it presents challenges in recruiting clinically representative samples without face-to-face clinical interviews. Additionally, large-scale phenotyping studies that include structured clinical interviews for assessing comorbidities (e.g., Jager et al., 2020; Rosenthal et al., 2022) often do not incorporate structured interviews to confirm the inclusion of individuals with clinically elevated levels of misophonia, instead relying on participants' self-identification or self-report questionnaire-based criteria.

To enhance the reliability of misophonia research, the use of semi-structured interviews specifically assessing misophonia symptoms, as seen in recent studies (e.g., Guetta et al., 2022), is essential. These interviews would help ensure that clinical samples accurately represent individuals with misophonia. As research on misophonia interventions increases (see Rosenthal et al., 2023), it is crucial to approximate the characteristics of individuals who are likely to seek treatment. In-person research with self-report and clinician rated measures can provide a fuller picture of the clinical presentation of misophonia and provide utility in intervention development.

This study describes the clinical features of misophonia in a treatment seeking sample, including the age of onset, course of the condition over time, characterization of triggers, and context of the triggers. We also identify and describe diagnostic comorbidities. Furthermore, we explore the relationships between these clinical features and the overall severity of misophonia, as indicated by both participant self-reports and clinician assessment.

1. Methods

1.1. Participants

Participants were eligible for the study if they met the following criteria: (a) 18 years of age or older, (b) seeking treatment for misophonia, and (c) met a clinical cut-off for misophonia (total score of 20 or higher on the Duke Misophonia Interview; Guetta et al., 2022). Psychological comorbidity was not an exclusion criterion, with the exception of psychological and/or neurological impairments that would preclude them from participating in the study (e.g., profound neurological impairment) or exceed misophonia as the primary presenting difficulty (e.g., current mania).

1.2. Procedures

This project is funded by (masked for review). All study procedures were pre-registered on open science framework (OSF; https://osf.io/9mwpd/?view_only=f7789c49dffe4a829cc6e504daac4bdc) and ClinicalTrials.gov (NCT05601284) as part of a randomized controlled treatment trial for misophonia (see masked for review). All procedures were approved by a University Institutional Review Board.

Participants were recruited from November 2022 to November 2023 via local flyers and social media posts advertising treatment for misophonia on online platforms (e.g., Facebook Ads). Participants interested in the study were directed to an informational webpage where they completed an eligibility screener. A total of 261 individuals filled out the online screener, which included the Misophonia Questionnaire (MQ; Wu et al., 2014 [see Measures section]). To be eligible for further participation, individuals needed to score above 5 (indicating at least mild impairment) on the MQ severity item and confirm their interest in

receiving treatment for misophonia. After the initial online screening, 232 qualified individuals were contacted via email to schedule a clinical interview to further assess eligibility. A total of 75 individuals responded to the email, consented to participate, and attended an intake appointment where they were given a structured interview to assess misophonia, the Duke Misophonia Interview (DMI; Guetta et al., 2022). Participants also completed a self-report questionnaire assessing sociodemographic characteristics and misophonia symptoms during the intake. Following the clinical interview, all participants were administered a comprehensive audiological assessment under the supervision of an audiologist as part of the larger clinical trial to identify peripheral hearing deficits such as hyperacusis or profound hearing loss (see masked for review for more details on audiological procedures). Participants were eligible for treatment if they met the pre-determined cutoff score of 20 on the DMI total score, constituting a score that fell one standard deviation below the mean in the original validation of the measure (Guetta et al., 2022). Psychiatric comorbidities were diagnosed by a graduate student clinical assessor using a semi-structured interview.

The final sample included 60 participants. Fifteen participants were excluded from the final sample due to subclinical misophonia symptoms (n = 9), sound sensitivities related to a trauma response ($n = 2$), sound sensitivities related to the volume of the sound ($n = 1$), current manic episode ($n = 1$), or were no longer seeking treatment for misophonia ($n = 2$). All participants were compensated $50 for completing the clinical interview and self-report questionnaire.

1.3. Measures

1.3.1. Duke Misophonia Interview (DMI; Rosenthal et al., 2021; Guetta et al., 2022)

The DMI is an 18-item semi-structured clinical interview designed to assess the presence and severity of misophonia symptoms. This instrument evaluates trigger sounds, the severity of reactions, and impairment on functioning, both currently and over the lifetime.

Participants begin by completing the DMI Checklist independently, which lists potential misophonic triggers and contexts that exacerbate reactions. The checklist aids clinicians in identifying relevant misophonic triggers. The clinician then conducts the interview, starting with background questions about the age of onset, the nature of misophonic triggers (human-produced, animal-produced, or environmentally produced), and the development of misophonia triggers and symptom severity over the individual's lifetime. The interview also explores the context of the sounds (i.e., whether the source of the sound affects the reaction). Information collected from both the DMI checklist and pre-interview background questions were used to assess trigger type and contexts affecting misophonic reactions.

The DMI is structured such that each item assesses the presence of, frequency and intensity, and impairment associated with a specific misophonia symptom (e.g., the experience of "negative emotions" during a misophonic trigger [item six]). In total, the DMI yields four summary scores: current severity, current impairment, global impairment, and total score. Severity of symptoms is evaluated over the past month using a 5-point Likert scale, with total severity scores ranging from 0 to 56—higher scores indicate greater frequency and distress of symptoms. Impairment is rated on a 3-point Likert scale for current and lifetime contexts, with total scores indicating the degree of functional impairment. The total DMI score aggregates all severity ratings for current symptoms and global impact, ranging from 0 to 72, with higher scores denoting greater overall severity and impairment.

The DMI has demonstrated excellent preliminary internal consistency, predictive validity, and test-retest reliability (Guetta et al., 2022), suggesting that the DMI is a reliable and valid tool for assessing misophonia in clinical settings. The reliability of the total score ($\alpha = .84$) was good, while the reliability for the impairment score ($\alpha = .67$) within an acceptable range.

The DMI was administered to all participants by a trained doctoral student clinician. To ensure consistency, the doctoral student and the principal investigator, a licensed clinical psychologist, reviewed and discussed the scoring of the first 10 participant interviews together. This process allowed them to reach agreement on the scoring for each item. After this calibration, the same doctoral student clinician conducted and independently scored the DMI for the remaining participants.

1.3.2. Diagnostic interview for anxiety, mood, OCD, and Neuropsychiatric disorders (DIAMOND; Tolin et al., 2018)

The DIAMOND is a structured diagnostic interview used to assess a wide range of DSM-5 psychiatric diagnoses, with the exception of personality disorders, certain dissociative disorders, and certain neurological and neurodevelopmental disorder (i.e., autism spectrum disorder). The DIAMOND demonstrates good to excellent interrater and test-retest reliability for anxiety, mood, and obsessive-compulsive and related diagnoses (Tolin et al., 2018). The DIAMOND was administered to participants by a trained graduate clinician during the clinical intake.

1.3.3. Misophonia Questionnaire (MQ; Wu et al., 2014)

The MQ is an 18-item self-report questionnaire assessing the severity and characteristics of misophonia. The MQ consists of three subscales: misophonia symptoms (seven items), misophonia emotions and behaviors (10 items), and misophonia severity scale (one item). The symptom subscale assesses the presence of sound sensitivities (e.g., people eating, repetitive tapping) on a 5-point Likert scale ranging from 0 (not at all true) to 4 (always true). The emotions and behaviors subscale assess the reactions associated with misophonia symptoms (e.g., leave the environment, become annoyed) on a 5-point Likert Scale ranging from 0 (never) to 4 (always). The total MQ score consists of the sum score from the symptoms and emotions/behaviors subscales with scores ranging from 0 to 68; higher scores indicate more misophonia symptoms. The severity subscale consists of a single item assessing the overall severity of misophonia symptoms on a scale from 1 (minimal) to 15 (very severe), with scores of 7 or higher indicating clinically significant symptoms. The internal consistency of the MQ total in the present sample was acceptable ($\alpha = .74$).

1.4. Data analysis

All analyses were performed using ***R*** software (R Core Team, 2024). Before analysis, data was inspected and no missingness was found in the DMI or MQ. We employed descriptive statistics to evaluate the clinical characteristics of our sample. To explore the relationship between these clinical characteristics and misophonia symptom severity, we conducted a series of linear regression models. Each model was used to independently investigate the influence of individual clinical characteristics on misophonia symptoms, incorporating categorical predictors that divided the sample into dichotomous clinical sub-groupings.

Participants were divided into two groups based on their symptom course; the first group included participants reporting a worsening of symptoms since onset ($n = 38$), and the second included participants whose symptoms improved or remained steady ($n = 22$). We also divided the sample based on trigger type; the first group comprised individuals exclusively bothered by human-produced sounds ($n = 20$), and the second group included those bothered by animal or environmentally produced sounds in addition to human-produced sounds ($n = 40$). Furthermore, we categorized participants according to whether the specific person making the sound affects their misophonic reaction ($n = 36$) or whether their reactions generalize to all individuals ($n = 24$). Lastly, participants were divided based on the presence of at least one other psychiatric diagnosis ($n = 29$) versus no comorbid diagnosis ($n = 31$).

We ran all four models using the MQ total score and the DMI total score as dependent variables. Additionally, we used the MQ severity item and the DMI impairment as dependent variables. Each model was

run four times to fully investigate the relationship between each clinical characteristic sub-grouping and misophonia symptoms as measured by the MQ and DMI. The results for the models run with the MQ severity item and DMI impairment subscale are detailed in the supplemental materials. A post-hoc power analysis revealed that, with group sizes of 20 and 40 participants respectively (representing the most uneven distribution observed), we could achieve an 81% power to detect a large effect size of $d = 0.70$.

2. Results

2.1. Sociodemographic characteristics

Descriptive statistics were used for demographic variables and participants primarily self-identified as White (98.3%), non-Hispanic (96.7%), heterosexual (76.7%), women (90.0%), with an average age of 33.80 years (SD = 12.18); see Table 1 for all participant demographics.

2.2. Misophonia symptoms

On average, participants reported a total score on the MQ of 38.05 ($SD = 8.13$), a score reflecting that the presence of misophonic triggers and negative behavioral and emotional reactions to the triggers were elevated at the time of the clinical interview. Participants endorsed an average score of 6.83 (SD = 1.68) on the MQ severity item, approximating the clinically significant cut-off range of 7 or higher. Average ratings on the DMI revealed a total score was 36.90 (SD = 5.51) and impairment score of 14.47 ($SD = 3.55$), indicating a heightened level of misophonia symptoms and associated psychosocial impairment.

Table 1
Participant sociodemographic characteristics (N = 60).

	n	Valid %
Gender Identity		
Woman	42	70.0%
Man	14	23.3%
Non-Binary	3	5.0%
Agender	1	1.7%
Sexual Orientation		
Asexual	3	5.0%
Bisexual	4	6.7%
Heterosexual/Straight	46	76.7%
Pansexual	5	8.3%
Queer	2	3.3%
Age, M (SD)	33.80 (12.18)	
	Range = 18-67	
Ethnicity		
Hispanic or Latino	2	3.3%
Race and Ethnicity[a]		
Asian or Asian American	2	3.3%
Black or African American	1	1.7%
Native South American	1	1.7%
White or White American	59	98.3%
Religion		
Church of Jesus Christ of Latter-Day Saints	27	45.0%
Jewish	1	1.7%
Not Religious	27	45.0%
Other	5	8.3%
Household Income		
Less than $20,000	4	6.7%
$20,000-$39,999	9	15.0%
$40,000-$59,999	4	6.7%
$60,000-$79,999	8	13.3%
$80,000-$99,999	6	10.0%
$100,000 or more	24	40.0%
Unknown	5	8.3%
Marital Status		
Divorced	3	5.0%
Living with a partner	5	8.3%
Married	34	56.7%
Single	18	30.0%
Employment Status		
Employed full-time	26	43.3%
Employed part-time	17	28.3%
Retired	2	3.3%
Student	10	16.7%
Unemployed	2	3.3%
Other	2	3.3%

[a] Categories not mutually exclusive.

2.3. Case history and course of symptoms

The majority of participants identified the onset of symptoms between the ages of 6–10 years ($n = 26$), followed by ages 10–13 ($n = 14$). Fewer participants reported the initial onset both before age 6 and between ages 14 to 18, each constituting 13% of the sample. Notably, onset in the early 20s was more rare ($n = 4$). The development of new triggers over time was common, with 85% ($n = 51$) of the participants reporting this occurrence. Few participants reported previously trying medications ($n = 4$) or some form of therapy for misophonia ($n = 3$). Over the lifetime, a large portion ($n = 38$) of the participants reported worsening misophonia symptoms, 16 participants experienced no change, and few ($n = 3$) observed improvements. A summary of misophonia case history can be seen in Table 2.

2.4. Triggers

The nature of misophonia triggers varied, with 33% (n = 20) triggered by human-produced sounds and the remainder by a combination of human, animal, and environmental sounds. Specifically, mouth sounds produced through eating was the most commonly reported trigger, with 97% ($n = 58$) of participants endorsing this trigger. Eating sounds were closely followed by mouth sounds unrelated to eating (e.g.,

Table 2
Misophonia clinical interview case history.

	Total Sample $n = 60$ (%)
Age of Onset	
Before age 6	8 (13)
Between ages 6 - 10	26 (43)
Between ages 10-13	14 (23)
Between ages 14-18	8 (13)
Early 20s	4 (0.07)
Course of Misophonia Symptoms Over the Lifetime	
Symptoms have become worse over time	38 (63)
Symptoms have stayed the same over time	16 (27)
Symptoms have improved over time	3 (0.05)
Symptoms have become worse, but have since improved over time	3 (0.05)
New Misophonia Triggers Developed Over time	
No	8 (13)
Yes	51 (85)
Unsure	1 (0.02)
Tried Previous Therapy for Misophonia	
No	57 (95)
Yes	3 (0.05)
Treatment Received	
Eye Movement Desensitization and Reprocessing (EMDR)	1 (0.02)
In therapy for something else, but talked about ways to address misophonia	1 (0.02)
Relaxation and deep breathing	1 (0.02)
Tried Medication for Misophonia	
No	56 (93)
Yes	6 (0.07)
Types of Misophonia Triggers (Endorsed during Clinical Interview)	
Human-produced	20 (33)
Human- and animal-produced	14 (23)
Human- and environmentally produced	13 (22)
Human-, animal-, and environmentally produced	13 (22)
Relevance of Context (Endorsed during Clinical Interview)	
Trigger sounds are specific to certain people or situation	36 (60)
Doesn't matter who or what makes the trigger sounds	24 (40)

lip smacking) and nasal sounds, both of which were endorsed by 51 participants. Human-produced repetitive sounds and throat sounds were also frequently reported (n = 49). In contrast, non-human produced repetitive noises were reported as triggers by less than half of the sample (n = 26). Seeing a sound produced without being able to hear it (e.g., watching TV with the volume off, seeing someone eating while wearing headphones) was the least frequently reported trigger (n = 14). The full summary of trigger noises endorsed by participants can be found in Fig. 1.

2.5. Contextual influence

Trigger sounds produced by known people (e.g., family, friends, roommates) was the most commonly reported situation exacerbating misophonia distress (n = 51). Forty-eight participants reported that certain internal experiences (e.g., trying to focus or relax, fatigue, illness, physical sensations, thoughts, emotions) appeared to make misophonia symptoms worse for 48 participants. Furthermore, quiet environments were identified by 42 participants as problematic. Fewer participants reported situations like noisy places (n = 18) and when the individual could see the trigger occurring (n = 21). Notably, only 2 participants reported that context does not matter, highlighting the specific situational dependency in the experience of misophonia for the large majority of participants. Fig. 2 shows a full summary of specific situational influences on misophonia. In the structured clinical interview, 36 participants reported that it mattered who specifically made the sounds, while the other 24 reported that it did not matter who made the sounds.

2.6. Psychiatric comorbidities

Over half of the sample (n = 31) did not meet criteria for another psychiatric disorder. Fourteen participants met diagnostic criteria for ADHD and 10 participants met criteria for generalized anxiety disorder. A handful of participants met criteria for other conditions, such as social anxiety disorder (n = 5), premenstrual dysphoric disorder (n = 4), and persistent depressive disorder (n = 4). A range of other disorders, including OCD, hoarding disorder, and body dysmorphic disorder, each were reported by 2 participants. Minimal occurrences were noted for tic disorder, somatic symptom disorder, post-traumatic stress disorder, panic disorder, and bipolar II disorder (n = 1 for each). See a summary of psychiatric comorbidity in Fig. 3.

2.7. Associations between clinical characteristics on misophonia symptom severity

Our analysis did not reveal a significant relationship between the worsening of symptoms over time and greater symptom severity, as evidenced by the MQ and DMI total scores (p = .178 and p = .463, respectively; see Tables 3 and 4). Similarly, being bothered by both human-produced and non-human-produced noises (e.g., environmental and animal sounds) did not significantly predict higher misophonia symptom severity compared to disturbances caused exclusively by human-produced noises (MQ p = .159; DMI p = .118; see Tables 3 and 4). Notably, a non-person-specific reaction to misophonic triggers ("it does not matter who produces the trigger sound") significantly predicted increased MQ total scores (β = 4.78, p = .024), explaining 8% of the variance, suggesting that a generalized response to triggers is associated with higher symptom severity (see Table 4 and Table S1 in online supplemental materials). Conversely, having one or more psychiatric comorbidities did not significantly affect misophonia severity on either the MQ or DMI scales (p = .837 and p = .519, respectively; see Tables 3 and 4). These results suggest that the generalization of misophonic triggers, rather than the type of triggers or progression of symptoms, may play a more significant role in the severity of the condition.

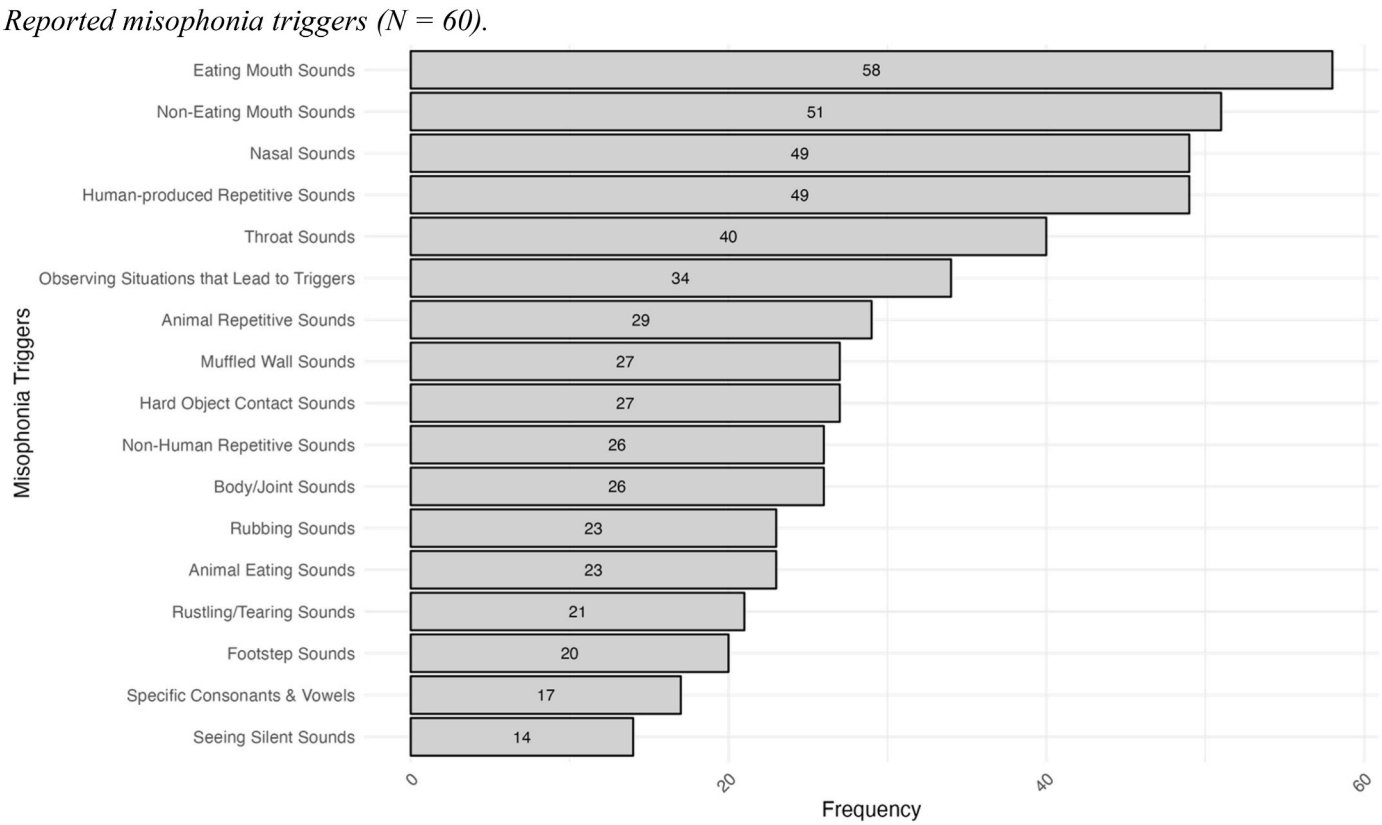

Fig. 1. Reported misophonia triggers (N = 60).

Contexts that influence misophonia distress (N = 60).

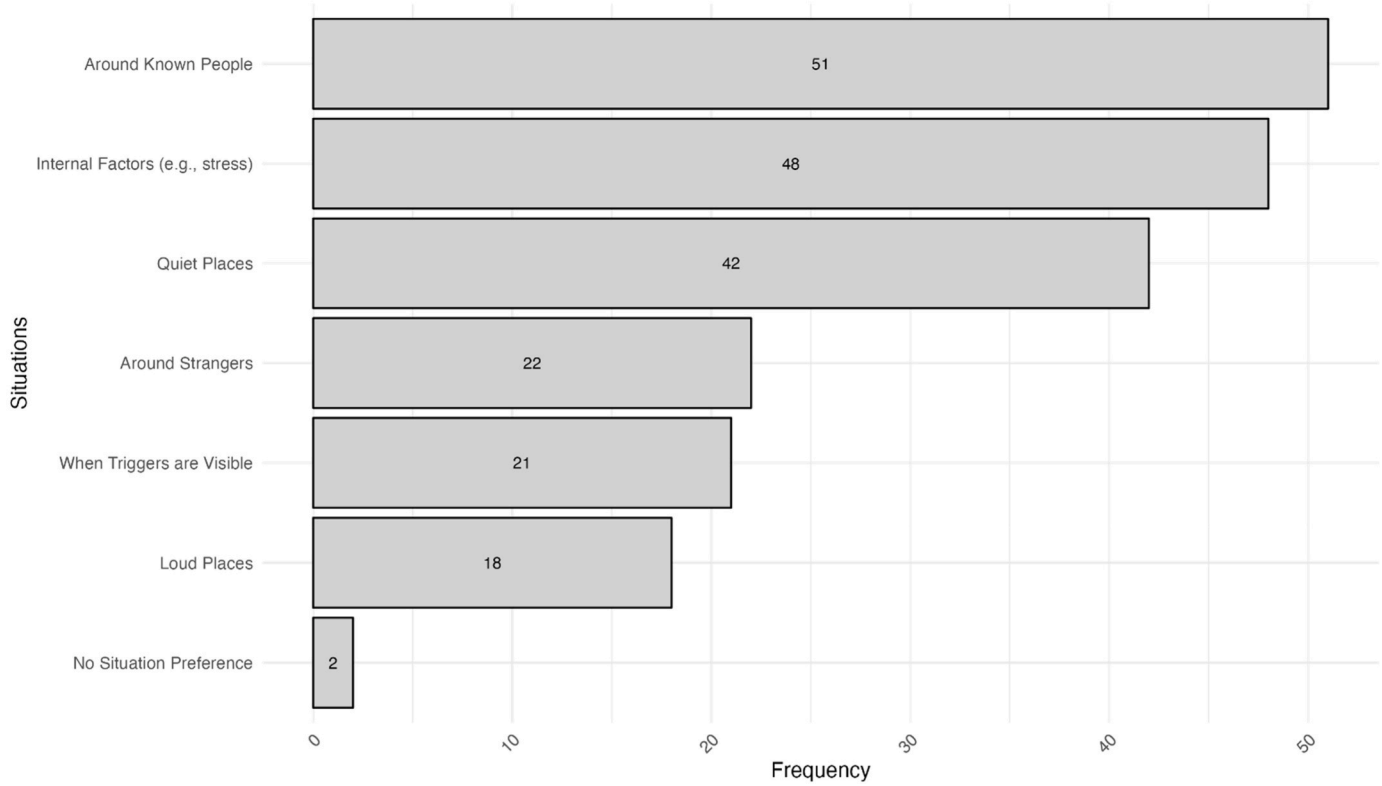

Fig. 2. Contexts that influence misophonia distress (N = 60).

3. Discussion

This study is one of the few studies to characterize the onset, clinical features, and comorbid psychiatric conditions in adults seeking treatment for misophonia. This study advances misophonia research in clinical samples by integrating structured clinical interviews with traditional self-report measures, enhancing the reliability and depth of insights into its clinical features.

Most participants indicated that their misophonic symptoms first manifested between the ages of 6 and 14, aligning with previous reports that suggest an average onset around ages 12 to 13 (Jager et al., 2020; Schröder et al., 2017). The emergence of misophonia during childhood to early adolescence parallels the typical onset of other psychiatric conditions such as phobias, OCD, and tic disorders. This pattern contrasts with anxiety disorders like panic disorder and generalized anxiety disorder, as well as mood disorders, which more commonly develop during late adolescence to early adulthood (Kessler et al., 2007). This suggests that the developmental trajectory of misophonia may be more akin to early-onset psychiatric disorders.

Many participants (63%) endorsed their symptoms becoming more intense over time, a trend also reported in prior studies (Jager et al., 2020; Sanchez & Silva, 2018). The increasing intensity corresponds with 85% of the participants reporting that new trigger sounds develop over time. Misophonia has been described as a chronic condition (e.g., Ferrer-Torres & Giménez-Llort, 2022), which is consistent with the report from the current sample. Further studies are needed to explore the course of misophonia symptoms to understand why the condition worsens for some individuals while improves for others (e.g., $n = 6$ in the current sample). It is important to note that no significant relationship was found between the historical progression of misophonia symptoms (whether worsening, steady, or improving) and the severity of symptoms at the time of clinical intake. It is possible the severity of symptoms that lead individuals to sign up for treatment may be uniformly high, irrespective of their symptom progression history. Consequently, clinical assessments at intake might focus on the current severity rather than historical changes in symptomatology.

All participants reported being bothered by repetitive human-produced sounds. In their initial set of diagnostic criteria for misophonia, Schröder et al. (2013) suggested that the sources of misophonic sounds are typically human. In a large-scale study by Jager et al. (2020), which used diagnostic screening procedures to enroll 575 individuals with misophonia, it was found that 96% were specifically bothered by throat and mouth sounds. These findings led the researchers to propose a revised set of diagnostic criteria, suggesting that oral or nasal sounds must be triggers for diagnosis. While we are not taking a position on diagnostic criteria, our current study found that 97% of participants reported issues with eating sounds.

Of note, roughly half of the sample was bothered by sounds from other sources, such as environmental noises (e.g., clock ticking) and animal-made noises (e.g., licking). However, the presence of additional bothersome noises from these sources did not correlate with more intense misophonia symptoms. This outcome is somewhat unexpected, considering that the presence of more misophonic triggers might logically provide more opportunities for triggering episodes. Human-produced sounds, particularly those made by adults, are typically more aversive to individuals with misophonia compared to sounds made by animals or babies (Jager et al., 2020). It may be that the triggering effect of human-produced noises, such as eating sounds, on individuals with misophonia is so intense that adding non-human sounds, even if they are bothersome, does not further increase the severity of the misophonia symptoms. Still, further research is warranted given the preliminary nature of these findings.

A substantial number of participants (85%) reported being triggered by sounds made by familiar individuals. In contrast, fewer participants

Diagnostic criteria met for other psychiatric conditions (N = 60).

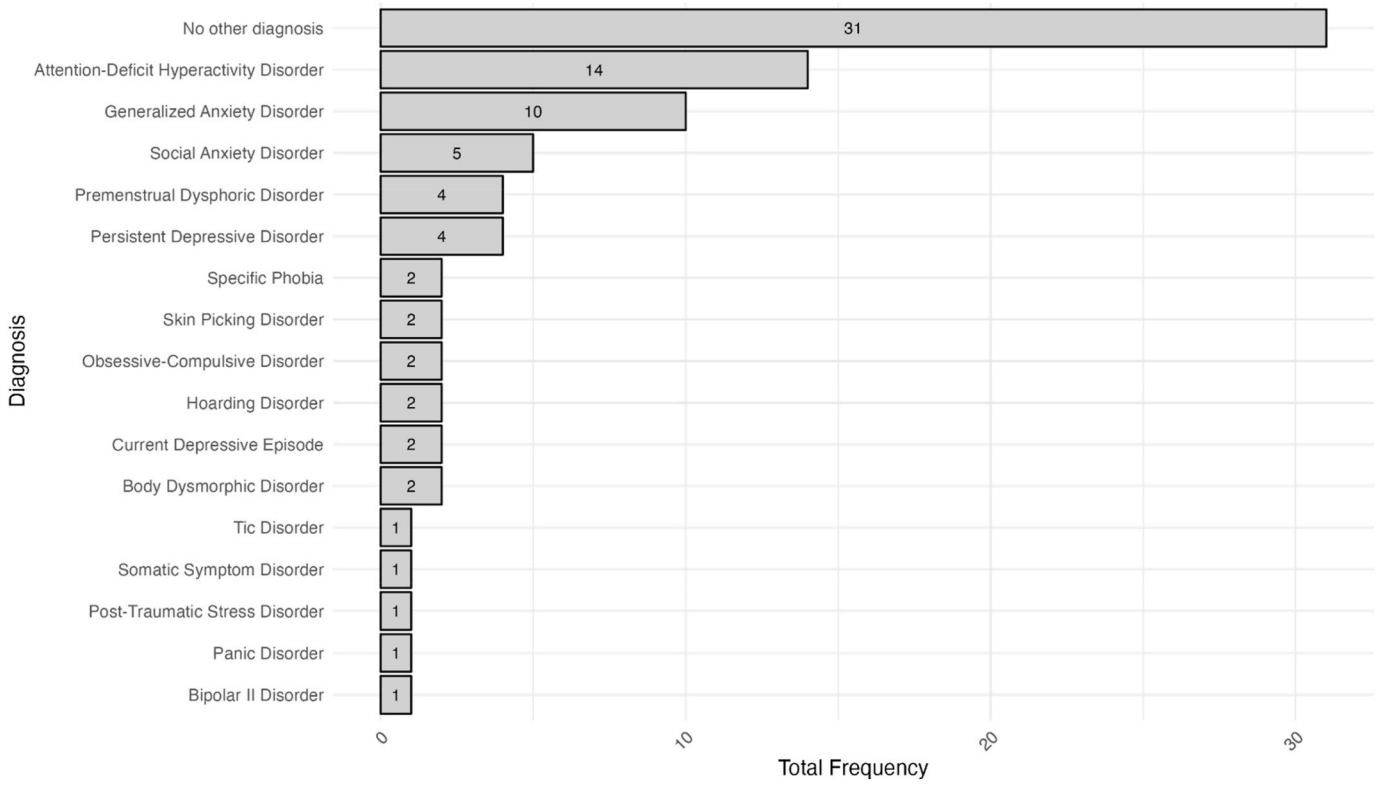

Fig. 3. Diagnostic criteria met for other psychiatric conditions (N = 60).

(40%) reported being triggered by strangers, although situations involving strangers can still be quite distressing. Our results suggest that, when triggers are not specific to certain individuals, participants tended to report significantly higher misophonia severity on the MQ self-report measure. A possible explanation for the increased severity could be that these individuals regard everyone as misophonic triggers, which not only heightens their hypervigilance towards misophonic triggers but also results in being triggered more frequently, thereby intensifying the presentation of misophonia. However, there was no correlation between the generalization of triggers to all individuals and misophonia severity as measure by the DMI through clinician ratings, which may be due to measurement accuracy or reporting bias. The measurement tools for misophonia, such as the MQ and the DMI, are still in the early stages of development. For instance, the MQ has not yet been validated in a clinical sample (Wu et al., 2014), and the DMI has only been psychometrically assessed in one study and its factor structure remains unevaluated (Guetta et al., 2022). As these tools improve, future assessments should further explore differences between individuals whose triggers are specific versus those that generalize to anyone.

We found that a significant number of participants (80%) reported that misophonia intensity can vary depending on internal factors such as focus or relaxation efforts, fatigue, illness, physical sensations, time of day, thoughts, and emotions. Other research, including a recent study by Guetta et al. (2024), has also shown that perceived generalized stress can significantly impact misophonia symptoms. This is consistent with patterns observed in other forms of psychopathology, where internal circumstances influence symptom intensity (Starr & Davila, 2012). In treating misophonia, clinicians should consider these internal factors to personalize treatment approaches. Only two participants indicated that their misophonia distress was unaffected by specific contexts, reinforcing that misophonia distress is typically context specific. It was commonly reported that quiet places, as opposed to loud environments, were more triggering. The fact that quiet environments are more triggering than loud ones further support the notion that misophonia is distinct from other sound tolerance conditions, like hyperacusis.

Meeting criteria for another psychiatric disorder was common in this sample, with nearly half of the participants diagnosed with an additional disorder. These results support previous findings that the prevalence of psychiatric disorders is significantly higher among individuals with misophonia compared to the general population (Rosenthal et al., 2022). Notably, adults in this sample were most frequently diagnosed with ADHD (23%), more than any other psychiatric disorder. Other research aligns with these findings, suggesting that ADHD may commonly co-occur with misophonia (Abramovitch et al., 2024; Rouw & Erfanian, 2018). While our findings reinforce the connection between misophonia and ADHD, further research is warranted considering that this studied relied on clinical interviews (the DIAMOND) for diagnosis, as opposed to the comprehensive assessment batteries typically used to diagnose ADHD.

The second most common comorbid condition participants met criteria for was generalized anxiety disorder, affecting 17% of the sample. This finding aligns with the structured clinical interview results from Rosenthal et al. (2022), who reported a 25% prevalence rate for generalized anxiety disorder. Other previous research (e.g., Guzick et al., 2023; Jager et al., 2020), indicate that anxiety and mood disorders occur in approximately 9–10% of individuals with misophonia, which are more prevalent than conditions historically associated with misophonia, such as OCD and post-traumatic stress disorder (PTSD). Indeed, recent literature suggests that OCD and PTSD are no more prevalent in individuals with misophonia than they are in the general population (e.g., Guetta et al., 2024; Jager et al., 2020). While features of these disorders may be observed in those with misophonia (e.g., Cusack et al., 2018), misophonia should not be attributed to the symptoms of OCD or PTSD. Instead, it should be treated as an separate disorder.

Table 3
Categorical regression models predicting misophonia questionnaire total score.

Model	R^2	β	Standard error	Lower 95% CI	Upper 95% CI	P-value
Course of Symptoms						
Symptoms remained the same or improved (reference group; n=22)	0.03					
Symptoms became worse (n=38)		2.95	2.16	−1.38	7.28	0.178
Person-Specific Context						
Matters who makes the sound (reference group; n=36)	0.08					
Does not matter who makes the sound (n=24)		4.78	2.07	0.64	8.92	0.024*
Type of Triggers Sound						
Human-produced only (*reference group; n=20*)	0.01					
Human-, and animal-produced and/or environmentally produced (n=40)		0.65	0.46	−3.28	5.68	0.159
Psychiatric Comorbidities						
Did not meet diagnostic criteria for another disorder (reference group; n=31)	0.00					
Diagnostic criteria met for at least one other disorder (n=29)		0.44	2.12	−3.80	4.68	0.837

**$p < .01$, *$p < .05$.

Table 4
Categorical regression models predicting duke misophonia interview total score.

Model	R2	β	Standard error	Lower 95% CI	Upper 95% CI	P-value
Course of Symptoms						
Symptoms remained the same or improved (reference group; n=22)	0.01					
Symptoms became worse (n=38)		1.49	2.02	−2.55	5.53	0.463
Person-Specific Context						
Matters who makes the sound (reference group; n=36)	0.00					
Does not matter who makes the sound (n=24)		−0.53	1.99	−4.52	3.46	0.792
Type of Triggers Sound						
Human-produced only (reference group; n=20)	0.04					
Human-, and animal-produced and/or environmentally produced (n=40)		2.35	2.03	−0.84	7.28	0.118
Psychiatric Comorbidities						
Did not meet diagnostic criteria for another disorder (reference group; n=31)	0.01					
Diagnostic criteria met for at least one other disorder (n=29)		1.07	1.65	−2.23	4.37	0.519

**$p < .01$, *$p < .05$.

Although literature highlights comorbidity as common in misophonia, findings on whether comorbidity is linked to a more severe presentation of misophonia are mixed. Misophonia may be more closely related to specific comorbid disorders rather than comorbidity in general. For instance, symptoms of other psychological conditions generally do not relate to misophonia severity, except in cases involving PTSD and personality disorders (Rouw & Erfanian, 2018; Cassiello-Robbins et al., 2021). Rosenthal et al. (2022) found that the presence of OCD, panic disorder, and symptoms of borderline personality disorder were significant predictors of misophonia symptom severity. In our study, the limited representation of specific psychiatric disorders within our small sample precluded an investigation into whether meeting diagnostic criteria for a particular disorder was associated with misophonia severity. Instead, we assessed whether psychiatric comorbidity alone could predict greater misophonia severity, but found no significant effect, likely due to the heterogeneity of psychiatric comorbidities in our sample. Future studies with larger samples should continue to investigate comorbid psychopathology in misophonia, as more insights are needed to distinguish misophonia symptoms from other psychiatric disorders, particularly for developing intervention strategies.

3.1. Contributions to existing research

As we have alluded to, our study replicates existing research on the age of onset, the common worsening of symptoms over time, common triggers, and frequent comorbid psychiatric disorders, but further substantiates the previous findings through its inclusion of a treatment-seeking sample and use of in-person structured clinical interviews. Notably, we identified a new finding that has not been previously reported as far as we know: the lack of person-specific sound sources—where any person could act as a trigger—might be connected to greater severity in misophonia. Moreover, we highlight data that support that misophonia can intensify depending on various contexts (e.g., quiet places, during times of stress). This finding suggests a potential point of heterogeneity in how misophonia presents across individuals.

3.2. Treatment considerations

Nuances in clinical characteristics should be carefully considered during diagnosis and treatment planning. For instance, it is feasible that individuals who experience distress from a broad range of human triggers, rather than specific individuals, may require different treatment strategies compared to those who are affected only by the sounds produced by select people. As a result, flexible intervention approaches, such as those already being considered (e.g., the Unified Protocol and Process-Based Therapy; see Rosenthal et al., 2023 for a review of person-centered psychotherapies for misophonia), are likely appropriate for individuals with misophonia.

Moreover, individuals who report that anyone could be a trigger source may face greater challenges in environments where adaptations, such as noise-canceling devices or leaving a triggering situation, are not feasible. Examples of such environments include classrooms, public transportation (e.g., buses, trains), waiting rooms, open-plan offices, or crowded events. Comprehensive and personalized treatment for individuals with misophonia should include multidisciplinary approaches, such as cognitive and behavioral strategies, along with audiological interventions like noise-canceling devices (see Bowers et al., 2024 for an example). In addition, accommodations in work or classroom settings may be beneficial, provided that they support adaptive functioning, such as enabling individuals to complete tasks like tests and work

assignments without distraction. Resources for individuals seeking academic and workplace accomodations are increasingly available on support and advocacy websites such as soQuiet.org.

3.3. Limitations

The results of this study should be interpreted with consideration to its generalizability. Our participant pool was largely composed of White women residing in the Western United States. Additionally, a general limitation of the extant misophonia research is that the definition of misophonia lacks consensus across studies. Therefore, we urge readers to interpret our findings while also considering the context of our inclusion criteria (a. participants must be seeking treatment for misophonia, b. endorse a minimum mild severity level on the MQ at initial screening, and c. receive a score of at least 20 on the DMI total scale at intake).

The absence of inter-rater reliability limits our ability to confirm the consistency and objectivity of the scoring. With only one rater, we were unable to compare scores across evaluators to ensure that assessments were not influenced by individual biases. Although the DIAMOND has demonstrated strong inter-rater reliability (Tolin et al., 2018), such data for the DMI has not been reported despite its preliminary validation (Guetta et al., 2022). Future studies incorporating multiple raters will enhance the rigor of misophonia research involving structured clinical interviews.

Another assessment limitation is the DIAMOND's restricted diagnostic coverage, allowing assessment of only a select set of DSM-5 disorders. Notably, it does not include personality disorders or ASD. Previous studies have linked personality disorder symptoms, particularly obsessive-compulsive and borderline personality disorders, with misophonia (Cassiello-Robbins et al., 2021; Jager et al., 2020; Rosenthal et al., 2022). Additionally, autistic traits are elevated in individuals with misophonia, with a significant proportion scoring above the threshold for clinically significant levels of these traits (Rinaldi et al., 2023). Pronounced autistic traits can exacerbate the severity of both conditions (Ertuerk et al., 2023). Future research should employ comprehensive diagnostic tools like the SCID-5 and SCID-5-PD for accurate assessment, which will be essential for distinguishing the unique and shared traits of misophonia and developing comprehensive treatment programs.

3.4. Conclusions and Implications for individuals and families living with misophonia

This study advances our understanding of misophonia by detailing its onset, progression, triggers, context dependence, and comorbidities in a treatment-seeking population. Our findings provide valuable insights for providers, individuals living with misophonia, and their loved ones. Specifically, misophonia often begins in childhood and worsens over time, with certain sounds triggering symptoms in context-specific ways depending on the individual. Contrary to previous speculations, misophonia does not appear to be linked to OCD or PTSD, though it may co-occur with other psychological issues, such as ADHD or anxiety. However, for many, misophonia develops independently, requiring its own distinct approach in treatment.

We also found that while some people are triggered by sounds made by specific individuals, others experience distress from sounds made by anyone. This distinction is crucial as it influences the severity of the condition, and the strategies needed for management. For those who can be triggered by anyone, broader coping strategies may be necessary to manage misophonia in various settings like classrooms, offices, or public spaces. Recognizing that misophonia varies across individuals and may present alongside different psychological conditions can help guide more effective, personalized treatment plans. Researchers should focus on refining diagnostic criteria in clinical samples and developing targeted interventions that consider the unique triggers and experiences of individuals with misophonia.

CRediT authorship contribution statement

Mercedes G. Woolley: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Leila K. Capel:** Writing – review & editing, Writing – original draft. **Emily M. Bowers:** Writing – review & editing, Writing – original draft, Methodology. **Julie M. Petersen:** Writing – review & editing, Project administration, Funding acquisition. **Karen Muñoz:** Writing – review & editing, Funding acquisition. **Michael P. Twohig:** Writing – review & editing, Investigation, Funding acquisition.

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Declaration of Competing Interest

The authors confirm there are no conflicts of interest to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jocrd.2024.100915.

Data availability

Data will be made available on request.

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