Obsessive-Compulsive Symptoms and Sound Sensitivities:

Comparing Misophonia and Hyperacusis

(Manuscript Submitted for Publication – Please do not quote)

Ariana A. Castroa\*, Ragnar Richard Dean Lindbergb, Gibbeum Kimb, Callie Brennanb, Namitha Jainb, Rafay A. Khanc, Fatima Husainb, Howard Berenbauma

a Department of Psychology, University of Illinois at Urbana-Champaign, Urbana-Champaign, IL, USA

b Department of Speech and Hearing Science, University of Illinois at Urbana-Champaign, Urbana-Champaign, IL, USA

c The Neuroscience Program, University of Illinois at Urbana-Champaign, Urbana-Champaign, IL, USA

\*Corresponding Author: Ariana A. Castro

323-382-9429

arianac3@illinois.edu

**Abstract**

Several previous studies have found an association between misophonia and obsessive-compulsive (O-C) symptoms. The goal of the present research was to examine the relationship between O-C symptoms and two different types of sound sensitivities: misophonia and hyperacusis. We did so in a large on-line sample of university students (*N* = 1,094), a subset of whom completed in-person audiological and psychological assessments (*N* = 102). We utilized a multi-trait, multi-method approach, measuring misophonia, hyperacusis, and O-C symptoms using both questionnaires and either clinician ratings or laboratory assessment. For the sake of examining specificity, interview-based depression ratings were also examined. The associations were generally consistent regardless of how O-C symptoms, misophonia, and hyperacusis were measured – O-C symptoms were associated with both types of sound sensitivities. Thus, the results suggest that sensory sensitivities, rather than misophonia specifically, are associated with O-C symptoms. Depression symptoms were not significantly associated with hyperacusis and were less strongly associated with misophonia than were O-C symptoms, suggesting that the associations between O-C symptoms and sound sensitivities are not simply artifacts of shared variance with general psychological distress.

*Keywords:* obsessive compulsive disorder; depression, hearing; sensory sensitivity

**1. Introduction**

Misophonia, a disorder in which individuals have strongly unpleasant emotional and/or physical reactions to specific sounds, was initially described just over 20 years ago (Jastreboff & Jastreboff, 2001). Although not included in the DSM or ICD, at least some scholars consider misophonia to be a mental disorder (e.g., Schroder et al., 2013). Several studies have found that misophonia is associated with a variety of psychiatric disorders, (e.g., Erfanian et al., 2019; Rosenthal et al., 2022; Rouw & Erfanian, 2017; Schroder et at., 2013). Because both misophonia and OCD share a monothematic preoccupation with particular subjects (e.g., sound, contamination) and difficulty redirecting attention away from aversive stimuli, a number of studies have explored whether they are indeed associated.

Three studies reported rates of OCD among individuals with misophonia. In a sample of 42 individuals with misophonia, Schroder et al. (2013) reported that only one (2.4%) had OCD. A much higher rate of OCD (11.5%) was found in a different sample of 52 individuals with misophonia (Erfanian et al., 2019). In a large sample of people with misophonia (*N* = F575), Jager et al. (2020) found that 2.8% had OCD. Although the results of these studies suggest that rates of OCD may be slightly elevated among individuals with misophonia, there are three methodological issues that limit the conclusions that can be drawn. First, none of these studies had control groups. Second, these studies treated both misophonia and OCD as dichotomous categories, despite the lack of evidence that either condition is taxonic[[1]](#footnote-1) (i.e., qualitatively distinct conditions, as opposed to sets of symptoms that fall on a continuum of severity). In the present research, rather than treating the phenomena of interest (e.g., misophonia) categorically, we treated them dimensionally. Finally, participants were recruited from among treatment-seeking individuals (Erfanian et al., 2020), from individuals referred with misophonia symptoms from a psychiatry department (Jager et al., 2020), or from a hospital website (Schroder et al., 2013). Such recruitment strategies may result in samples of people who are not representative of people in the general population with elevated levels of misophonia symptoms.

Three independent studies (Cusack et al., 2018; Wu et al., 2014; Zhou et al., 2017), testing large unselected samples of non-patients (mean sample size of 575; two samples composed of college students and one sample combining college students and a large community sample), examined the relation between misophonia, measured by the Misophonia Questionnaire (MQ; Wu et al., 2014) and O-C symptoms, measured by the Obsessive Compulsive Inventory-Revised (OCI-R; Foa et al., 2002). All three studies found relatively strong positive correlations (ranging from .44 to .58) between misophonia and O-C symptoms. These studies have the advantage of having large samples that are not recruited on the basis of treatment-seeking or hospital-based recruitment of misophonia sufferers. Because of this recruitment approach, these samples are less likely to be systematically biased. In contrast, because they relied entirely on self-report questionnaires, the strength of the association between misophonia and O-C symptoms may have been inflated due to shared method variance.

Misophonia is not the only disorder characterized by sounds causing distress and impairment. Hyperacusis refers to individuals experiencing discomfort in response to a broad range of sounds that are acceptable to individuals with normal hearing (Khalfa et al., 2002); here, we focus specifically on ‘loudness’ hyperacusis (Tyler et al., 2014). As is the case with misophonia, individuals with hyperacusis have been found to have elevated levels of psychiatric symptoms. Paulin et al. (2016) found that individuals with hyperacusis were significantly more likely than controls to have depression, generalized anxiety disorder, and panic disorder. To our knowledge, only two studies have examined the relation between hyperacusis and obsessive-compulsive symptoms. Juris et al. (2016) found that 10% of individuals with hyperacusis had obsessive-compulsive disorder; although they did not have a control group, this is substantially higher than the population base rate, which has generally been found to be between 1% and 3% (Fontenelle et al., 2006). Only a single study compared individuals with elevated levels of hyperacusis with controls. Aazh and Moore (2017) examined the relation between hyperacusis and obsessive-compulsive symptoms (using the Hyperacusis Questionnaire (HQ; Khalfa et al., 2002) and OCI-R, respectively) in a sample of patients seeking help for tinnitus and/or hyperacusis. Among individuals with elevated HQ scores (≥ 26), 37% had elevated OCI-R scores (≥ 21), whereas among individuals without elevated HQ scores (<26), only 19% had elevated OCI-R scores. The effect size for this difference in proportions, measured using Cohen’s *h* (Cohen, 1992), is .42, which is much closer to medium than to small[[2]](#footnote-2).

The goal of the present research was to examine the relation between O-C symptoms and two different types of sound sensitivities: misophonia and hyperacusis. In doing so, we wished to determine whether O-C symptoms were associated specifically with misophonia or whether they were associated more broadly with sound sensitivities. We did so in a large on-line sample of university students, a subset of whom completed in-person audiological and psychological assessments. We utilized a multi-trait, multi-method approach (Campbell & Fiske, 1959), measuring misophonia, hyperacusis, and O-C symptoms using both questionnaires and either clinician ratings or laboratory assessment. To further explore specificity, we also examined whether misophonia and hyperacusis were also associated with depression symptoms. If it were the case that associations between O-C symptoms and misophonia and hyperacusis are merely reflections of their being associated with psychological distress, the correlations between depression and misophonia and hyperacusis would be expected to be even larger than the correlations between O-C symptoms and misophonia and hyperacusis.

**2. Methods**

2.1 Participants

Online Sample

An online survey (see below) was completed by 1,094 students at a large American university. All participants gave informed consent in accordance with our university Institutional Review Board. In terms of gender, 65.5% reported being female or primarily feminine, 31.9% reported being male or primarily masculine, 0.7% reported being male and female, 1.5% reported being neither male or female, and 0.4% reported not knowing. The sample ranged in age from 18 to 25 years (*M* = 20.5; *SD* = 2.0). The racial composition was as follows: 53.3% White, 29.3% Asian or Asian American, 3.8% African American, 0.6% American Indian/Alaska Native, 0.2% Native Hawaiian or other Pacific Islander, and 12.7% other or multiracial. In terms of ethnicity, 12.7% reported being Latinx. All participants individually consented to participate in the study and were compensated.

In-Person Sample

One-hundred and two students completed an in-person psychological interview and an audiological assessment (see details below). All participants gave informed consent in accordance with our university Institutional Review Board. In terms of gender, 67.6% reported being female or primarily feminine, 29.4% reported being male or primarily masculine, 2.0% reported being both male and female, and 1.0% reported being neither male or female. The sample ranged in age from 18 to 25 years (*M* = 20.5; *SD* = 2.0). The racial composition was as follows: 58.8% White, 22.5% Asian or Asian American, 2.9% African American, 2% American Indian/Alaska Native, 1% Native Hawaiian or other Pacific Islander, and 12.8% other or multiracial. Of the sample, 3.9% reported being Latinx. All participants individually consented to participate in the study and were compensated.

2.2 Instruments

Misophonia

Questionnaire

The Misophonia Questionnaire (MQ; Wu et al., 2014) is composed of three sections: (a) questions regarding sensitivity to different types of sounds (e.g., people eating); (b) questions regarding responses to sensitive sounds (e.g., becoming angry); and (c) a 15-point visual analog scale ranging from “minimal” to “very severe.”

Interview

We used the Amsterdam Misophonia Scale (A-MISO-S; Schroder et al., 2013), a semi-structured interview and clinical rating scale, to assess misophonia symptom severity. The A-MISO-S was constructed to resemble the Yale-Brown Obsessive-Compulsive Scale (Y-BOCS; Goodman et al., 1989) – it measures (using a 0 (absent) to 4 (extreme) rating scale) the following aspects of misophonia: (a) time occupied by misophonia; (b) interference with functioning; (c) distress; (d) control over responding to misophnic triggers; (e) avoidance; and (f) effort resisting. Because the resistance rating was very weakly associated with the remaining items, we computed a total A-MISO-S score by summing across the other five ratings.

As expected, the questionnaire and interview-based measures of misophonia were positively correlated, *r* = .71, *p* < .01.

Hyperacusis[[3]](#footnote-3)

Questionnaire

The Hyperacusis Questionnaire (HQ; Khalfa et al., 2002) includes 14 questions (each answered using a 0 (no) to 3 (yes, a lot) scale) that assess individuals’ responses to noise (e.g., “Do you ever use earplugs or earmuffs to reduce your noise perception”; “Are you particularly sensitive to or bothered by street noise”; “Do you ever turn down an invitation or not go out because of the noise you would have to face”).

Laboratory[[4]](#footnote-4).

Loudness Discomfort Levels (LDLs) are the lowest intensity levels at which an individual reports a sound being "uncomfortably loud." LDLs were measured in each ear using three different types of sound stimuli: (a) 500 Hz pure tone, (b) 4000 Hz pure tone, and (c) speech stimuli (spondee words). Each sound was initially presented at 40 dB SL of their average hearing thresholds. The presentation levels were increased by 5 dB, using the ascending method, until the point at which participants indicated that the sounds were uncomfortably loud. We calculated the average LDLs in dB HL across both ears across the three types of stimuli; for higher scores to be indicative of greater hyperacusis severity, this average was subtracted from a constant (120).

As expected, the questionnaire and laboratory-based measures of hyperacusis were positively correlated, *r* = .25, *p* < .05.

O-C Symptoms

Questionnaire

We measured O-C symptoms using the 18-item (each answered using a 0 (not at all) to 5 (extremely) scale) self-report Obsessive-Compulsive Inventory-Revised (Foa et al., 2002). The OC-R is composed of six subscales that capture the degree to which participants were bothered, during the last month, by different types of O-C symptoms (ordering, checking, neutralizing, hoarding, washing, and obsessing).

Interview

We used the Y-BOCS (Goodman et al., 1989) to assess O-C symptoms severity. The Y-BOCS is a 10-item semi-structured interview and clinical rating scale used to measure obsessions and compulsions. There are five items that capture obsessions severity and five items that capture compulsions severity.

As expected, the questionnaire and interview-based measures of O-C symptoms were positive correlated, *r* = .32, *p* < .01.

Depression Symptoms

We used the Mood Disorders module of the Structured Clinical Interview for *DSM-5* disorders (SCID-5; First et al., 2015) to assess depression symptom severity. Specifically, clinician ratings (using the SCID’s 3-point scale: 0 = absent; 1 = subthreshold; 2 = at or above threshold) of the nine symptoms used to evaluate current depressive episode (e.g., feeling depressed or down most of the day, nearly every day) were summed to obtain a total depression symptom score.

2.3 Procedure

First, 12,131 undergraduate and graduate students were sent an online survey measuring misophonia, hyperacusis, obsessive-compulsive symptoms, tinnitus, and hearing health/problems[[5]](#footnote-5). Ten thousand of these students were randomly sampled from among undergraduate students enrolled at the university; the remaining 2,131 students who were sent the survey were all the undergraduate and graduate students between the ages of 18-25 currently enrolled in the home college of several of the investigators of this study; they were invited to complete the survey to increase survey yield.

We invited a subset of the online sample to complete in-person psychological and audiological assessments. Participants were selected with the goal of interviewing approximately equal numbers of individuals reporting: (a) elevated levels of misophonia; and/or (b) elevated levels of hyperacusis; and (c) individuals not reporting elevated levels of misophonia or hyperacusis. A clinical psychology doctoral student administered the psychological interviews[[6]](#footnote-6) and made the clinical ratings. A doctoral student with a Master’s degree in Audiology conducted the audiological assessment.

**3. Results**

We began[[7]](#footnote-7) by testing whether: (a) we could replicate the previous finding that self-reported misophonia symptoms are positively associated with self-reported O-C symptoms; (b) self-reported misophonia symptoms are positively associated with interview-based O-C symptoms; and (c) interview-based misophonia symptoms would be positively associated with self-reported and interview-based O-C symptoms. As can be seen in Table 1, in both the online sample and the subset of participants who completed in-person assessments, consistent with past research, participants with higher self-reported misophonia scores tended to have higher self-reported O-C scores, with a large effect size. Similarly, participants with higher self-reported misophonia scores tended to have higher interview-based O-C scores, with the effect size being small to medium. Extending previous research, we also found that interview-based misophonia was positively associated with both self-reported and interview-based O-C symptoms, with a medium effect size.

We also examined whether self-reported and lab-assessed hyperacusis would be associated with self-reported and interview-based O-C symptoms. As can be seen in Table 1, in both the online sample and the subset of participants who completed in-person assessments, self-reported hyperacusis was positively associated with self-reported O-C symptoms, with a large effect size; in fact, self-reported O-C symptoms were as strongly correlated with self-reported hyperacusis as they were with self-reported misophonia. Similarly, self-reported hyperacusis was positively associated with interview-based O-C symptoms, with the effect size being small to medium. The correlations examining lab-assessed hyperacusis were similar, albeit somewhat weaker, to the correlations examining self-reported hyperacusis; it should be noted that the correlation between lab-assessed hyperacusis and interview-based O-C symptoms fell just short of statistical significance.

Finally, we examined the associations between depression symptoms and both misophonia and hyperacusis. As can be seen in Table 1, depression symptoms were less consistently and strongly associated with misophonia than were O-C symptoms; the difference was particularly large regarding questionnaire-based misophonia. Likewise, depression symptoms were notably less strongly associated with hyperacusis than were O-C symptoms.

**4. Discussion**

Consistent with past research (Cusack et al., 2018; Wu et al., 2014; Zhou et al., 2017), we found strong evidence that elevated levels of misophonia are associated with elevated levels of O-C symptoms. Because we employed a multi-trait, multi-method approach, the associations we observed cannot be attributed to shared method variance. Moreover, since we began sampling from a broad, unselected group of university students, the associations are unlikely to be exaggerated due to biased sampling (as might be the case had we sampled individuals receiving professional mental health treatment). Although our selection of individuals to participate in the in-person assessments was not random, it is worth noting that the correlation between questionnaire measures was almost identical in the online and in-person samples.

As was the case with misophonia, we found strong evidence that elevated levels of hyperacusis are associated with elevated levels of O-C symptoms. Only two previous studies have explored this possibility. Although the results of both studies suggested there may be a link between hyperacusis and O-C symptoms, one study did not have a control group (Juris et al., 2016) and the other study examined the link in a sample of patients seeking help for tinnitus and/or hyperacusis (Aazh & Moore, 2017).

Depression symptoms were not significantly associated with hyperacusis and were less strongly associated with misophonia than were O-C symptoms. This different pattern of associations is important because it renders far less plausible the possibility that the association between misophonia and hyperacusis and O-C symptoms is merely a reflection of misophonia and hyperacusis being associated with psychological distress. One possibility that was not examined in the present research is that misophonia and hyperacusis are associated with anxiety in general, and not with O-C symptoms in particular. It will be important to examine this possibility in future research, especially since Rosenthal et al. (2022) recently reported that more than half of individuals with misophonia met the diagnostic criteria for at least one current anxiety disorder.

It will be important for future research to determine why both misophonia and hyperacusis are associated with O-C symptoms. One possibility that we think should be explored is whether all three are associated with executive functioning deficits, including but not limited to deficits in response inhibition, which has previously been found to be associated with OCD (e.g., Norman et al., 2019). A deficit in response inhibition may help explain why individuals with misophonia (and perhaps hyperacusis as well) are unable to let go of the distress they experience upon exposure to their auditory triggers. It is also worth noting that deficits in executive functioning, including response inhibition, have been found in anorexia nervosa and ADHD (Pievsky & McGrath, 2018; Thomas et al., 2022), both of which have been found in at least some research to be associated with misophonia (Erfanian et al., 2019; Rouw & Erfanian, 2017). A second possibility that we think should be explored is that O-C symptoms are associated with both misophonia and hyperacusis because all three are associated not specifically with auditory sensitivity but with the broader construct of sensory sensitivity (e.g., Aykan et al., 2020; Ward, 2019). There is some evidence suggesting a link between sensory sensitivity and OCD (Ben-Sasson & Podoly, 2017; Podoly et al., 2022). Moreover, there is strong evidence of sensory sensitivity being associated with both ADHD (e.g., Panagiotidi et al., 2018) and autism spectrum disorder (e.g., Klintwall et al., 2011), both of which have been found in at least some research to be associated with misophonia (Erturk et al., 2023; Rouw & Erfanian, 2017).

The present research provides robust evidence that both misophonia and hyperacusis are associated with O-C symptoms. It will be important to examine whether other sound tolerance disorders, such as noise sensitivity (Henry et al., 2022), and related hearing disorders, such as tinnitus, are also associated with O-C symptoms. It will also be important to replicate the present findings in samples that are less homogeneous in terms of education and age. Examining a much broader range of ages will be particularly valuable since many hearing-related problems (e.g., tinnitus) become much more common as people get older. Because the present research was cross-sectional, it is not possible to draw conclusions regarding causality. Although it is plausible that O-C symptoms may contribute to sound sensitivities, or that sound sensitivities may contribute to O-C symptoms, we posit that the most likely explanation for their being associated is that both are associated with one or more vulnerability factors, such as deficits in response inhibition. Thus, what will be most important is theory-driven longitudinal research that has the potential to clarify why these different sets of problems are associated.

**Acknowledgement**

This research was supported by a grant from the Misophonia Research Fund to Dr. Fatima Husain.

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Table 1. Correlations between obsessive-compulsive (O-C) and depression symptoms and both misophonia and hyperacusis.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | OCI Questionnaire | YBOCS Interview | Depression Interview |  |
|  |  |  |  |  |
| **Misophonia**  Online Sample  Questionnaire | .53\*\*\* | -- | -- |  |
| In-Person Sample  Questionnaire | .52\*\*\* | .25\* | .17t |  |
| Interview | .36\*\*\* | .32\*\*\* | .28\*\* |  |
| **Hyperacusis**  Online Sample  Questionnaire | .58\*\*\* | -- | -- |  |
| In-Person Sample  Questionnaire | .57\*\*\* | .24\* | .14 |  |
| Lab Assessed | .28\*\* | .17t | -.06 |  |

Note. t *p* < .10; \* *p* < .05; \*\* *p* < .01; \*\*\* *p* < .001

1. Previous research on a wide range of psychological problems, such as depression, borderline personality disorder, and obsessive-compulsive symptoms, has generally failed to find consistent, replicable evidence of taxonicity (e.g., Arntz et al., 2009; Liu, 2016; Olatunjiet al., 2008). [↑](#footnote-ref-1)
2. Although Aazh and Moore (2017) reported that this difference was not statistically significant when conducting a multinomial logistic regression, a two-sample proportion z-test did reveal a significant difference, *z* = 1.96, *p* < .05. [↑](#footnote-ref-2)
3. The diagnosis of hyperacusis is complex and typically entails a combination of audiological assessment of loudness discomfort levels and self-report; there are no universally agreed-upon thresholds for the diagnosis. The present study measured hyperacusis dimensionally, as was the case for misophonia, O-C symptoms, and depression symptoms. [↑](#footnote-ref-3)
4. Otoscopic inspection, tympanometry, and acoustic reflexes were conducted on all participants to rule out outer ear, middle ear, or retrocochlear pathologies. Pure-tone audiometry thresholds were measured. All participants included in the study had a word recognition score (WRS) higher than 80% in both ears. Results of the complete audiological assessment will be reported elsewhere. [↑](#footnote-ref-4)
5. We do not report on tinnitus or other hearing-related issues in the present paper. [↑](#footnote-ref-5)
6. The interview also included an assessment, using the SCID-5, of bipolar psychopathology, lifetime history of depressive episodes, and obsessive-compulsive disorder, none of which are reported in this paper. [↑](#footnote-ref-6)
7. Descriptive statistics and correlations among all variables can be found in Table S1 in supplemental materials. [↑](#footnote-ref-7)