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An Exploration of Misophonia in the Literature

Megan E. Singer
Grand Valley State University

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Abstract

Misophonia is a disorder that elicits an extreme negative reaction to specific auditory and visual stimuli. Triggering stimuli, which are often human produced, provoke an array of symptoms including heightened negative emotions along with autonomic nervous system responses. Despite being a relatively common disorder, misophonia is still inadequately recognized and is often classified under conditions such as obsessive-compulsive disorder and anxiety. No cure for misophonia currently exists, but there are many treatments and coping mechanisms used by people with misophonia to ease their symptoms. This comprehensive review synthesizes current research on misophonia, exploring underlying mechanisms, comorbidities, diagnostic methodologies, and treatment efficacy. By combining valuable insights, this review aims to enhance awareness and understanding of this often-overlooked disorder.

Misophonia is a disorder in which specific sounds and visual stimuli cause an extreme negative reaction. It is estimated that around 20% of the general population are affected by this relatively unheard-of disorder (Ferrer-Torres & Gimenez-Llort, 2022; Kılıç et al., 2021; Swedo et al., 2022). Bothersome stimuli, referred to as triggers, are both auditory and visual and are often human produced. Each person has their own unique combination of triggers that may include chewing, sniffling, tapping, or leg swinging (Rouw & Erfanian, 2017). An array of symptoms, including negative emotions and the fight or flight reaction of the autonomic nervous system, occur when a trigger is sensed. Symptoms are often exacerbated in familiar contexts but are independent of loudness and pitch (Edelstein et al., 2013). Misophonia is differentiated from simply "disliking" a sound in the experience of disproportionate levels of negative emotions toward a person producing triggers (Edelstein et al., 2013). Misophonia has a spectrum of severity in which everyone's experience with the disorder is unique. People may perceive their misophonia symptoms as less severe than others who experience the same triggers and symptoms, resulting in varying degrees of severity of this disorder (Rosenthal et al., 2021).

The present review is aimed at examining many aspects of misophonia including the etiology of the disorder, co-occurring disorders, distinct evaluations used to identify misophonia in individuals, and the prevalence of treatments. This review will compile valuable and relevant research evidence on the subject to inform the general population of misophonia, which is still a relatively unknown disorder.

Onset and Etiology

While the exact etiology of misophonia remains to be elucidated, there have been many studies that aim to investigate the symptomatology of misophonia and its causes. Misophonia primarily emerges in childhood and is more prevalent in younger populations (Potgieter et al.,

2019; Savard et al., 2022; Wu et al., 2014). Kılıç et al. (2021) found that individuals with misophonia generally report that their symptoms emerged in childhood or adolescence. The onset is usually associated with traumatic memories of triggering situations in which they experienced unpleasant feelings toward sounds created by family members (Schröder et al., 2013; Taylor, 2017). It is still unclear whether misophonia is more prevalent in females than males, as previous research has suggested a higher presence of misophonia in the female population (Kılıç et al., 2021; Wu et al., 2014). However, studies that suggested higher prevalence of misophonia in females were based on samples that were predominantly composed of females, which brings the sex differences into question (Ferrer-Torres & Giménez-Llort, 2022; Kılıç et al., 2021; Savard et al., 2022; Wu et al., 2014). Further research is needed to clarify true disparities in the prevalence of misophonia between genders.

Hereditary and genetic links to misophonia have been suggested, but there is a lack of substantial research to support this hypothesis. Rouw and Erfanian (2018) found that one third of participants in a large-scale misophonia study had family members with similar misophonia symptoms. Sanchez and Silva (2017) studied a family in which 15 members were said to be affected by misophonia. They suggested that the incidence of misophonia in 15 family members was likely influenced by autosomal dominant inheritance (Sanchez & Silva, 2017). Other studies have also found an association between the presence of misophonia and a family history of the disorder (Edelstein et al., 2013; I. Jager et al., 2020; Kılıç et al., 2021). Despite these findings, the available evidence does not support a definitive hereditary or genetic association to misophonia, demonstrating a need for further exploration in future research (Swedo et al., 2022).

People with misophonia generally have normal hearing, suggesting the disorder may be neurological rather than auditory (Potgieter et al., 2019). Aberrant brain connections and

functions have been proposed as a potential cause of misophonia. Stronger functional brain connections between the autonomic nervous system (involved in regulating involuntary bodily processes) and the limbic system (responsible for regulating emotions) are associated with the conditioned reflex responses to patterns of sounds (Jastreboff & Jastreboff, 2014). This overactivity of regulatory systems is entirely subconscious, demonstrating a potential explanation as to why it is difficult for people with misophonia to regulate their emotional reactions to everyday sounds (Jastreboff & Jastreboff, 2014). Another brain region involved in misophonia is the orbitofrontal cortex (OFC), which processes stimuli and assigns emotions to sensory input (Neacsiu et al., 2022). Hyperconnectivity between the OFC and frontal brain regions (involved in planning motor responses) is unique to misophonia, as most other disorders are typically characterized by hypoconnectivity between the OFC and other brain regions (Neacsiu et al., 2022). The hyperconnectivity between these two brain regions may explain the intense emotional responses to triggers and the difficulty in controlling those responses.

Hyperactivity in the supplementary motor area (involved in motor learning and control) and ventral premotor cortex (involved in integrating sensory information and motor planning) is also unique to misophonia, which is different from other disorders that typically exhibit decreased activity in these areas (Neacsiu et al., 2022). The hyperactivity in these areas may explain the common misophonic response of finding, mimicking, and escaping triggering stimuli (Neacsiu et al., 2022). Studies have also found that hyperactivity of the insula (responsible for perceiving sensation and emotion) may be associated with the dysfunctional emotion regulation in triggering situations (Kumar et al., 2017; Neacsiu et al., 2022). The anterior insular cortex, which controls emotional awareness, empathy, and decision-making, is also hyperactive when experiencing triggers (Kumar et al., 2017; Neacsiu et al., 2022). Additionally, hyperactivity in

the amygdala (processing emotion and fear) may explain the association of triggering stimuli as "negative" (Neacsiu et al., 2022). Hyperactivity of the insula and amygdala are also associated with comorbidities of misophonia; however, current research does not suggest a causal relationship between misophonia and any other conditions (Ferrer-Torres & Giménez-Llort, 2022; Neacsiu et al., 2022; Schröder et al., 2013).

Comorbidities

Because the etiology of misophonia is still widely unknown, no criteria for the differentiation of misophonia and other disorders has been established. Misophonia may co-occur with other psychological and auditory disorders including any combination of obsessive compulsive disorder (OCD), anxiety, attention deficit disorder, depression, autism spectrum disorder, post-traumatic stress disorder, tinnitus, and hyperacusis; however, it is important to recognize misophonia's distinct symptomatology separate from these disorders, warranting classification as its own distinct disorder (Ferrer-Torres & Giménez-Llort, 2022; Potgieter et al., 2019; Swedo et al., 2022). The most prominent comorbidities of misophonia are OCD and anxiety (Barahmand et al., 2023; Ferrer-Torres & Giménez-Llort, 2022; Neacsiu et al., 2022).

Obsessive Compulsive Disorder

OCD is the most frequently associated comorbidity with misophonia and the two disorders are often studied concurrently (Ferrer-Torres & Giménez-Llort, 2022; Potgieter et al., 2019; Schröder et al., 2013). Many of the evaluation methods for misophonia were developed based on OCD assessment scales (Siepsiak et al., 2020). Misophonia is often categorized within the obsessive-compulsive spectrum of diagnostic manuals (e.g. the Diagnostic and Statistical Manual of Mental Disorders Fifth Edition); however, the correlations between these two disorders have been largely disproved (Barahmand et al., 2023; Schröder et al., 2013). OCD and misophonia

overlap in symptoms such as disgust sensitivity, distress, avoidance, and obsessive thoughts. Despite these similarities, misophonia is distinguished from OCD in the sensation of aggression and anger, the varying ability to control reactions to triggers, and a wide range of differential reactions (Barahmand et al., 2023; Cavanna & Seri, 2015; Schröder et al., 2013). Additionally, contamination-based disgust and compulsive acts were found to be associated with OCD but not misophonic reactions (Barahmand et al., 2023). Hyperactivity in the insula and the amygdala is associated with both OCD and misophonia (Barahmand et al., 2023; Kumar et al., 2017; Neacsiu et al., 2022). Another shared cognitive experience of OCD and misophonia is the perception of "imperfect" acts that elicit discomfort, which relates to previous findings linking misophonia to perfectionism (Barahmand et al., 2023). However, OCD is associated with dysfunctional connectivity between the dorsomedial prefrontal cortex (decision making and planning) and the insula, whereas misophonia is associated with dysfunctional connectivity between the ventromedial prefrontal cortex and the insula (Barahmand et al., 2023). This is an important difference when considering the distinction of misophonia and OCD as two distinct disorders.

Anxiety

When the brain is anticipating or sensing misophonic triggers, people with misophonia report feeling extreme stress and anxiety in response to those triggers (Mattson et al., 2023; Neacsiu et al., 2022; Swedo et al., 2022). It is important to distinguish that the "anxiety" felt by people with misophonia is not related to being afraid or fearful of triggers; rather, the anxiety experienced is a unique experience of intense emotional and physiological reactions and avoidance behavior (Neacsiu et al., 2022). While anxiety itself can be a symptom of misophonia, fear and worry are distinguishing factors between misophonia and anxiety disorders (Barahmand et al., 2023). Anxiety disorders and misophonia both prompt emotional arousal, distress, and

aggressive reactions in those affected (Barahmand et al., 2023). Previous research has found that public shame when experiencing a misophonic trigger as well as aggressive reactions to triggers is related to anxiety sensitivity (Barahmand et al., 2023). The anterior insular cortex is related to the cognitive and emotional responses elicited by anxiety and misophonia (Neacsiu et al., 2022). However, hyperactivity of the insula is what primarily triggers the negative emotions and maladaptive emotional responses in misophonia (Neacsiu et al., 2022).

Evaluation

Before scientifically validated studies established assessment measures and criteria for misophonia, clinical interviews were the primary way of assessing this disorder (Potgieter et al., 2019). In recent years, several testing methods have been created to systematically assess and diagnose individuals with misophonia. The development of these evaluations has resulted in improved recognition of misophonia as a distinct disorder. Despite this progress, there is not a universally recognized or standardized evaluation tool for evaluating and diagnosing misophonia. Commonly used evaluation tools will be summarized in this section.

Misophonia Questionnaire

The Misophonia Questionnaire (MQ) was one of the first self-report questionnaires developed by Wu et al. in 2014 to assess the presence of misophonia symptoms and the severity of sound sensitivity in individuals. The MQ contains three subsections to evaluate the presence of specific triggers, the reactions elicited by triggers, and the severity of the individual's sensitivities (Wu et al., 2014). This test was developed using many other established scales and questionnaires including the Adult Sensory Questionnaire, Sheehan Disability Scale, and Obsessive-Compulsive Inventory-Revised (Abramowitz & Deacon, 2006; Kinnealey & Oliver, 2002; Sheehan, 2000; Wu et al., 2014). The MQ aimed to compile useful knowledge from these

evaluations that is applicable to the diagnosis of misophonia symptomatology. On the Misophonia Severity subsection, which ranges from 1-15, ratings of 7 or above indicated clinically significant misophonia symptoms. Rosenthal et al. (2021) found the MQ had good specificity of 72% and sensitivity of 78% for determining clinical misophonia (Rosenthal et al., 2021). The population used to validate this test was a university sample, bringing the generalizability of the study into question. Despite these constraints, the MQ is one of the most common diagnostic measures for this disorder. It has been utilized in numerous subsequent studies of misophonia. The MQ was one of the most influential assessments in early scientific findings and is very well known within the misophonia community (Rosenthal et al., 2021; Siepsiak et al., 2020; Wu et al., 2014).

MisoQuest

The MisoQuest is another self-report questionnaire used to screen for misophonia. The diagnostic criteria of the MisoQuest were based on the Amsterdam Misophonia Scale (A-MISO-S), which was developed by Schröder et al. (2013). The MisoQuest consists of 14 questions, using a five-point Likert scale to evaluate self-reported reactions to specific sounds, avoidance behaviors, and the impact on daily functioning. On a scale ranging from 0-70, scores of 61 or above on the test indicate the presence of misophonia (Siepsiak et al., 2020). Savard et al. (2022) found the MisoQuest had good specificity of 96% but low sensitivity of 66%. The diagnostic criteria of the MisoQuest was based on the A-MISO-S criteria; however, more updated diagnostic criteria has been published since the creation of this evaluation (Potgieter et al., 2019; Rosenthal et al., 2021). Nevertheless, the MisoQuest is a widely used evaluation tool to assess misophonia (Rosenthal et al., 2021; Siepsiak et al., 2020).

Duke Misophonia Questionnaire

The Duke Misophonia Questionnaire (DMQ), developed in 2021, built upon previously established tests and definitions of misophonia to establish a novel set of diagnostic criteria and subscales. The nine subscales of this self-report assessment evaluate differential responses to triggers, coping with triggers, impairment in functioning, and severity of misophonia (Rosenthal et al., 2021). These subscales can be grouped together into symptom severity and coping composite scales. The DMQ subscales or composite scales can be used independently – as opposed to administering the entire assessment – to evaluate specific aspects of misophonia (Rosenthal et al, 2021). This allows researchers or clinicians to administer the various sections of the DMQ as needed. On the Impairment subscale, with possible scores ranging from 0-48, scores of 39 and above are considered clinically significant for misophonia impairment (*Duke Misophonia Questionnaire (DMQ) | Duke Department of Psychiatry & Behavioral Sciences*, n.d.). The DMQ was reported to have very good specificity of 91% and sensitivity of 100% (Rosenthal et al., 2021). As research continues to progress, the DMQ fails to address the current proposed diagnostic criteria for misophonia (Rosenthal et al., 2021; Swedo et al., 2022; Williams et al., 2022).

Duke-Vanderbilt Misophonia Screening Questionnaire

One of the most recent evaluation methods published in 2022 is the Duke-Vanderbilt Misophonia Screening Questionnaire (DVMSQ). The DVMSQ uses an algorithm that was built upon the revised diagnostic criteria proposed by Jager et al. (2020) and the consensus definition proposed by Swedo et al. (2022) to determine clinically significant misophonia. The aim of this evaluation measure was to apply the recently developed consensus definition of misophonia into a relatively short questionnaire that could be used in many contexts. The test consists of 21

questions, using a five-point Likert scale to evaluate symptom frequency and impairment caused by symptoms of misophonia (Williams et al., 2022). The DVMSQ's diagnostic algorithm contains six criteria for misophonia. Individuals who meet all six criteria are considered to exhibit clinically significant misophonia. The initial publication of the DVMSQ did not report a specific value to classify misophonia status, and therefore did not include specificity and sensitivity values (Williams et al., 2022). While this is the newest evaluation of misophonia, further research is necessary to validate the findings of the preliminary study and to determine the specificity and sensitivity to misophonia (Rosenthal et al., 2023; Williams et al., 2022).

Treatment

While no cure for misophonia currently exists, various treatment approaches have been developed to decrease the severity of symptoms and emotional reactivity misophonia may cause. Therapy techniques such as Cognitive-Behavioral Therapy (CBT), exposure therapy, and pharmacotherapy have been utilized to help treat misophonia. Coping mechanisms such as ear plugs and headphones are also used as sensory distraction strategies to manage reactions to misophonic triggers. It is important to note that while there are many treatment techniques used with patients for suspected misophonia, no official treatment protocol has been established.

Cognitive-Behavioral Therapy

CBT has been widely used by clinicians to help patients develop functional coping mechanisms to respond to triggers. This therapy targets the reactions of the autonomic nervous system through modifying behavior to control their reactiveness (I. J. Jager et al., 2021). Through self-management techniques, individuals work to restructure their thoughts and behavioral reactions toward triggers so that triggers no longer accompany the extreme emotional reaction they typically elicit (Ferrer-Torres & Giménez-Llort, 2022; Potgieter et al., 2019).

Therapists separate the reaction from the trigger using various coping strategies such as deep breathing and redirecting attention. CBT may include short exposures to trigger sounds, also known as exposure and response prevention, wherein the patient is gradually exposed to their triggers while practicing the adaptive techniques they learned in therapy to avoid overwhelming anger and anxiety (Ferrer-Torres & Giménez-Llort, 2022; Mattson et al., 2023; Potgieter et al., 2019). The thought behind exposure and response prevention is to "habituate" the patient with their triggers in an otherwise safe environment and to build positive defensive reactions rather than negative ones (Mattson et al., 2023; Potgieter et al., 2019). CBT has been proven effective in many studies of individuals with misophonia, but the efficacy of the treatment after several months still needs further validation (Ferrer-Torres & Giménez-Llort, 2022; I. J. Jager et al., 2021).

Support Groups

One of the most accessible strategies to help cope with misophonia is the use of support groups. Support groups provide a space for people with misophonia to connect with each other and share information, stories, and challenges. Examples of misophonia support groups on Facebook include "Misophonia: Coping and Solutions," "Misophonia Support Group," and "Misophonia Treatment Tracker." Other support groups include those offered by soQuiet Misophonia Advocacy, the Misophonia Association, and MisoMatch (*MisoMatch - Going through Misophonia as a Community*, n.d.; *soQuiet Misophonia Advocacy*, n.d.; *Support | Misophonia Association*, n.d.). Support groups are also utilized by family members to help them better understand how to live and interact with their loved ones affected by misophonia. Often it is challenging for people who do not have misophonia to understand the impact and challenges faced by people who do have the disorder, so having a space to talk and listen provides unique

learning opportunities (Brout, 2023). The literature surrounding effectiveness of support groups for misophonia is mixed: Ghorbani et al. (2022) found that both online group-mindfulness and online group-CBT were effective in reducing misophonia symptomatology, while Smith et al. (2022) did not find significant value in support groups as a treatment approach.

Pharmacological Treatment

Antidepressants to treat symptoms and comorbidities have been studied using case studies of individuals with misophonia. These drugs have been found to be effective in decreasing the symptoms of misophonia, including anxiety and distress (Ferrer-Torres & Giménez-Llort, 2022; Mattson et al., 2023). However, since these drugs have primarily been tested in patients with multiple conditions, the effect pharmacological treatments may have on the wider misophonic population remains unclear (Ferrer-Torres & Giménez-Llort, 2022; Mattson et al., 2023). Research is still developing within this field as the misophonia community aspires to find a cure. Various supplements and vitamins have been suggested as possible treatments for misophonia, particularly magnesium and vitamin B, within misophonia support groups and pages on social media (Misophonia Treatment Tracker, n.d.). However, it is important to note that no scientific research on the effectiveness of supplements and vitamins has been published, so they cannot be considered a reliable treatment option at this time (*General Health and Wellness*, n.d.).

On-Ear Sound Generating Devices

The use of on-ear sound generating devices have primarily been used to treat tinnitus and hyperacusis (Jastreboff & Jastreboff, 2014). These devices, which resemble over-the-ear hearing aids, produce a wide variety of non-repeating fractal chimes, broadband noise, or nature sounds. Unlike hearing aids, these on-ear sound generating devices are not meant to amplify noise. Instead, they are used to increase external auditory stimuli entering the auditory system, which

decreases the perception of tinnitus and hyperacusis (Folmer & Carroll, 2006; Jastreboff & Jastreboff, 2014). The use of these devices has also been used to treat misophonia, as they help to increase "background noise" rather than allowing the brain to focus on trigger sounds (Johnson, n.d.). An informal study was conducted by nine audiologists in 2012 that showed out of 65 patients with misophonia who were fit with these devices, 85% found the devices beneficial in their emotion regulation and were less affected by triggers (Johnson, n.d.). While further research is necessary to validate the efficacy of on-ear sound generating devices in treating misophonia, they have promising effects for people with misophonia, such as being able to tolerate a wider variety of listening environments (Johnson, n.d.)

Sensory Distraction

Through the development of diagnostic criteria for misophonia, coping strategies have been identified that are widely used by individuals with misophonia. These coping strategies are utilized by individuals in many different contexts and do not require the help of a doctor or therapist to employ them. The most common coping mechanisms are sensory distractions in which individuals use their surroundings to remove their focus from a trigger. Jastreboff and Jastreboff (2014) proposed that increasing sensory input when experiencing adverse trigger sounds decreases the intense response of the autonomic nervous system. Earplugs, noise canceling headphones, and listening to music are ways to decrease the intensity of auditory triggers (Cavanna & Seri, 2015; Edelstein et al., 2013). Self-distraction such as making another sound, creating an alternate physical sensation (e.g. rubbing thighs, biting nails), or focusing attention on a task are other common coping strategies used to decrease the reaction caused by triggers (Edelstein et al., 2013; Rosenthal et al., 2021). The most proactive coping mechanisms used by individuals with misophonia are asking the person producing the trigger to stop or

removing themselves from triggering situations, as these aim to avoid the trigger all together (Cavanna & Seri, 2015; Edelstein et al., 2013; Rosenthal et al., 2021).

Conclusion

Much remains to be discovered about misophonia, but the existing research helps to enhance the understanding and awareness of the disorder. Etiology, comorbidities, evaluations, and treatments were discussed. Through compiling research within this field, the current project has revealed a more thorough understanding of the mechanisms underlying this disorder. Future research should continue to investigate the impacts misophonia has on those affected and how this disorder is specifically differentiated from simply disliking certain stimuli. No cure currently exists for misophonia, so future research should also continue investigating the potential mechanisms that may improve the quality of life of people with misophonia. Misophonia is unique in that it is not something that can be seen or heard on the surface. Often people silently endure its effects and may feel ashamed about their condition. Therefore, research should prioritize awareness and advocacy to foster greater openness, acceptance, and comfortability for those affected.

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