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Misophonia: A Review

Mizofoni: Bir Gözden Geçirme

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Abstract

Misophonia is defined as a disproportionate emotional response to everyday sounds created by other people and sometimes to animal sounds. It can be severe enough to disrupt people's professional and social functionality. The risk factors and etiology of the disease are not fully known. It can be seen together with some neurodevelopmental diseases and psychiatric disorders. Amsterdam Misophonia Scale and Misophonia Scale are scales developed to evaluate misophonia. Diagnostic criteria have not been fully determined and are not included in the current diagnostic classifications. In its treatment, methods such as cognitive behavioral therapy, mindfullnes, dialectical behavioral therapy and exposure are used, and no specific pharmacological treatment has been defined.

Keywords: Misophonia, decreased sound tolerance, phenomenology, diagnosis

Öz

Mizofoni, diğer insanların oluşturduğu günlük seslere ve bazen hayvan seslerine orantısız şekilde duygusal tepki vermek olarak tanımlanmaktadır. Kişilerin mesleki ve sosyal işlevselliklerini bozabilecek kadar şiddetli olabilir. Hastalığın risk faktörleri ve etiyolojisi tam olarak bilinmemektedir. Bazı nörogelişimsel hastalıklar ve psikiyatrik bozukluklarla birlikte görülebilmektedir. Amsterdam Mizofoni Ölçeği ve Mizofoni Ölçeği mizofoniyi değerlendirmek için geliştirilmiş ölçeklerdir. Tanı kriteleri tam olarak belirlenmemiştir ve güncel tanı sınıflamalarında yer almamaktadır. Tedavisinde, bilişsel davranışçı terapi, farkındalık (mindfullnes), diyalektik davranış terapisi ve maruz bırakma gibi yöntemler kullanılmakta olup belirli bir farmakolojik tedavi tanımlanmamıştır.

Anahtar sözcükler: Mizofoni, azalmış ses toleransı, fenomenoloji, tanı

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MISOPHONIA is a derivate word from the Greek words *misos* (hate) and *phónè* (voice), referring to hate of sound. In the literature, it is defined using a common terminology. Briefly, misophonia is a disproportionate emotional response to everyday sounds created by other individuals and, sometimes, to animal sounds and to specific repetitive sounds such as typing or pen clicking (Bernstein et al. 2013, Edelstein et al. 2013, Schröder et al. 2013, Kumar et al. 2014, Erfanian et al. 2017, Schneider and Arch 2017, Erfanian et al. 2019). Loud breathing, yawning, chewing, swallowing, tapping foot, crunching, lip-smacking, pen clicking, touching, typing, finger tapping, and joint cracking are the main triggers of misophonia (Schröder et al. 2013, Kumar et al. 2014, Schröder et al. 2017, McKay et al. 2018, Sanchez and Silva 2018). Most individuals experience mild to severe negative feelings from anxiety, agitation, anger, dislike, annoyance, to loss of control (Kumar et al. 2014, Schröder et al. 2013, Boyce 2015, Dozier 2015a, Wu et al. 2014). Some patients may strongly react to certain auditory and visual stimuli, while some others show misophonia-like symptoms against repetitive movements such as chewing and leg bouncing or foot shaking, which is defined as misokinesia (selective hatred of movement) (Schröder et al. 2013, Jaswal et al. 2021).

Misophonia was first described by Marsha Johnson, PhD, a clinical audiologist, in 1997 as selective sound sensitivity syndrome (Bernstein et al. 2013). The term misophonia was coined by Jastreboff in 2001 as unelaborated emotional reactions to a broad range of sounds with the arousal of the sympathetic nervous system (Jastreboff and Jastreboff 2001, Edelstein et al. 2013). It is not classified in the Diagnostic and Statistical Manual of Mental Disorders-5th edition (DSM-5) or International Classification of Diseases-Revision 10 (ICD-10) (Potgieter et al. 2019). It shows a possible overlap with obsessive-compulsive disorder (OCD) and, therefore, some authors have advocated that misophonia can be most appropriately classified under the OCD category (Schröder et al. 2013). Individuals suffering from misophonia may experience discomfort and dislike to everyday ordinary sounds such as nail cutting, tooth brushing, breathing, smelling, sneezing, speaking, walking, laughing, snoring, whistling, TV sound or cough (Cavanna and Seri, 2015). This may lead to anxiety and avoidance behaviors, adversely affecting functionality of the individual (Edelstein et al. 2013). In this review, we discuss the diagnosis, etiology, risk factors, and treatment of misophonia, that has been an increasingly observed phenomenon in recent years, in the light of literature data.

Epidemiology

In the literature, researches regarding misophonia are limited to case series. Since there is no consensus on the definition of misophonia, its true incidence is unclear. However, some authors have claimed that its true prevalence in the society is underestimated (Siepsiak and Dragan 2019). Jastreboff et al. (2014) reported that 92% of individuals with decreased sound tolerance might suffer from misophonia with an overall incidence of 3% in the general population. This figure can increase up to 15%, when other conditions presenting with decreased sound tolerance are considered together (Fabijanska 1999). On the other

hand, there is a scarce number of studies investigating the prevalence of misophonia in non-clinical population. In a study including 483 undergraduate students, Wu et al. (2014) reported that 23.4% of the students were sometimes sensitive to certain sounds, while 19.9% of the students had clinically significant misophonia symptoms. In the study of Zhou et al. (2017) including 415 undergraduate students, 20% of the participants were sensitive to sound, while 6% of them had misophonia symptoms.

Tinnitus is a non-auditory, internal sound with a prevalence of 10% in the general population (KochKin et al. 2011). About 10 to 60% of patients with tinnitus may suffer from misophonia symptoms (Hadjipavlou et al. 2008, Sztuka et al. 2010). Previous studies have shown that 86% of patients with tinnitus have hyperacusis and 25 to 30% of them require treatment (Anari et al. 1999, Jastreboff and Jastreboff 2006). In a study, 1.75% of the general population were found to have hyperacusis without tinnitus, however, it was difficult to discriminate those with isolated hyperacusis from those with isolated misophonia or those with having these conditions together (Jastreboff, 2015).

Etiology

Although the etiology of misophonia has not been fully elucidated yet, neurological disorders may be implicated (Kumar et al. 2017). A few number of studies have examined the possible link between subjective and behavioral reactions and alterations in the central nervous system. However, neurobiological studies are still at a nascent stage and far from delineating the clinical characteristics precisely.

Edelstein et al. (2013) were the first researchers to perform psychophysiological measurements in misophonia. In their study, misophonic individuals and healthy controls were subjected to sound stimuli and their skin conductance responses (SCRs) were evaluated. Misophonic individuals reported trigger sounds as being invasive, intrusive, and disgusting with a higher SCRs to auditory stimuli than visual stimuli (Edelstein et al. 2013, Kumar et al. 2017). This finding indicates that the physiological responses of the individual to stimuli are consistent with their subjective rating items and the aforementioned responses are typical autonomic nervous system responses and autonomic arousal is measurable by SCRs in misophonic individuals (Edelstein et al. 2013). In another study, Kumar et al. (2017) evaluated specific trigger sound-related responses in brain and body in misophonic individuals, compared to healthy controls, using functional magnetic resonance imaging (fMRI) and physiological measurements including heart rate and galvanic skin response. They found that trigger sounds in misophonic individuals were associated with abnormal activation of the anterior insular cortex and its abnormal functional connection with the regions responsible for the regulation and processing of emotions such as ventromedial prefrontal cortex, posteromedial cortex, amygdala, and hippocampus. In addition, trigger sounds yielded an increased heart rate and galvanic skin response in these individuals that were mediated by the anterior insular cortex activity. Although this study defines misophonia based on fMRI findings, the authors suggested that misophonia did not feature in any psychiatric or neurological classification of diseases. Furthermore, San Giorgi et al.

(2015) investigated the brain regions related to misophonia using fMRI and found that misophonic patients had an increased activity in bilateral superior temporal cortex with hyperactivated left amygdala.

Many studies have shown that misophonia has overlapping symptoms with tinnitus, which is one of the notable symptoms in the differential diagnosis (Jastreboff and Jastreboff 2001, Schwartz et al. 2011). It has ben thought that there is an increased connection between auditory and limbic structures, thereby stimulating sensitivity to sound triggers (Jastreboff and Hazell 2008). In addition, clinical symptoms are triggered by external, human-made sounds in misophonia, while individuals having tinnitus are often sensitive to internal, abstract sounds (Cavanna and Seri 2015).

Misophonic individuals are usually hyper-focused on listening for the trigger with an obsessive tendency, anger, and aggression. Schröder et al. (2013) has advocated that misophonia has obsessive, compulsive, and impulsive similarities to OCD and that it should be considered under the obsessive-compulsive personality disorder (OCPD), considering the general characteristics of patients, the disease onset and course, and treatment response. Similarly, OCPD patients show impulsive reactions to eating sounds, which triggers avoidance behaviors and intolerance playing a role in its etiology. About one-third of patients have also a positive family history (Rouw and Erfanian 2018).

Furthermore, misophonia has similar traits to the other psychiatric disorders, *i.e*. specific phobia, post-traumatic stress disorder, social phobia, OCD, intermittent explosive disorder, antisocial personality disorder, personality disorders with impulsive aggression, borderline personality disorder, OCPD, sensory processing disorders, and phonophobia. However, the diagnostic criteria for the aforementioned disorders are not fully applicable for misophonia. Therefore, some authors have advocated that misophonia should be considered in the OCD spectrum as a distinct entity (Schröder et al. 2013).

Risk factors

The risk factors of misophonia have not been fully clarified, yet. In a recent study, Cassiello-Robbins et al. (2020) showed that neuroticism and difficulties in regulating emotions might be significant risk factors. However, further studies are warranted to elucidate risk factors of misophonia.

Clinical presentation and diagnosis

The majority of published studies have emphasized that misophonia begins in the first years of childhood or adolescence (Hadjipavlou et al. 2008, Bernstein et al. 2013, Schröder et al. 2013, Kumar et al. 2014, Dozier 2015a, Schneider and Arch 2017). Its initial manifestations usually begin at 13 years of age (Schröder et al. 2013, Rouw and Erfanian 2018). However, some authors have advocated that misophonia usually affects adults or has a lifelong course (Boyce 2015, Zhou et al. 2017, Tunç and Başbuğ 2017, Sanchez and Silva 2018).

Misophonic individuals describe negative experiences, when they are exposed to certain

sounds. Anger, disgust, irritation, and anxiety are the dominant emotions in misophonia (Edelstein et al. 2013, Schröder et al. 2013, Jastreboff and Jastreboff 2015, Schröder et al. 2017). These individuals typically experience physical symptoms such as difficulty in breathing, pain, hot flush, increased heart rate, and physical pressure on chest or head (Edelstein et al. 2013). Although rare, they show aggression and verbal or physical violence (Edelstein et al. 2013, Schröder et al. 2013). As the time of triggering sounds is obscure, misophonic patients may be constantly anxious and alert. Being hyper-focused on listening to triggering sounds and alert, they usually show avoidance behaviors. They may suffer from physical and mental discomfort with impaired quality of life (Edelstein et al. 2013).

In a study including 42 misophonic patients, Schröder et al. (2013) reported that all sounds produced by humans were the triggering stimuli, while animal or other sounds and the sounds made by the patients themselves did not induce distress. In 81% of the patients, symptoms were triggered by eating sounds like lip smacking, while 64.2% of the patients described breathing sounds as provocative and 59.5% of the patients were intolerant to the typing sounds or pen clicking sounds. In this study, the stimuli were initially auditory, but sometimes they responded to visual stimuli such as the image related to the triggering sound (*e.g.* watching someone eating). A total of 59.5% and 40.5% of the patients showed irritation and disgust, respectively. In addition 28.5% and 16.7% of the patients showed verbal aggression and physical aggression, respectively.

In another study, Wu et al. (2014) evaluated the incidence of misophonia among undergraduate students. A total of 22.8% of the students were sensitive to the eating sounds (*e.g.* chewing, swallowing, slurping) 22.8% to tapping sounds (*e.g.* tapping pen on table or tapping foot on floor) 21.7% to nasal sounds (*e.g.* inhalation or sniffing), 19.5% to throat sounds (*e.g.* throat-clearing or coughing), and 14.7% to environmental sounds (*e.g.* clock ticking or refrigerator running). In terms of functional impairment in those having clinically significant misophonic symptoms, work and school functioning was substantially impaired in 52.1%, social functioning in 22.9%, and family and home functioning in 18.8%.

Misophonia is not included in the current diagnostic classifications. However, several diagnostic criteria and tools have been developed to evaluate the severity of misophonia. Schröder et al. (2013) defined diagnostic criteria for misophonia (Table 1). They also developed an adapted version of the Yale-Brown Obsessive-Compulsive Scale, namely the Amsterdam Misophonia Scale (A-MISO-S) to measure the severity of misophonia symptoms. This six-item scale measures the time occupied by misophonic sounds daily, how much these sounds interfere with one's social or work functioning, level of anger, resistance against the impulse, control over one's thoughts and ager, and time spent to avoid misophonic triggers. The scale scores range from 0 to 24 and 0-4 indicate subclinical misophonic symptoms, 5-9 mild, 10-14 moderate, 15-19 severe, and 20-24 extreme.

In a large-scale of Jager et al. (2020a), the recommended diagnostic criteria by Schröder et al. (2013) were revised and emphasized that all criteria should be met to diagnose misophonia. The revised criteria were as follows: A) preoccupation with a specific external

auditory triggering sounds, B) triggers evoking intense feeling of irritation, anger and/or disgust, C) profound sense of loss of self-control, fear, or immense emotional outbursts, D) avoiding triggering to occur, E) symptoms leading to impaired functionality in daily life, and F) symptoms that cannot be explained by another disorder.

In another study, Dozier et al. (2017) proposed diagnostic criteria for misophonia as follows:

A- The presence or anticipation of a specific sensory experience such as a sound, sight, or other stimulus (e.g. eating sounds, breathing sounds, machine sounds, leg movement, vibration) provoking an impulsive, aversive physical and emotional response that typically begins with irritation or disgust and quickly becomes anger.

B- The stimulus elicits an immediate physical reflex response (skeletal or internal muscle action, sexual response, warmth, pain, or other physical sensation). The physical response cannot always be identified, however, the presence of an immediate physical response may be used to more clearly identify the condition as misophonia.

C- A moderate duration of the stimulus (e.g. 15 sec) elicits general physiological arousal (e.g. sweating, increased heart rate, muscle tension).

D- Dysregulation of thoughts and emotions with rare, but potentially aggressive outbursts. Aggressive outbursts may be frequent in children.

E- The negative emotional experience is later recognized as excessive, unreasonable, or disproportionate to the circumstances or the provoking stressor.

F- The individual tends to avoid the misophonic situation, or if he/she does not avoid it, endures the misophonic stimulus situation with discomfort or distress.

G- The individual's emotional and physical experience, avoidance, and efforts to avoid cause significant distress or significant interference in the person's life. For instance, it is difficult for the individual to perform tasks at work, attend classes, participate in routine activities, or interact with specific individuals.

Furthermore, to attempt to propose diagnostic criteria for misophonia, Wu et al. (2014) developed the Misophonia Questionnaire (MQ) which consists of three parts. The first part was named the Misophonia Symptom Scale to evaluate the presence of specific sound triggers produced by human and environmental sounds (repetitive or not) such as eating, tapping, or throat sounds. The second part was named the Misophonia Emotions and Behaviors Scale which evaluates emotional and behavioral reactions associated with misophonia symptoms. The third part was named the Misophonia Severity Scale which was adapted from the National Institute of Mental Health-Global Obsessive–Compulsive Scale. The first and second parts of the questionnaire are rated on a 0 to 4 scale, ranging from 0 (not at all true) to 4 (always true) and are summed to form the total score with possible values ranging from 0 to 68. The last part of the questionnaire is rated on a 1 to 15 scale, ranging from "minimal" to "very severe". A score of ≥7 indicate clinically significant sound sensitivity.

In another study, Siepsiak et al. (2020) developed a new questionnaire to assess

misophonia, namely MisoQuest. This questionnaire was based on the diagnostic criteria proposed by Schröder et al. (2013). Due to the distinct symptomatology of misophonia from OCD, the authors suggested that the MisoQuest should be used rather than A-MISO-S or MQ. As proposed by the authors, this tool allows the measurement of misophonia severity, rather than the presence of misophonic symptoms. However, as a newly developed tool, its use in the clinical practice is limited. Further clinical studies are needed to investigate whether the MisoQuest provides an additional contribution to the existing tools for misophonia.

Although the definition and clinical presentation of misophonia may be similar to that of OCD, depression, attention deficit-hyperactivity disorder, asthma, Tourette syndrome, dysthymic disorder, eating disorders, post-traumatic stress disorder, social phobia, body dysmorphic disorder, or panic disorder, none of these diagnostic categories fit the whole symptomatology of misophonia (Schröder et al. 2013, Wu et al. 2014, Dozier 2015b, Erfanian et al. 2017, Schröder et al. 2017). In addition, cases of borderline personality disorder, tinnitus and hearing loss, agoraphobia, generalized anxiety disorder, hypochondria, skin picking, and bipolar disorder have been reported in the literature (Schröder et al. 2013, Boyce 2015, Colucci 2015, Dozier 2015a, Erfanian et al. 2017, Schröder et al. 2017). However, the exact link between these conditions and misophonia still remains to be elucidated.

In the differential diagnosis of misophonia, hyperacusis and phonophobia characterized by the decreased sound tolerance are considered. Hyperacusis is defined as an increased sensitivity to certain frequencies and volume ranges of everyday sounds which impair the social and work functionality of the individual (Aazh and Moore 2017). In misophonic individuals, the intensity of the reaction is not related to the intensity of the triggering sound and may vary according to the settings. To illustrate, one can show a higher reaction to low sounds such as breathing or smelling, while he/she cannot show a reaction to loud music. In individuals with hyperacusis, on the other hand, the intensity of the reaction is closely related to the intensity of the triggering sound and, mostly, does not vary according to the settings. Furthermore, there is a significant connection between the auditory system and the other limbic systems in misophonia, while there is a normal functional connection in hyperacusis. Of note, misophonic reaction is selective and is not associated with hearing impairment (Jastreboff and Jastreboff 2015). However, individuals with hyperacusis usually exhibit a lower loudness discomfort level based on audiological examinations (Siepsiak et al. 2019). Phonophobia characterized by decreased sound tolerance is also considered a subcategory of misophonia. It shares a similar mechanism to misophonia. However, misophonic individuals usually experience irritation, anger, disgust, and anxiety, while an irrational and overwhelming fear of sound is the predominant manifestation in those with phonophobia, characterized by clinically significant anxiety against environmental sounds and leading to avoidance behavior with the fear of harm to ears with worsened symptoms (Asha'ari et al. 2010). Finally, hyperacusis, misophonia, or phonophobia have no association with hearing thresholds and some patients may have normal hearing, while some others may have hearing impairment (Tyler et al. 2014).

Treatment

In the literature, there is no study investigating the efficacy of pharmacological treatments in misophonia. Anecdotal data have suggested that misophonic patients with misophonia-related reactions and accompanying neurodevelopmental disorders or anxiety disorder may benefit from serotonergic and/or anti-dopaminergic medications (Cavanna 2014, Hocaoglu 2018). Besides pharmacological treatments, non-pharmacological methods are available for the management of misophonia including cognitive behavioral therapy (CBT), exposure and response prevention therapy, which are the components of CBT, in patients with coexisting OCD symptoms, mindfulness, dialectical behavior therapy, and exposure therapy with relaxation techniques (Dozier 2015a, 2015b, Reid et al. 2016, Kamody and Del Conte 2017, Schröder et al. 2017).

Several studies have demonstrated that CBT is a useful method in the management of misophonic symptoms (Bernstein et al. 2013, Schröder et al. 2017, Hocaoglu 2018). In an open-label study investigating the efficacy of CBT in 90 misophonic patients, Schröder et al. (2017) reported a significant reduction in the misophonic symptoms in 48% of the patients. In this study, the presence of disgust and severe misophonia were found to be independent predictors of treatment response. In another randomized-controlled study investigating the efficacy of CBT in misophonic patients, the patients were divided into two groups as the CBT and control groups and the CBT group had less misophonic symptoms in the short-term with a higher rate of improvement, compared to the control group (Jager et al. 2020b). Additionally, a recent study recommended using cognitive therapies (*e.g.* schema therapy) in the management of misophonic symptoms of patients having strong negative emotions (Natalini et al. 2020). In literature, there are some studies utilizing pharmacological therapies alone in misophonic patients. Vidal et al. (2017) presented a case of misophonic and OCD symptoms treated with escitalopram and achieved a partial relief at Day 30. In another report, Tunç et al. (2017) used alprazolam, an anxiolytic agent, in a misophonic patient and achieved favorable outcomes.

The lack of a precise theoretical rationale and etiological framework builds a barrier in front of the development of effective management strategies, thereby, posing a challenge for clinicians in the management of misophonic patients in daily practice. We believe that informing patients regarding investigational studies in this field may be helpful. Similarly, patients should be informed about the uncertainty of the classification of the disease. Based on the nature of the disease, it may be accompanied by some other disorders and a multidisciplinary approach including neurologists, audiologists, neuropsychologists, and psychiatrists should be adopted to increase the treatment success. A detailed medical history including individual characteristics of patients and comorbidities should be also taken to tailor an individualized treatment for each patient and to map the treatment plan.

Conclusion

Misophonia has become a matter of interest to researchers in recent years. In the literature, the

majority of published data are of case reports and case series. The underlying mechanism of misophonia is still unclear and, thus, further large-scale, prospective, randomized-controlled studies are needed to gain a better understanding of this issue. Also, its coexistence with the other pathologies is still under debate. Future studies can shed light into the mysterious nature of the disease. Currently, there is a limited number of tools in the diagnosis and assessment of severity of misophonia and no consensus has been reached upon yet regarding their use in the clinical practice. We, therefore, believe that future studies would provide additional contribution to the existing knowledge on this topic. Given the complex nature of the disease, multidisciplinary studies are also of utmost importance.

In conclusion, misophonia is a debilitating condition which may remarkably impair the quality of life of the individual. In the literature, no reliable and valid studies have been carried out to investigate the prevalence of misophonia in specific patient groups, as well as the general population. In addition, current classification systems have not defined misophonia yet and it is still unclear whether it is a distinct entity or a symptom domain accompanying other diseases. Further comprehensive and well-designed studies are warranted to elucidate etiology, epidemiology, and treatment of this disease. With the increasing knowledge on misophonia, more useful treatment approaches can be developed. This would, eventually, allow us to improve the quality of life of these patients and, as the clinicians, to feel more comfortable and self-confident.

References

Aazh H, Moore BC (2017) Factors related to uncomfortable loudness levels for patients seen in a tinnitus and hyperacusis clinic. Int J Audiol, 56:793-800.

Anari M, Axelsson A, Eliasson A, Magnusson L (1999) Hypersensitivity to sound: questionnaire data, audiometry and classification. Scand Audiol, 28:219-230.

Asha'ari ZA, Zain NM, Razali A (2010) Phonophobia and hyperacusis: practical points from a case report. Malays J Med Sci, 17:49-51.

Bernstein RE, Angell KL, Dehle CM (2013) A brief course of cognitive behavioural therapy for the treatment of misophonia: a case example. Cogn Behav Ther, 42:e10.

Boyce PM (2015) A young woman with noise intolerance. Medicine Today,16:46-47.

Cassiello-Robbins C, Anand D, McMahon K, Guetta R, Trumbull J, Kelley L, et al. (2020) The mediating role of emotion regulation within the relationship between neuroticism and misophonia: A preliminary investigation. Front Psychiatry, 11:847.

Cavanna AE, Seri S (2015) Misophonia: current perspectives. Neuropsychiatr Dis Treat, 11:2117-2123.

Cavanna AE (2014) What is misophonia and how can we treat it? Expert Rev Neurother, 14:357-359.

Colucci DA (2015) A case of amplified misophonia? Hear J, 68:40.

Dozier TH (2015a) Etiology, composition, development and maintenance of misophonia: A conditioned aversive reflex disorder. Psychological Thought, 8:114–129.

Dozier TH (2015b) Counterconditioning treatment for misophonia. Clin Case Stud, 14:374-387.

Dozier TH, Lopez M, Pearson C (2017) Proposed diagnostic criteria for misophonia: a multisensory conditioned aversive reflex disorder. Front Psychol. 14:1975.

Edelstein M, Brang D, Rouw R, Ramachandran S (2013) Misophonia: physiological investigations and case descriptions. Front Hum Neurosci, 7:296.

Erfanian M, Brout JJ, Keshavarz A (2017) Misophonia and affective disorders: The relationship and clinical perspective. Eur Psychiatry, 41:471

Erfanian M, Kartsonaki C, Keshavarz A (2019) Misophonia and comorbid psychiatric symptoms: a preliminary study of clinical findings.

Nord J Psychiatry. 73:219-228.

Fabijanska A, Rogowski M, Bartnik G, Skarzynski H (1999) Epidemiology of tinnitus and hyperacusis in Poland. Proceedings of the sixth international tinnitus seminar:569-571. 1999, Cambridge, UK.

Hadjipavlou G, Baer S, Lau A, Howard A (2008) Selective sound intolerance and emotional distress: what every clinician should hear. Psychosom Med, 70:739-740.

Hocaoglu C (2018) A little known topic misophonia: two case reports. Dusunen Adam, 31:89.

Jager I, de Koning P, Bost T, Denys D, Vulink N (2020a) Misophonia: Phenomenology, comorbidity and demographics in a large sample. PLoS One. 15:e0231390.

Jager IJ, Vulink NCC, Bergfeld IO, van Loon AJJM, Denys DAJP (2020b) Cognitive behavioral therapy for misophonia: A randomized clinical trial. Depress Anxiety, doi: 10.1002/da.23127.

Jastreboff MM, Jastreboff PJ (2001) Components of decreased sound tolerance: hyperacusis, misophonia, phonophobia. ITHS News Lett, 2:5-7.

Jastreboff P (2015) 25 years of tinnitus retraining therapy. HNO, 63:307-311.

Jastreboff PJ, Hazell JW (2008) Tinnitus Retraining Therapy: Implementing the Neurophysiological Model. Cambridge, Cambridge University Press.

Jastreboff PJ, Jastreboff MM (2006) Tinnitus retraining therapy: a different view on tinnitus. J Otorhinolaryngol Relat Spec, 68:23-30.

Jastreboff PJ, Jastreboff MM (2014) Treatments for decreased sound tolerance (hyperacusis and misophonia). Semin Hear, 35:105-120.

Jastreboff PJ, Jastreboff MM (2015) Decreased sound tolerance: hyperacusis, misophonia, diplacousis, and polyacousis. Handb Clin Neurol, 129:375-387.

Jaswal SM, Blesser AD, Handy TC (2021) A common human problem has a name: misokinesia. Research Square, doi: 10.21203/rs.3.rs-240866/v1.

Kamody RC, Del Conte GS (2017) Using dialectical behavior therapy to treat misophonia in adolescence. Prim Care Companion CNS Disord, 19:17l02105.

KochKin S, Tyler R, Born J (2011) MarkeTrak VIII: The prevalence of tinnitus in the United States and the self-reported efficacy of various treatments. Hear Rev, 18:10-26.

Kumar S, Hancock O, Cope T, Sedley W, Winston J, Griffiths TD (2014) Misophonia: a disorder of emotion processing of sounds. J Neurol Neurosurg Psychiatry, 85:e3.

Kumar S, Tansley-Hancock O, Sedley W, Winston JS, Callaghan MF, Allen M, et al. (2017) The brain basis for misophonia. Curr Biol, 27:527-533.

McKay D, Kim S-K, Mancusi L, Storch EA, Spankovich C (2018) Profile analysis of psychological symptoms associated with misophonia: a community sample. Behav Ther, 49:286-294.

Natalini E, Dimaggio G, Varakliotis T, Fioretti A, Eibenstein A (2020) Misophonia, maladaptive schemas and personality disorders: A report of three cases. J Contemp Psychother, 50:29-35.

Potgieter I, MacDonald C, Partridge L, Cima R, Sheldrake J, Hoare DJ (2019) Misophonia: A scoping review of research. J Clin Psychol, 75:1203-1218.

Reid AM, Guzick AG, Gernand A, Olsen B (2016) Intensive cognitive-behavioral therapy for comorbid misophonic and obsessive-compulsive symptoms: A systematic case study. J Obsessive Compuls Relat Disord, 10:1-9.

Rouw R, Erfanian M (2018) A large-scale study of misophonia. J Clin Psychol, 74:453-479.

San Giorgi R (2015) Hyperactivity in amygdala and auditory cortex in misophonia: preliminary results of a functional magnetic resonance imaging study. Amsterdam Brain Cognition Journal, 2:21-28.

Sanchez TG, Silva FED (2018) Familial misophonia or selective sound sensitivity syndrome: evidence for autosomal dominant inheritance? Braz J Otorhinolaryngol, 84:553-599.

Schneider RL, Arch JJ (2017) Case study: a novel application of mindfulness-and acceptance-based components to treat misophonia. J Contextual Behav Sci, 6:221-225.

Schröder A, Vulink N, Denys D (2013) Misophonia: diagnostic criteria for a new psychiatric disorder. PLoS One, 8:e54706.

Schröder AE, Vulink NC, van Loon AJ, Denys DA (2017) Cognitive behavioral therapy is effective in misophonia: An open trial. J Affect Disord, 217:289-294.

Schwartz P, Leyendecker J, Conlon M (2011) Hyperacusis and misophonia: the lesser-known siblings of tinnitus. Minn Med, 94:42-43.

Siepsiak M, Dragan W (2019) Misophonia-a review of research results and theoretical concepts. Psychiatr Pol, 53:447-458.

Siepsiak M, Śliwerski A, Łukasz Dragan W (2020) Development and psychometric properties of misoquest-a new self-report Questionnaire for Misophonia. Int J Environ Res Public Health. 17:1797.

Sztuka A, Pospiech L, Gawron W, Dudek K (2010) DPOAE in estimation of the function of the cochlea in tinnitus patients with normal hearing. Auris Nasus Larynx, 37:55-60.

Tunç S, Başbuğ HS (2017) An extreme physical reaction in misophonia: stop smacking your mouth! Psychiatry and Clinical Psychopharmacology, 27:416-418.

Tyler RS, Pienkowski M, Roncancio ER, Jun HJ, Brozoski T, Dauman N et al. (2014) A review of hyperacusis and future directions: part I. Definitions and manifestations. Am J Audiol. 23:402-419.

Vidal C, Vidal LM, Lage MA (2017) Misophonia: case report. Eur Psychiatry, 41:644.

Wu MS, Lewin AB, Murphy TK, Storch EA (2014) Misophonia: incidence, phenomenology, and clinical correlates in an undergraduate student sample. J Clin Psychol, 70:994-1007.

Zhou X, Wu MS, Storch EA (2017) Misophonia symptoms among Chinese university students: Incidence, associated impairment, and clinical correlates. J Obsessive Compuls Relat Disord, 14:7-12.

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