For any issues with this document, please contact your library.

---

Title: Journal of obsessive-compulsive and related disorders.
ArticleTitle: Misophonic symptoms in non-psychotic psychiatric outpatients and its association with trait psychological variables
ArticleAuthor: Çolak
Vol: 29 Date: 2021-04-01 Pages: 100644-
OCLC - 990385299; ISSN - 22113649; LCN - 2012263062;
Publisher: Amsterdam : Elsevier 2010s-
Source: LibKeyNomad
Copyright: CCG

---

NOTICE CONCERNING COPYRIGHT RESTRICTIONS:

The copyright law of the United States [Title 17, United StatesCode] governs the making of photocopies or other reproductions of copyrighted materials.

Under certain conditions specified in the law, libraries and archives are authorized to furnish a photocopy or other reproduction. One of these specific conditions is that the photocopy is not to be "used for any purpose other than private study, scholarship, or research." If a user makes a request for, or later uses, a photocopy or reproduction for purposes in excess of "fair use," that user may be liable for copyright infringement.

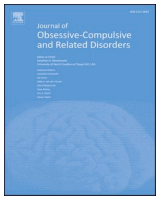
This institution reserves the right to refuse to accept a copying order if, in its judgment, fulfillment of that order would involve violation of copyright law.

Journal of Obsessive-Compulsive and Related Disorders 29 (2021) 100644

Contents lists available at ScienceDirect

Journal of Obsessive-Compulsive and Related Disorders

journal homepage: www.elsevier.com/locate/jocrd



# Misophonic symptoms in non-psychotic psychiatric outpatients and its association with trait psychological variables

Burçin Çolak [a], Berker Duman [b,c], Oğuzhan Herdi [d,*], Rıfat Serav İlhan [a], Direnç Sakarya [e]

[a] Ankara University, Faculty of Medicine, Department of Psychiatry, Ankara, Turkey
[b] Ankara University, Faculty of Medicine, Department of Psychiatry, Division of Consultation-Liaison Psychiatry, Ankara, Turkey
[c] Neuroscience and Neurotechnology Center of Excellence (NOROM), Ankara, Turkey
[d] Health Ministry of Republic of Turkey, Antalya Serik State Hospital, Antalya, Turkey
[e] Uppsala University, Faculty of Medicine, Department of Psychiatry, Uppsala, Sweden

ARTICLE INFO

*Keywords:*
Misophonia
Obsession
Anxiety
Personality traits
Somatosensory amplification

ABSTRACT

*Background:* Misophonia is commonly described as abnormal or disproportionately aversive and emotional reactions to specific sounds that interfere with patients' psychosocial functioning. In this study, we aimed to investigate the possible associations of specific psychological traits with misophonic symptoms in psychiatric outpatients.

*Subjects:* Misophonic Symptoms Checklist (MSC), Eysenck Personality Questionnaire-Revised Short Form (EPQRS), Maudsley Obsessive-Compulsive Inventory (MOCI), State-Trait Anxiety Inventory (STAI), Buss-Perry Aggression Questionnaire (BPAQ) and Somatosensory Amplification Scale (SASS) were used to assess various psychological traits in a sample of consecutive outpatients at University Hospital Psychiatry Department in September 2019.

*Results:* After multiple regression analysis, we found that the MOCI, STAI, EPQRSneuroticism, SASS, and BPAQ predicted misophonic symptoms where only SASS and MOCI were significant predictors.

*Conclusions:* Our findings indicate that proneness to somatization and obsessivecompulsive symptoms are significantly associated with misophonic symptoms. These findings contribute to the phenomenological understanding of misophonia.

## 1. Introduction

The term misophonia was introduced by Jastreboff and Jastreboff to describe patients 'who react negatively to specific sounds with specific patterns and/or meanings to individuals in specific situations' (Jastreboff & Jastreboff, 2001; Rouw & Erfanian, 2018). Although the first descriptions of this condition stemmed from audiology literature related to hyperacusis; recently more evidence from neurophysiology and neurobiology research has supported its neuropsychiatric features and discussed it as a candidate neuropsychiatric disorder (Song et al., 2014; Brout et al., 2018). Currently, misophonia is still not classified as a distinct psychiatric disorder in any diagnostic classification system though it shares many aspects of a psychiatric disorder (Kumar et al., 2017).

Misophonia was described as abnormal or disproportionately aversive and emotional reactions to specific sounds, generally but not limited to the oral or nasal origin, which interfere with patients' psychosocial functioning (Potgieter et al., 2019; Taylor, 2017). Negative strong emotional and autonomic reactions such as the 'fight or flight' response are elicited by specific stimuli called 'trigger sounds' (Edelstein, Brang, Rouw, & Ramachandran, 2013). Trigger sounds include breathing, wheezing, chewing, eating, slurping, lip-smacking, pen clicking/tapping, typing, and cracking knuckles (Kumar et al., 2017; McKay, Kim, Mancusi, Storch, & Spankovich, 2018). In some cases, images or visual stimuli such as leg-rocking, watching someone chewing, or hair-twiddling, could provoke similar emotional, behavioral, and physiological reactions to trigger sounds (Dozier & Morrison, 2017).

Emotional reactions to the stimuli vary from discomfort, anxiety, and distress to irritation, disgust, hate, anger, feeling trapped, impatience and loss of self-control, and could even be related to the subject or context (Edelstein et al., 2013; Potgieter et al., 2019; Schröder, Vulink, & Denys, 2013). Indeed, some authors suggested that aggressive

* Corresponding author.
*E-mail address:* oguzhan2036@gmail.com (O. Herdi).

https://doi.org/10.1016/j.jocrd.2021.100644
Received 15 August 2020; Received in revised form 10 March 2021; Accepted 18 March 2021
Available online 24 March 2021
2211-3649/© 2021 Elsevier Inc. All rights reserved.

outbursts are a central feature of misophonic conditions (Kluckow, Telfer, & Abraham, 2014; McGuire, Wu, & Storch, 2015; Schröder et al., 2013). Besides, physiological or autonomic reactions are reported to be important aspects of misophonia. Autonomic arousal in individuals with misophonia causes a variety of symptoms, possibly due to activation of the sympathetic nervous system activated by 'trigger sounds' (Vidal, Vidal, & Lage, 2010). Furthermore, misophonic patients were reported to have specific maladaptive coping mechanisms such as avoidance of social situations in which the trigger sound might occur, which in turn could interfere with the interpersonal and occupational functioning of the patient (Cavanna & Seri, 2015; Schröder et al., 2013; Webber & Storch, 2014).

Phenomenological features of misophonia have been associated with a variety of psychiatric disorders. Obsessive-compulsive disorders, agoraphobia, tic disorders, mood disorders, panic disorder, attention deficit hyperactivity disorder, hypochondriasis, body dysmorphic disorder, eating disorder, trichotillomania, skin picking, and autism spectrum disorders have been reported to have significant associations with misophonic symptoms (Cavanna, 2014; Ferreira, Harrison, & Fontenelle, 2013; Hazen et al., 2008; Johnson et al., 2013; McGuire et al., 2015; Schröder et al., 2013; Taylor, 2017; Taylor, Conelea, McKay, Crowe, & Abramowitz, 2014; Webber, Johnson, & Storch, 2014).

The variability of psychiatric symptoms associated with misophonia might suggest a common physiopathology between misophonia and psychiatric disorders instead of accepting them as entirely distinct entities (Taylor, 2017). Research on potential intermediate phenotypes between misophonia and psychiatric disorders underlying both entities can be valuable in this respect. Various psychological trait features are defined for the underlying psychopathology of diverse psychiatric disorders (Rosenström et al., 2019). For instance, previous research indicates anxiety, anger, obsessions, and avoidance behaviours which are also common features in psychiatric disorders could be associated with misophonia (Potgieter et al., 2019).

Personality, especially neurotic traits, is associated with a variety of psychiatric disorders (Calati et al., 2008; Celikel et al., 2009; Joyce, Light, Rowe, Cloninger, & Kennedy, 2010; Svrakic et al., 2002). Studies indicate that neuroticism is an important personality trait for general psychopathology risk (Ormel et al., 2013; Lahey, 2009). Psychoticism is related to tough-mindedness such as being intolerant, belittling, acting disruptively, and lacking in empathy (Heath & Martin, 1990). Misophonic behaviours of the individuals can be disturbing to others via harsh criticism, anger outburst or failure of empathic understanding of reasonable explanations of the origins of misophonia trigger sounds such as making nasal sounds because of a rhino-sinusitis or hand-tapping due to exam anxiety. These behaviors can be understood as an expression of personality that can be admitted to the psychoticism factor. Furthermore, personality is found to be important in noise sensitivity (Shepherd, Heinonen-Guzejev, Hautus, & Heikkilä, 2015). According to this study, personality can have independent effects, accounted for 33% of the variance, on noise sensitivity. A recent study indicates that sensitivity and emotional reactions towards unpleasant stimuli in misophonic individuals might be related to neuroticism (Daniels, Rodriguez, & Zabelina, 2020). Therefore, personality, especially neuroticism, could be an important mediator on misophonic symptoms in psychiatric patients which is worth investigating as a candidate trait.

Misophonia was also shown to be related to obsessive and compulsive symptoms, especially with obsessive thoughts (Cusack, Cash, & Vrana, 2018). Obsessive-compulsive symptoms associated with ordering and harm avoidance dimensions, not compulsive symptoms such as handwashing or neutralizing, are shown to be related to misophonia (McKay et al., 2018). Obsessive-compulsive symptoms were also shown as a mediator between anxiety sensitivity and misophonic symptom severity (Cusack et al., 2018). These significant results underline the importance of obsessive and compulsive traits in misophonia. However, it is not well established that this is still the case for psychiatric patients that can be valuable to investigate the associations between these conditions. Another important facet of misophonia could be aggressive traits. However, trait aggression is not investigated and most of the studies were focused on state anger to misophonic triggers (Wu, Lewin, Murphy, & Storch, 2014; Zhou, Wu, & Storch, 2017).

Anxiety is an expected response due to trigger sounds associated with misophonia Dozier & Morrison, 2017). However, little is known about the relations between trait anxiety and misophonia. In a recent study, baseline anxiety (pre-stimulus anxiety level) was found to be directly related to emotional responses towards trigger sounds associated with misophonia (Daniels et al., 2020). Anxiety was also shown to be an important mediator for aggressive reactions towards misophonic sounds (Wu et al., 2014). Anger reactions towards others were also found to be associated with misophonia (McKay et al., 2018). But it is not clear that anger reactions are a state or a trait feature in misophonia. So, both trait anxiety and aggression could be important features associated with strong aversive emotions and associated behaviors due to misophonic trigger sounds in psychiatric patients.

Somatosensory amplification is another trait feature that could be associated with misophonia (Barsky, Goodson, Lane, & Cleary, 1988; Venugopal, Mohan, & Chaturvedi, 2006). Somatosensory amplification is defined as a general disposition to experience ordinary bodily sensations as uncomfortable and disturbing. Besides, sensations that are mildly noxious or disturbing might be experienced as very painful and catastrophic via the somatosensory amplification process. Somatosensory amplification is a neurobiologically valid and widely accepted feature in the pathophysiology of somatic symptom and related disorders (Nakao & Barsky, 2007; Çolak et al., 2021). Somatosensory amplification could interfere with normal sensory processing probably with associated affective and cognitive outcomes (Köteles & Witthöft, 2017). Indeed, sensory processing is defined as sequential neural processing for organizing visceral and autonomic sensations from ones' own body and the external world (Williams, Tinley, & Curtin, 2010), and deficits of sensory processing were suggested as a candidate mediator in the pathophysiology of misophonia (Schröder et al., 2013). Moreover, in a recent study, misophonia was found to be associated with physical concerns which are defined as sensitivity towards interoceptive sensations as a part of anxiety sensitivity (McKay et al., 2018). Therefore, somatosensory amplification would be suggested as a potential trait feature in association with misophonic symptoms.

Evidence suggests that misophonic symptoms, although they fluctuate slightly over time, emerge in adolescence and tend to have a chronic course; this, in turn, could be viewed as evidence that certain psychological traits could be features of misophonia (Rouw & Erfanian, 2018; Siepsiak & Dragan, 2019). However, the association of misophonic symptoms with other psychological traits has still not been investigated. As mentioned above, misophonia could potentially be related to personality (especially with neurotic traits), anxiety proneness, obsessiveness, and aggressive tendencies. Furthermore, somatosensory amplification could be an important candidate for the sensory processing deficits in misophonia. A coherent picture of the relations between associated psychological traits and misophonia can give valuable insights into the underlying causes of this intractable condition. Additionally, results are far from to be conclusive due to the lack of studies from clinical populations. Trait phenotypes associated with psychiatric disorders can be valuable in this respect.

In this study, we aimed to investigate the associations of specific psychological trait variables with misophonic symptoms in psychiatric outpatients. We hypothesized that misophonic symptoms could be positively associated with neuroticism, trait anxiety, obsessiveness, anger, and somatosensory amplification in psychiatric outpatients and predicted by them.

## 2. Methods

### 2.1. Participants

Our study was carried out in the outpatient psychiatry clinic at University Hospital in Turkey in September 2019. The aim was to enroll enough number of consecutive outpatients who fulfill the inclusion criteria according to the calculated sample size. Patients with a minimum of five years of education (primary education level in the country) were asked to participate in the study. Patients diagnosed with psychotic disorders, bipolar disorder, intellectual disability, cognitive disorders, and alcohol/drug-related disorders and marked to severely symptomatic patients were also excluded (mildly symptomatic patients were included).

### 2.2. Procedure

Patients received information about the study and invited to participate. Written and verbal informed consents were obtained from patients who agreed to participate to the study. Diagnostic assessments were conducted according to the established routines in the outpatient clinic and assessments for inclusion and exclusion to the study were done by experienced psychiatrists. Patients who were eligible filled the measures of the study in a single session on the day of their routine psychiatric assessments and treatments. The study has been approved by the local ethics committee.

### 2.3. Measures

#### 2.3.1. Sociodemographic data collection

Information about the age, gender, marital, educational, and occupational status of the participants was obtained.

#### 2.3.2. Misophonic Symptoms Questionnaire (MSQ)

Misophonic Symptoms Questionnaire (MSQ) is a 4-point Likert type scale developed by (Öz & Kılıç, 2017). The checklist assesses both types and severity of misophonic symptoms and includes 50 different sounds. The total score will be between 0 and 150; with higher scores indicating more severe misophonic symptoms. Psychometric assessments of the MSC has shown that the scale is both valid and reliable in assessing misophonic symptoms.

#### 2.3.3. Eysenck personality questionnaire revised-short form (EPQRS)

The Eysenck Personality Questionnaire Revised-Short Form (EPQR-S) is a self-report screening tool designed to assess three dimensions of personality; extraversion, neuroticism, and psychoticism. The instrument consists of 6 yes/no questions for each personality dimension with 6 additional questions belonging to the lying subscale for testing social desirability bias. The questionnaire was developed by Eysenck and Eysenck (1975) and was revised by Francis, Brown, and Philipchalk (1992). The validity and reliability study of the Turkish version of EPQRS was done by Karanci (Eysenck & Eysenck, 1975; Francis et al., 1992; Karancı, Dirik, & Yorulmaz, 2007).

#### 2.3.4. Maudsley Obsessive-Compulsive Inventory (MOCI)

Maudsley Obsessive-Compulsive Inventory (MOCI) was developed by Hodgson and Rachman and is designed to measure subsets of obsessive-compulsive symptoms (Hodgson & Rachman, 1977). MOCI comprises 30 yes/no items grouped into four subscales and higher scores indicate more serious obsessive-compulsive traits. The Turkish version of the inventory has been shown to have adequate validity and reliability in a study conducted by Erol and Savasir (Erol & Savasir, 1989). In the Turkish form, seven items from the Minnesota Multiphasic Personality Inventory (MMPI) was added.

#### 2.3.5. State-Trait Anxiety Inventory (STAI)

State-Trait Anxiety Inventory (STAI) was developed by Spielberger and Gorsuch and aims to measure both state and trait anxiety levels of individuals (Gaudry, Vagg, & Spielberger, 1975). The Turkish version has adequate psychometric properties shown in a study by Oner (Öner, 1997). The instrument comprises 40 items grouping into two distinct categories: state and trait. The trait anxiety part of STAI was used in this research which comprises a total of 20 questions. Higher scores indicate higher trait anxiety.

#### 2.3.6. Buss-Perry Aggression Questionnaire (BPAQ)

Buss-Perry Aggression Questionnaire (BPAQ) was developed by Buss and Perry and revised by them in 1992 (Buss & Perry, 1992). It measures 4 dimensions of personality: physical and verbal aggression, rage, and hostility. The instrument comprises 29 5-point Likert-type items. Higher scores indicate higher levels of aggression. The Turkish version of BPAQ had high internal consistency (Chronbach's alpha .85) and stability (reliability coefficients 0.97) (Demirtas-Madran, 2012).

#### 2.3.7. Somatosensory Amplification Scale (SASS)

Somatosensory Amplification Scale (SASS) was developed to assess the amplification of various somatic and visceral sensations that are not the symptoms of serious diseases. It measures various domains from bodily and visceral sensations such as auditory, visual, noxious, or visceral sensory modalities. It was created by Barsky and translated to Turkish by Güleç & Sayar (Barsky, Wyshak, & Klerman, 1990; Güleç & Sayar, 2007) with high internal consistency (Chronbach's alpha .78) and test-retest reliability (0.73). The instrument comprises 10 5-point Likert type items. The score ranges from 10 to 50 points. Individuals with higher scores are more prone to perceive somatic sensations as more intense and disturbing.

### 2.4. Statistical analyses

Descriptive variables were given by mean SD, n (%) or median (range), appropriately. T-tests were conducted for MSQ scores in demographic groups. Pearson or Spearman correlation was performed to investigate the association between misophonic symptoms and MOCI, EPQRS, BPAQ, STAI, SASS according to the normality assumptions, appropriately. Mann-Whitney U and independent samples t-tests were conducted for group comparisons in terms of MSQ scores and admission status (first admission or one than more admission) and medication status (use or no-use), respectively. Multiple linear regression analyses were performed to explore independent associations between each risk variable as a predictor of MSQ using the 'enter method'. All the predictors in a block were entered in a single step. MOCI, EPQRS-neuroticism, BPAQ, STAI, and SASS were included as independent variables in the model. Multicollinearity analyses were conducted for testing possible correlations between these variables. Total sample size of $n = 138$ was calculated by g-power program (effect size $f^2 = 0.15$, $\alpha$ err prob $= 0.05$, power $= 0.95$ with 5 predictors). Data of patients with missing values were excluded from further analyses (n: 23). All statistical analyses were performed using the Statistical Package for Social Science (SPSS, version 23.0 for Windows). A p-value of $<.05$ was considered to be statistically significant.

## 3. Results

A total of 163 patients enrolled in the study and data from 140 patients were included in the final analyses. MSQ scores were not significantly different according to socio-demographic variables as gender ($t = -0.622$; $p = .535$), educational ($F = 1.735$; $p = .180$), marital ($t = -0.091$; $p = .928$) and occupational ($t = 0.516$; $p = .626$) status.

Overall, 120 patients (85.7%) were under follow-up and 20 patients (14.3%) were during first admission. There was no difference between these groups in terms of MSQ scores ($Z = -0.569$, $p = .570$). Diagnosis of

the patients were as follows: depression (n: 29; 20.7%), generalized anxiety disorder (n:17; 12.1%), generalized anxiety disorder-not otherwise specified (n: 13; 9.3%), adjustment disorder (n: 18; 12.9%), obsessive-compulsive disorder (n: 5; 3.6%), attention deficit and hyperactivity disorder (n: 9; 6.4%), insomnia disorder (n: 7; 5.0%), panic disorder (n: 7; 5.0%), social anxiety disorder (n: 4; 2.9%), functional neurological symptom disorder (n: 4; 2.9%), trauma related disorders (n: 3; 2.1%), eating disorder (n: 2; 1.4%), sexual dysfunction (n: 2; 1.4%), tic disorder (n: 2; 1.4%), gender dysphoria (n: 2; 1.4%).

Of these, 109 (77.9%) patients were using psychotropic medications. From these, 75 (53.6%) patients were on monotherapy, and 34 (24.3%) patients were on combination therapy in terms of psychotropic medication. Only a small number of patients (n: 11; 7.8%) were on psychotherapy and last, 20 (14.3%) patients were on their first admission as mentioned above. There were no significant difference between patients who were on medication or not in terms of MSQ scores ($t = 0.791$; $p = .430$). Medication status were as follows: Selective serotonin reuptake inhibitors (SSRIs) (n: 55; 39.3%), selective serotonin noradrenaline reuptake inhibitors (SNRIs) (n: 8; 5.7%), SSRIs + antipsychotics (AP) (n: 19; 13.6%), SNRIs + AP (n: 5; 3.6%), SSRIs + atypical or tricyclic (TCA) antidepressants (n: 7; 5.0%), TCA (n: 3; 2.1%), psychostimulants (n: 7; 5.0%), SSRIs + psychostimulants (n: 3; 2.1%), atypical antidepressants (n:2; 1,4%). Sociodemographic, clinical and psychological variables of the sample are given in Table 1.

There were significant weak correlations between MSQ and EPQRS-neuroticism ($rho = 0.179$; $p = .039$); mild correlations between MSQ and BPAQ ($r = 0.310$; $p < .001$), STAI ($r = 0.362$; $p < .001$) and moderate correlations between MSQ and MOCI ($r = 0.431$; $p < .001$), SASS ($r = 0.546$; $p < .001$). Other character traits, extraversion ($rho = -0.107$; $p = .221$) and psychoticism ($rho = 0.050$; $p = .566$), were not related with MSQ scores. Age was not related with MSQ ($r = 0.131$; $p = .125$). Age was inversely correlated with BPAQ ($r = -0.215$; $p = .013$) but not with MOCI ($r = 0.104$; $p = .225$), EPQRS-neuroticism ($rho = -0.113$; $p = .198$), STAI($r = 0.028$; $p = .748$) and SASS ($r = 0.129$; $p = .137$). Correlations of MOCI, EPQRS, BPAQ, STAI and SASS between MSQ were given in Table 2.

Analysis conducted to see if the data met the assumption of collinearity indicated that multicollinearity was not a concern (BPAQ, Tolerance = 0.77, VIF = 1.28; SASS, Tolerance = 0.72, VIF = 1.372; STAI, Tolerance = 0.44, VIF = 2.24; MOCI, Tolerance = 0.43, VIF = 2.32; EPQRS-neuroticism, Tolerance = 0.60, VIF = 1.64). In the multiple regression analyses, these variables significantly predicted MSQ scores and explained 32.5% of the variance ($R^2 = 0.352$, $F(5,119) = 12.953$, $p < .001$). The analysis shows that STAI (Beta = 0.04, $t(124) = 0.32$, $p = .747$), BPAQ (Beta = 0.15, $t(124) = 1.74$, $p = .083$), EPQRS-neuroticism (Beta = −0.13, $t(124) = -1.40$, $p = .162$) did not significantly predict MSQ scores, however only SASS (Beta = 0.39, $t(124) = 4.52$, $p < .001$) and MOCI (Beta = 0.25, $t(124) = 2.25$, $p = .026$) scores were the significant predictors in the full model (see Table 3).

**Table 1**
Sociodemographic and psychological variables.

| | Sample Characteristics | MSQ scores | p-value |
|---|---|---|---|
| **Age** | 34.14 ± 13.2 | n/a | n/a |
| **Gender** | | | |
| **Female** | (n: 103), 73.6% | 49.44 ± 31.7 | |
| **Male** | (n: 37), 26.4% | 45.91 ± 22.5 | ,535 |
| **Education** | | | |
| **Elementary** | (n: 44), 31.4% | 50.18 ± 31.4 | |
| **High** | (n: 48), 34.3% | 53.15 ± 30.5 | |
| **University** | (n: 48), 34.3% | 42.33 ± 26.0 | ,180 |
| **Marital Status** | | | |
| **Married** | (n: 64), 45.7% | 47.89 ± 28.4 | |
| **Single** | (n: 75), 53.3% | 48.34 ± 30.1 | ,928 |
| **Occupational Status** | | | |
| **Employed** | (n: 38), 27.1% | 50.63 ± 27.0 | |
| **Unemployed** | (n: 102), 72.9% | 47.72 ± 30.4 | ,606 |
| **Psychotropic use** | | | |
| **Yes** | (n: 109), 77.9% | 49.56 ± 29.1 | |
| **No** | (n: 31), 22.1% | 44.80 ± 31.2 | ,430 |
| **Admission** | | | |
| **First Admission** | (n: 20), 14.3% | 42,40 ± 19,37 | |
| **Follow-up** | (n: 120), 85.7% | 49,53 ± 30,84 | ,570 |
| **EPQRS** | | | |
| **Neuroticism** | 5 (0–6) | | |
| **Extraversion** | 4 (0–6) | | |
| **Psychoticism** | 1 (0–6) | | |
| **Lying** | 5 (0–6) | n/a | n/a |
| **MOCI** | 15.3 ± 8.1 | n/a | n/a |
| **STAI** | 49.31 ± 8.8 | n/a | n/a |
| **BPAQ** | 80.37 ± 21.4 | n/a | n/a |
| **SASS** | 28.66 ± 9.23 | n/a | n/a |
| **MSQ** | 48.51 ± 29.5 | n/a | n/a |

*Mean ± SD; median (min-max), rate (%) are given as appropriately.
**MOCI: Maudsley Obsessive Compulsive Inventory, EPQRS: Eysenck Personality Questionnaire Revised Short Form Subscales, STAI: State-Trait Anxiety Inventory-Trait Scale, BPAQ: Buss-Perry Aggression Questionnaire, SASS: Somatosensory Amplification Scale, MSQ: Misophonic Symptoms Questionnaire, n/a: not applicable, $p < .05$.

## 4. Discussion

In this study, we investigated the association of trait psychological variables with misophonic symptoms and significant correlations were found between misophonic symptoms and various psychological trait variables such as obsessive-compulsive symptoms, neuroticism, trait anxiety, somatosensory amplification, and aggression in non-psychotic psychiatric outpatients. No significant correlations were found between misophonic symptoms and the other personality dimensions namely extraversion and psychoticism. Sociodemographic and clinical variables were not associated with MSQ scores. Multiple regression analyses showed that a full model consisting of scores of EPQRS-neuroticism, BPAQ, STAI, SASS, and MOCS significantly predicted the misophonic symptoms. However, MOCS and SASS remained to be significant in the full model even after adjustment. This is the key finding of our study which requires further consideration.

### 4.1. Neuroticism and misophonia

Neuroticism, not psychoticism or extraversion, correlated significantly with misophonia symptoms. Previous studies indicate personality could be an important mediator on noise sensitivity (Stansfeld, Clark, Jenkins, & Tarnopolsky, 1985; Stansfeld, 1992). Also, neuroticism was shown to be positively related to noise sensitivity where extraversion was inversely related (Dornic & Ekehammar, 1990). However, this was not replicated in another study (Shepherd et al., 2015). To our knowledge, the only study on the association between neuroticism and misophonia was conducted by Daniels et al. (2020). The primary measure of the study was not assessing personality but neuroticism was used as a covariate. In that study, neuroticism was found to be related both to sound sensitivity and emotional behaviours towards misophonia trigger sounds. Therefore, our results were in line with the findings of the aforementioned study. As a general risk factor towards psychiatric disorders, neuroticism could be accepted as an important psychological trait towards misophonia; however, it did not remain as a significant predictor in the full regression model. So, to our opinion, this finding indicates that misophonia is a stable and distinct entity irrespective of personality. To our knowledge, ours was the first study that reports an association between misophonia symptoms and neuroticism in a clinical group. This finding needs to be replicated in further studies both for clinical and non-clinical samples.

### 4.2. Trait aggression and misophonia

Trait aggression evaluated by BPAQ correlated significantly with misophonia symptoms; however, it did not remain a significant

**Table 2**
Correlations of variables with MSQ.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| **1.MSQ** | | | | | | | | |
| **2.BPAQ** | ***.310***[b] | | | | | | | |
| **3.SASS** | ***.546***[b] | ***.323***[b] | | | | | | |
| **4.STAI** | ***.362***[b] | ***.312***[b] | ***.429***[b] | | | | | |
| **5.MOCI** | ***.431***[b] | ***.310***[a] | ***.483***[b] | ***.695***[b] | | | | |
| **6. EPQRS-Neuroticism** | ***.179***[a] | ***.422***[b] | ***.324***[b] | ***.502***[b] | ***.483***[b] | | | |
| **7. EPQRS-Extraversion** | *-.107* | *-.036* | *-.086* | ***-.321***[b] | ***-.267***[b] | ***-.193***[b] | | |
| **8. EPQRS-Psychoticism** | *.050* | ***.271***[b] | *-.106* | *-.093* | *-.100* | *.003* | *.117* | |
| **9. EPQRS-Lying** | *-.064* | ***-.346***[b] | *-.056* | *-.068* | *.026* | *-.078* | ***-.185***[a] | ***-.365***[b] |

Spearman or Pearson correlation analyses were used appropriately.
[a] 05 level (2-tailed).
[b] 01 level (2-tailed).

**Table-3**
Multiple regression analyses for MSQ.

| | B | SE | Beta | p-value |
|---|---|---|---|---|
| **Neuroticism** | −2.31 | 1.65 | −0.13 | .162 |
| **BPAQ** | 0.2 | 0.11 | 0.15 | .083 |
| **STAI** | 0.12 | 0.36 | 0.04 | .747 |
| **SASS** | **1.24** | **0.27** | **0.39** | **< .001** |
| **MOCS** | **0.92** | **0.41** | **0.25** | **.026** |
| **Constant** | −13.26 | 14.9 | | .375 |

*$R^2 = 0.352$, $F(5,119) = 12.953$, $p < .001$.

predictor in the full regression model. Wu et al. (2014) have previously reported a significant association between anger outbursts and misophonia. In this study, also anxiety was a mediator for anger reactions towards misophonia. Similar results were also shown in another study (Zhou et al., 2017). In these studies, the 'Rage Outbursts and Anger Rating Scale' were used to assess symptoms in the previous weeks unlike our assessment with BPAQ which reflects trait aggression. Aggressiveness was not also a robust feature in another study although mild correlations towards misophonia were observed (McKay et al., 2018). Therefore, our results are in line with this finding that trait aggression is not a robust predictor of misophonia. It can be concluded that there are other possible mediators towards anger that could explain the mechanism of misophonia. To the best of our knowledge, this was the first study that assessed the relation between trait aggression and misophonia. Future studies should be conducted to explore the role of trait aggression either as an exogenous or endogenous risk factor for misophonia related behaviours.

### 4.3. Obsessive-compulsive symptoms and misophonia

We also found a significant association between misophonic and obsessive-compulsive symptoms, as measured by MOCI and it remained as one of the significant predictors in the full regression model. This finding is in line with previous researches that obsessiveness is an important feature of the cognitive model of misophonia (Cusack et al., 2018; McGuire et al., 2015; Siepsiak & Dragan, 2019). Although different scales such as 'Obsessive-compulsive inventory revised' and MOCI were used in different populations (e.g. clinical, population-based); it seems to be a robust finding that misophonia has relations to obsessive-compulsive traits in the clinical group.

### 4.4. Trait anxiety and misophonia

Previous studies have reported an association between higher levels of anxiety and misophonia symptoms (Quek et al., 2018; Wu et al., 2014), prompting a discussion of misophonia symptoms as a possible consequence of anxiety. However, these studies have used a time scale which only assessed anxiety levels during the previous weeks. We found a significant correlation between misophonia symptoms and trait anxiety which is defined as an inclination to react anxiously towards general distress. In a recent study conducted by Daniels et al. (2020), trait anxiety was found to be not correlated with misophonic symptom severity; probably due to methodological issues such as sampling and psychometric measures.

On the other hand, the association between anxiety and misophonia is complicated which needs further elaboration. In our study, trait anxiety was mildly correlated with misophonia severity. However, it was not found to be a significant predictor in the full regression model. Therefore, different dimensions of anxiety should be taken into account (Mcwilliams & Brian, 2001). For instance, anxiety sensitivity was suggested as an associated feature of misophonia severity (Cusack et al., 2018). Anxiety sensitivity in misophonia could be defined as a fear of fear towards arousal related experiences, as unpleasant sounds in misophonia, which in turn leads to aggressive reactions for coping with the disturbing sensations (Wu et al., 2014). Although we did not have any measures to evaluate anxiety sensitivity, it may have some substantial effect on misophonia severity (as discussed later). Nonetheless, we showed the first evidence that misophonic sensitivity has a significant positive correlation with trait anxiety in psychiatric outpatients. Future studies should focus on the association between different dimensions of anxiety and misophonia.

### 4.5. Somatosensory amplification and misophonia

We found that the severity of somatosensory amplification was significantly associated with misophonic symptoms even in the fully adjusted statistical models. McKay et al. (2018) showed that physical concerns as sensitivity towards interoceptive sensations discriminated individuals with misophonia from non-misophonics (McKay et al., 2018). In that study, Anxiety Sensitivity Index–3 was used to assess the three dimensions (cognitive, social, and physical) of anxiety. Furthermore, Bodily Perception Scale scores which was also another measure for bodily sensations and interoceptive signals was found to have significant correlations with misophonic symptoms in that study. In a previous study, dispositional interoceptive focus, as indicated by body awareness, was shown to be an important facet of somatosensory amplification (Köteles & Doering, 2016). All these results could indicate a salient overlap between somatosensory amplification and anxiety sensitivity.

According to Perez, Barsky, Vago, Baslet, and Silbersweig (2015), interactions between enhanced cortical or subcortical sensory processing, cognitive evaluation, and affective modification of visceral or peripheral stimuli lead to the way to somatosensory amplification. Attentional bias, negative anticipation, catastrophizing, negative mood which also constitute the core features of misophonia are all proposed to be related to somatosensory amplification (Edelstein et al., 2013; Potgieter et al., 2019; Schröder et al., 2013). Indeed, evidence from neuroscientific research could contribute to our findings. For instance, in a recent fMRI study, anterior insula which has a pivotal role in the

perception of interoceptive signals as a part of the salience network; ventromedial prefrontal cortex (vmPFC), hippocampus, and amygdala which are associated with the cognitive and emotional aspects of somatic conditions were found to be associated with misophonia (Kumar et al., 2017). These brain regions are also associated with the neural network of somatosensory amplification (Boeckle, Schrimpf, Liegl, & Pieh, 2016; Bourke, Langford, & White, 2015; Perez et al., 2015). This overlap can be an important missing link in the pathophysiology of misophonia as a candidate feature in this respect. For example, trait anxiety was shown to be related to enhanced functional connectivity between insula and periaqueductal gray matter that leads to increased pain perception via its effect on thalamo-cortical sensory gating (Perez et al., 2015). Somatosensory amplification with its cognitive amplifiers and affective modifiers which interfere with enhanced auditory processing could be the basis of anxiety sensitivity in this regard. To our knowledge, ours is the first study that indicates a possible link between somatosensory amplification and misophonia and this should be investigated in further studies.

### 4.6. Limitations

Although there is a growing interest in misophonia, the basis of its mechanism is still in nascent stages. Research on underlying intermediate phenotypes is valuable in this respect. We have investigated prominent psychological traits associated with misophonia in a psychiatric outpatient sample, however with some limitations. First, the generalizability of our findings to all psychiatric patients is limited since the study sample consisted of outpatients in a single university hospital psychiatry department, and due to the exclusion of psychotic or other severe psychiatric disorders. Second, some of our findings might be due to the number of analyses being carried out and represent type I statistical error. So, this limitation should be bear in mind when interpreting our results. Third, even though we are reporting preliminary evidence for trait features for misophonia; state assessments still need to be considered in understanding misophonia. For instance; depressed mood could interfere with self-reported psychological variables. For minimizing the impact of state variables, we only enrolled patients who were mildly symptomatic and we have excluded severe psychiatric disorders. Although diagnoses such as obsessive-compulsive disorder or anxiety disorders could have a stronger inclination towards misophonia; due to the heterogeneity of the psychiatric diagnoses in our sample, it sounds methodologically not feasible to control diverse psychiatric symptoms. Fourth, self-report nature of the scales might interfere with the outcomes. Finally, the cross-sectional methodology in our study does not allow us to draw conclusions about causality.

### 4.7. Conclusion and future directions

Ours is the first study reporting associations between trait psychological features and misophonic symptoms in a sample consisted of psychiatric outpatients. In line with previous reports in non-clinical population we have demonstrated that obsessive and compulsive traits are also significant in the clinical population. Finally, we have found some evidence regarding somatosensory amplification which has some overlaps with anxiety sensitivity as a possible explanation for the etiology. These findings might contribute to the understanding of misophonia as a phenomenological/clinical entity. Future studies are warranted to investigate the roles of these constructs, especially relations between somatosensory amplification, obsessive-compulsive traits, anxiety sensitivity as well as different aspects of misophonia.

## Role of funding sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Contributors

Burçin Çolak: Conceptualization; Formal analysis; Methodology; Project administration; Resources; Roles/Writing - original draft; Writing - review & editing

Berker Duman: Conceptualization; Formal analysis; Investigation; Methodology; Project administration; Supervision; Validation; Roles/Writing - original draft; Writing - review & editing

Oğuzhan Herdi: Data curation; Formal analysis; Investigation; Methodology; Project administration; Software; Roles/Writing - original draft; Writing - review & editing. Authorship

Rifat Serav İlhan: Conceptualization; Formal analysis; Investigation; Methodology; Project administration; Supervision; Roles/Writing - original draft; Writing - review & editing. Authorship

Direnç Sakarya: Conceptualization; Supervision; Roles/Writing - original draft; Writing - review & editing. Authorship

## Conflicts of interest

There is no conflict of interest for this paper.

## Declaration of competing interest

All authors declare that they have no conflicts of interest.

## Acknowledgments

The authors would like to thank Jarita Rutkowski and Anna Bowles for their help in editing the manuscript, and to Safiye Zeynep Tatlı for her contrubition.

## References

Barsky, A. J., Goodson, J. D., Lane, R. S., & Cleary, P. D. (1988). The amplification of somatic symptoms. *Psychosomatic Medicine, 50*(5), 510–519. https://doi.org/10.1097/00006842-198809000-00007

Barsky, A. J., Wyshak, G., & Klerman, G. L. (1990). The somatosensory amplification scale and its relationship to hypochondriasis. *Journal of Psychiatric Research, 24*, 323–334. https://doi.org/10.1016/0022-3956(90)90004-A

Boeckle, M., Schrimpf, M., Liegl, G., & Pieh, C. (2016). Neural correlates of somatoform disorders from a meta-analytic perspective on neuroimaging studies. *NeuroImage: Clinical, 11*, 606–613. https://doi.org/10.1016/j.nicl.2016.04.001

Bourke, J. H., Langford, R. M., & White, P. D. (2015). The common link between functional somatic syndromes may be central sensitisation. *Journal of Psychosomatic Research, 78*, 228–236. https://doi.org/10.1016/j.jpsychores.2015.01.003

Brout, J. J., Edelstein, M., Erfanian, M., Mannino, M., Miller, L. J., Rouw, R., et al. (2018). Investigating misophonia: A review of the empirical literature, clinical implications, and a research agenda. *Frontiers in Neuroscience, 12*, 36. https://doi.org/10.3389/fnins.2018.00036

Buss, A. H., & Perry, M. (1992). The aggression questionnaire. *Journal of Personality and Social Psychology, 63*(3), 452–459. https://doi.org/10.1037/0022-3514.63.3.452

Calati, R., Giegling, I., Rujescu, D., Hartmann, A. M., Muller, H. J., Ronchi, D., et al. (2008). Temperament and character of suicide attempters. *Journal of Psychiatric Research, 42*(11), 938–945. https://doi.org/10.1016/j.jpsychires.2007.10.006

Cavanna, A. E. (2014). What is misophonia and how can we treat it? *Journal of Expert Review of Neurotherapeutics, 14*, 357–359. https://doi.org/10.1586/14737175.2014.892418

Cavanna, A. E., & Seri, S. (2015). Misophonia: Current perspectives. *Neuropsychiatric Disease and Treatment, 11*, 2117–2123. https://doi.org/10.2147/NDT.S81438

Celikel, F. C., Kose, S., Cumurcu, B. E., Erkorkmaz, U., Sayar, K., Borckardt, J. J., et al. (2009). Cloninger's temperament and character dimensions of personality in patients with major depressive disorder. *Comprehensive Psychiatry, 50*(6), 556–561. https://doi.org/10.1016/j.comppsych.2008.11.012

Çolak, B., Eken, A., Kuşman, A., Sayar Akaslan, D., Kızılpınar, S.Ç., Çakmak, I. B., et al. (2021). The relationship of cortical activity induced by pain stimulation with clinical and cognitive features of somatic symptom disorder: A controlled functional near infrared spectroscopy study. *Journal of Psychosomatic Research, 140*, 110300. https://doi.org/10.1016/j.jpsychores.2020.110300

Cusack, S. E., Cash, T. V., & Vrana, S. R. (2018). An examination of the relationship between misophonia, anxiety sensitivity, and obsessive-compulsive symptoms. *Journal of Obsessive-Compulsive and Related Disorders, 18*(April), 67–72. https://doi.org/10.1016/j.jocrd.2018.06.004

Daniels, E. C., Rodriguez, A., & Zabelina, D. L. (2020). Severity of misophonia symptoms is associated with worse cognitive control when exposed to misophonia trigger sounds. *PloS One, 15*(1), 1–12. https://doi.org/10.1371/journal.pone.0227118

Demirtaş Madran, H. A. (2012). Buss-perry saldırganlık ölçeği'nin türkçe formunun geçerlik ve güvenirlik çalışması. *Türk Psikiyatri Dergisi, 23*(2), 1–6. https://doi.org/10.5080/u6859

Dornic, S., & Ekehammar, B. (1990). Extraversion, neuroticism, and noise sensitivity. *Personality and Individual Differences, 11*(9), 989–992. https://doi.org/10.1016/0191-8869 (90)90283-W

Dozier, T. H., & Morrison, K. L. (2017). Phenomenology of Misophonia: Initial physical and emotional responses. *American Journal of Psychology, 130*(4), 431–438. https://doi.org/10.5406/amerjpsyc.130.4.0431

Edelstein, M., Brang, D., Rouw, R., & Ramachandran, V. S. (2013). Misophonia: Physiological investigations and case descriptions. *Frontiers in Human Neuroscience, 7*, 296. https://doi.org/10.3389/fnhum.2013.00296

Erol, N., & Savasir, I. (1989). The Turkish version of the Maudsley obsessional compulsive questionnaire. In *Presented at the 2nd regional conference of the international association for cross-cultural psychology*. Amsterdam, the Netherlands.

Eysenck, H. J., & Eysenck, S. B. G. (1975). *Manual of the Eysenck personality questionnaire*. London: Hodder and Stoughton.

Ferreira, G. M., Harrison, B. J., & Fontenelle, L. F. (2013). Hatred of sounds: Misophonic disorder or just an underreported psychiatric symptom? *Annals of Clinical Psychiatry, 25*, 271–274.

Francis, L. J., Brown, L. B., & Philipchalk, R. (1992). The development of an abbreviated form of the revised Eysenck personality questionnaire (EPQR-A): Its use among students in England, Canada, the U.S.A. and Australia. *Personality and Individidual Differences, 13*(4), 443–449. https://doi.org/10.1016/0191-8869(92)90073-X

Gaudry, E., Vagg, P., & Spielberger, C. D. (1975). Validation of the State-Trait Distinction in Anxiety Research. *Multivariate Behaviour Research, 10*(3), 331–341. https://doi.org/10.1207/s15327906mbr1003_6

Güleç, H., & Sayar, K. (2007). Reliability and validity of the Turkish form of the Somatosensory Amplification Scale. *Psychiatry and Clinical Neurosciences, 61*, 25–30. https://doi.org/10.1111/j.1440-1819.2007.01606.x

Hazen, E. P., Reichert, E. L., Piacentini, J. C., Miguel, E. C., Do Rosario, M. C., Pauls, D., et al. (2008). Case series: Sensory intolerance as a primary symptom of pediatric OCD. *Annals of Clinical Psychiatry, 20*(4), 199–203. https://doi.org/10.1080/10401230802437365

Heath, A. C., & Martin, N. G. (1990). Psychoticism as a dimension of personality: A multivariate genetic test of Eysenck and Eysenck's psychoticism construct. *Journal of Personality and Social Psychology, 58*(1), 111–121. https://doi.org/10.1037/0022-3514.58.1.111

Hodgson, R. J., & Rachman, S. (1977). Obsessional-compulsive complaints. *Behavioral Research Therapy, 15*(5), 389–395. https://doi.org/10.1016/0005-7967(77)90042-0

Jastreboff, M. M., & Jastreboff, P. J. (2001). *Hyperacusis. Audiology on-line*, 6-18-2001.

Johnson, P. L., Webber, T. A., Wu, M. S., Lewin, A. B., Murphy, T. K., & Storch, E. A. (2013). When selective audiovisual stimuli become unbearable: A case series on pediatric misophonia. *Neuropsychiatry, 3*(6), 569–575. https://doi.org/10.2217/NPY.13.70

Joyce, P. R., Light, K. J., Rowe, S. L., Cloninger, C. R., & Kennedy, M. A. (2010). Self-Mutilation and Suicide Attempts: Relationships to Bipolar Disorder, Borderline Personality Disorder, Temperament and Character. *Australian and New Zealand Journal of Psychiatry, 44*(3), 250–257. https://doi.org/10.3109/00048670903487159

Karancı, N., Dirik, G., & Yorulmaz, O. (2007). Eysenck kişilik anketi-gözden geçirilmiş kısaltılmış formunun (EKA-GGK) Türkiye'de geçerlik ve güvenilirlik çalışması. *Türk Psikiyatri Dergisi, 18*(3), 1–8.

Kluckow, H., Telfer, J., & Abraham, S. (2014). Should we screen for misophonia in patients with eating disorders? A report of three cases. *International Journal of Eating Disorders, 47*(5), 558–561. https://doi.org/10.1002/eat.22245

Köteles, F., & Doering, B. K. (2016). The many faces of somatosensory amplification: The relative contribution of body awareness, symptom labeling, and anxiety. *Journal of Health Psychology, 21*(12), 2903–2911. https://doi.org/10.1177/1359105315588216

Köteles, F., & Witthöft, M. (2017). Somatosensory amplification – An old construct from a new perspective. *Journal of Psychosomatic Research, 101*(July), 1–9. https://doi.org/10.1016/j.jpsychores.2017.07.011

Kumar, S., Tansley-Hancock, O., Sedley, W., Winston, J. S., Callaghan, M. F., Allen, M., et al. (2017). The Brain Basis for Misophonia. *Current Biology, 27*, 527–533. https://doi.org/10.1016/j.cub.2016.12.048

Lahey, B. B. (2009). Public health significance of neuroticism. *American Psychologist, 64*(4), 241–256. https://doi.org/10.1037/a0015309

McGuire, J. F., Wu, M. S., & Storch, E. A. (2015). Cognitive-behavioral therapy for 2 youths with misophonia. *Journal of Clinical Psychiatry, 76*(5), 573–574. https://doi.org/10.4088/JCP.14cr09343

McKay, D., Kim, S. K., Mancusi, L., Storch, E. A., & Spankovich, C. (2018). Profile Analysis of Psychological Symptoms Associated With Misophonia: A Community Sample. *Behavior Therapy, 49*, 286–294. https://doi.org/10.1016/j.beth.2017.07.002

Mcwilliams, L., & Cox, B. (2001). How distinct is anxiety sensitivity from trait anxiety? A re-examination from a multidimensional perspective. *Personality and Individual Differences, 31*, 813–818. https://doi.org/10.1016/S0191-8869(00)00182-3

Nakao, M., & Barsky, A. J. (2007). Clinical application of somatosensory amplification in psychosomatic medicine. *BioPsychoSocial Medicine, 1*, 17. https://doi.org/10.1186/1751-0759-1-17

Öner, N. (1997). *Türkiye'de Kullanılan Psikolojik Testler (Bir Başvuru Kaynağı), 3. Basım*. Ankara: Boğaziçi Üniversitesi Yayınları.

Ormel, J., Jeronimus, B. F., Kotov, R., Riese, H., Bos, E. H., Hankin, B., et al. (2013). Neuroticism and common mental disorders: meaning and utility of a complex relationship. *Clinical Psychology Review, 33*(5), 686–697. https://doi.org/10.1016/j.cpr.2013.04.003

Öz, G., & Kılıç, C. (2017). Mizofoni: Psikiyatride Yeni Bir Bozukluk? Yaygınlığı, Sosyodemografik Özellikleri ve Ruhsal Belirtilerle İlişkisi. *Türk Psikiyatri Dergisi, 28*, 9.

Perez, D. L., Barsky, A. J., Vago, D. R., Baslet, G., & Silbersweig, D. A. (2015). A neural circuit framework for somatosensory amplification in somatoform disorders. *Journal of Neuropsychiatry and Clinical Neurosciences, 27*(1), e40–e50. https://doi.org/10.1176/appi.neuropsych.13070170

Potgieter, I., MacDonald, C., Partridge, L., Cima, R., Sheldrake, J., & Hoare, D. J. (2019). Misophonia: A scoping review of research. *Journal of Clinical Psychology, 75*, 1203–1218. https://doi.org/10.1002/jclp.22771

Quek, T., Ho, C., Choo, C., Nguyen, L., Tran, B., & Ho, R. (2018). Misophonia in Singaporean Psychiatric Patients: A Cross-Sectional Study. *International Journal of Environmental Research and Public Health, 15*, 1410. https://doi.org/10.3390/ijerph15071410

Rosenström, T., Gjerde, C., Krueger, R. F., Aggen, S. H., Czajkowski, N. O., Gillespie, N. A., et al. (2019). Joint factorial structure of psychopathology and personality. *Psychological Medicine, 49*, 2158–2167. https://doi.org/10.1017/S0033291718002982

Rouw, R., & Erfanian, M. (2018). A Large-Scale Study of Misophonia. *Journal of Clinical Psychology, 74*, 453–479. https://doi.org/10.1002/jclp.22500

Schröder, A., Vulink, N., & Denys, D. (2013). Misophonia: Diagnostic Criteria for a New Psychiatric Disorder. *PloS One, 8*, Article e54706. https://doi.org/10.1371/journal.pone.0054706

Shepherd, D., Heinonen-Guzejev, M., Hautus, M., & Heikkilä, K. (2015). Elucidating the relationship between noise sensitivity and personality. *Noise and Health, 17*(76), 165. https://doi.org/10.4103/1463-1741.155850

Siepsiak, M., & Dragan, W. (2019). Misophonia - A review of research results and theoretical concepts. *Psychiatria Polska, 53*(2), 447–458. https://doi.org/10.12740/PP/92023

Song, J. J., De Ridder, D., Weisz, N., Schlee, W., Van de Heyning, P., & Vanneste, S. (2014). Hyperacusis-associated pathological resting-state brain oscillations in the tinnitus brain: a hyperresponsiveness network with paradoxically inactive auditory cortex. *Brain Structure and Function, 219*, 1113–1128. https://doi.org/10.1007/s00429-013-0555-1

Stansfeld, S. A. (1992). Noise, noise sensitivity and psychiatric disorder: epidemiological and psychophysiological studies. *Psychological Medicine, Suppl, 22*, 1–44.

Stansfeld, S. A., Clark, C. R., Jenkins, L. M., & Tarnopolsky, A. (1985). Sensitivity to noise in a community sample: I. Measurement of psychiatric disorder and personality. *Psychological Medicine, 15*(2), 243–254. https://doi.org/10.1017/s0033291700023527

Svrakic, D. M., Draganic, S., Hill, K., Bayon, C., Przybeck, T. R., & Cloninger, C. R. (2002). Temperament, character, and personality disorders: etiologic, diagnostic, treatment issues. *Acta Psychiatrica Scandinavica, 106*(3), 189–195. https://doi.org/10.1034/j.1600-0447.2002.02196.x

Taylor, S. (2017). Misophonia: A new mental disorder? *Medical Hypotheses, 103*, 109–117. https://doi.org/10.1016/j.mehy.2017.05.003

Taylor, S., Conelea, C. A., McKay, D., Crowe, K. B., & Abramowitz, J. S. (2014). Sensory intolerance: latent structure and psychopathologic correlates. *Comprehensive Psychiatry, 55*, 1279–1284. https://doi.org/10.1016/j.comppsych.2014.03.007

Venugopal, D., Mohan, K. I., & Chaturvedi, S. K. (2006). Somatization, somatosensory amplification, attribution styles and illness behaviour: A review. *International Review of Psychiatry, 18*(1), 25–33. https://doi.org/10.1080/09540260500466790

Vidal, C., Vidal, L. M., & Lage, M. A. (2010). Misophonia: Case report. *European Psychiatry, Supplement, 41*, 644. https://doi.org/10.1016/j.eurpsy.2017.01.2259

Webber, T. A., Johnson, P. L., & Storch, E. A. (2014). Pediatric misophonia with comorbid obsessive–compulsive spectrum disorders. *General Hospital Psychiatry, 36*. https://doi.org/10.1016/j.genhosppsych.2013.10.018, 231.e1-231.e2.

Webber, T. A., & Storch, E. A. (2014). Toward a theoretical model of misophonia. *General Hospital Psychiatry, 37*(4), 369–370. https://doi.org/10.1016/j.genhosppsych.2015.03.019

Williams, C. M., Tinley, P., & Curtin, M. (2010). Idiopathic toe walking and sensory processing dysfunction. *Journal of Foot and Ankle Research, 3*(1), 16. https://doi.org/10.1186/1757-1146-3-16

Wu, M. S., Lewin, A. B., Murphy, T. K., & Storch, E. A. (2014). Misophonia: Incidence, phenomenology, and clinical correlates in an undergraduate student sample. *Journal of Clinical Psychology, 70*(10), 994–1007. https://doi.org/10.1002/jclp.22098

Zhou, X., Wu, M. S., & Storch, E. A. (2017). Misophonia symptoms among Chinese university students: Incidence, associated impairment, and clinical correlates. *Journal of Obsessive-Compulsive and Related Disorders, 14*, 7–12. https://doi.org/10.1016/j.jocrd.2017.05.001