



ORIGINAL ARTICLE

# Evaluation of the psychometric properties of the English MisoQuest and its relationship with audiological and psychological factors

Fatma Betul Kula<sup>a,b</sup>, Mark Cropley<sup>a</sup> and Hashir Aazh<sup>b</sup>

<sup>a</sup>Department of Psychology, University of Surrey, Guildford, UK; <sup>b</sup>Hashir International Specialist Clinics & Research Institute for Misophonia, Tinnitus and Hyperacusis, London and Guildford, UK

## ABSTRACT

**Objective:** The aim was to establish the validity and reliability of the English version of MisoQuest, a 14-item misophonia questionnaire initially validated in the Polish language.

**Design:** Reliability was examined through internal consistency, measurement error, and test-retest reliability. Validity was evaluated with confirmatory factor analysis, convergent, and discriminant validity. Participants completed the English MisoQuest at two-time points and participated in follow-up interviews.

**Study Sample:** The study included 451 adult participants, with an average age of 36.4 years (SD 12.8).

**Results:** The English MisoQuest showed very good internal consistency ( $\alpha$  and  $\kappa$  0.93) and high test-retest reliability (ICC 0.89). While CFA indicated adequate overall model fit, it did not fully support a one-factor structure, as some items shared variance even when controlled for the latent variable. Convergent validity was demonstrated by moderate to strong correlations with established misophonia questionnaires. Weak correlations with non-misophonia measures supported discriminant validity. Unexpectedly, moderate correlations were found with Hyperacusis Impact Questionnaire ( $r$  0.34;  $p < 0.01$ ) and Three-dimensional Fatigue Inventory ( $r$  0.31;  $p < 0.01$ ).

**Conclusion:** The study found that the English version of MisoQuest is a reliable and valid tool for measuring misophonia within the English-speaking adult population.

## ARTICLE HISTORY

Received 2 February 2024  
Revised 30 December 2024  
Accepted 10 January 2025

## KEYWORDS

Misophonia; Validity;  
Reliability; English  
MisoQuest

## 1. Introduction

Misophonia is characterised by profound emotional, physiological and behavioural reactions towards specific sounds or visual stimuli, as defined by Swedo et al. (2022). Common triggers for misophonia involve sounds produced by others, particularly those linked to oral functions (e.g. chewing, eating), nasal sounds (e.g. breathing and sniffing) and repetitive sounds such as tapping or clicking. When individuals with misophonia are exposed to the trigger sounds, they often experience emotional reactions (e.g. anger and irritation), bodily sensations (e.g. increased heart rate and tense muscles), and behavioural responses (e.g. avoidance and aggressive behaviours, asking people to stop making the noise) (Dibb, Golding, and Dozier 2021; Edelstein et al. 2013; Jager, Vulink, et al. 2020). The prevalence of clinical misophonia (i.e. people for whom symptoms of misophonia cause a significant burden) has been reported in 18.4% of a representative sample of the UK adult population (Vitoratou et al. 2023). However, in the US, a recent study by Dixon et al. (2024) found that 4.6% of the adult population experience clinical levels of misophonia.

Research indicates that misophonia is frequently associated with conditions such as obsessive-compulsive disorder and trauma-related disorders (Schroder, Vulink, and Denys 2013; Wu et al. 2014). Approximately 28% of individuals diagnosed with misophonia also exhibit one or more psychiatric disorders (Jager, Vulink, et al. 2020). Misophonia co-occurs with a diverse range of

anxiety disorders, with nearly 57% of sampled participants meeting the criteria for at least one anxiety-related disorder (Rosenthal et al. 2022). It is estimated that 12% of misophonia patients also experience tinnitus, with 4% of them also presenting hyperacusis (Rouw and Erfanian 2018). Some studies have suggested that individuals with misophonia also report hearing loss (Aazh et al. 2022; Enzler et al. 2021; Siepsiak et al. 2022). Dibb and Golding (2022) reported that individuals with misophonia have difficulties in emotional well-being and social functioning. They reported that compared to quality of life, individuals with misophonia showed increased levels of fatigue as measured by the Misophonia Response scale (Dibb and Golding 2022).

A valid and reliable measurement tool is essential for accurately assessing misophonia severity and ensuring consistent results across studies, which enhances the credibility and comparability of research. The MisoQuest questionnaire, consisting of 14 items, was initially validated in a Polish sample (Siepsiak et al. 2022). However, a recent systematic review by Kula, Cropley, and Aazh (2022) emphasised the need for further evaluation of MisoQuest's psychometric properties, especially within an English-speaking population, using the COSMIN framework (Mokkink et al. 2018).

This study aims to validate the English version of the MisoQuest by evaluating its structural validity, reliability, measurement error, and convergent and discriminant validity according to COSMIN standards (Mokkink et al. 2018). Our data collection involved a three-stage approach. Initially, participants

**CONTACT** Fatma Betul Kula [f.kula@surrey.ac.uk](mailto:f.kula@surrey.ac.uk) University of Surrey, Stag Hill, University Campus, Guildford GU2 7XH, UK

Supplemental data for this article can be accessed online at <https://doi.org/10.1080/14992027.2025.2456015>.

© 2025 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group on behalf of British Society of Audiology, International Society of Audiology, and Nordic Audiological Society.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

engaged in an online survey, completing the measurements at two separate points two weeks apart. A subsample of participants who completed both stages of the survey were invited to the third stage, which was an interview to complete the same survey, using identical measures, but this time administered by the researcher. More details are provided in the methods section.

Based on existing research, we hypothesised the following for the validation of the English MisoQuest. While Siepsiak et al. (2020a) performed a confirmatory analysis using Graded Response Model to confirm the factor structure of the MisoQuest, they did not use Confirmatory Factor Analysis (CFA). Although measurement error was addressed in the original study, our study focuses on analysing the standard error of measurement. Furthermore, both convergent and discriminant validity are examined, aspects not fully explored in the initial validation. We expected the English version to demonstrate internal consistency (Cronbach's  $\alpha$  and McDonald's  $\lambda > 0.70$ ), strong test-retest reliability similarly reliability levels as reported in the original scale's development, and low measurement error. For convergent validity, we anticipated moderate to strong correlations between the English MisoQuest and other misophonia-related measures (e.g. AMISO-R, MIQ, SS4), and for discriminant validity, weak correlations with constructs unrelated to misophonia, such as hearing loss, hyperacusis, mental health, sleep and stress.

## 2. Materials and methods

### 2.1. Ethics approval and consent to participate

Ethics approval for the study was obtained from the University of Surrey Research Integrity and Governance Office (Reference: FHMS-21 22 083 EGA). All participants provided online consent after being informed about the study's objectives, procedures, and their right to withdraw at any time.

### 2.2. Participants

The sample size was determined based on a 25:1 participant-to-item ratio for the MisoQuest questionnaire, resulting in a minimum target of 350 participants (Hair et al. 2019). Although some scholars recommend a minimum ratio of 5:1 (Comrey and Lee 2013), a larger sample size can improve factor stability and result generalisability. For test-retest reliability, a minimum of 100 participants were required to minimise statistical error and improve reliability estimates (COSMIN guidelines; Mokkink et al. (2018).

The survey link was distributed via university email lists, social media (Instagram, X), and the Hashir International Specialist Clinics' online newsletter. Additionally, it was shared within Facebook support groups and through non-profit organisations (e.g. SoQuiet). From 475 initial respondents, only those who passed an attention check and met standard response time criteria were included in the analysis, yielding a final sample of 451. This quality control process aligns with recommendations to exclude careless responses (Arias et al. 2020; Chandler, Sisso, and Shapiro 2020), and we additionally excluded outliers with response times more than three standard deviations from the mean (Leys et al. 2013). Initially, 475 individuals were recruited for the study. After applying the attention check and processing time criteria, a final sample of 451 respondents was included in the analysis. In the study's second phase for test-retest reliability, 154 participants took part.

The inclusion criteria for participants included being at least 18 years old and having a good understanding of English (self-reported). Exclusion criteria were if they had a significant cognitive impairment or severe visual impairment (this was communicated with them in the study invitation and information sheet).

### 2.3. The translation process

According our agreement with the developer of MisoQuest, we used the English version of MisoQuest that was translated from the original Polish version and published as a supplement to their original paper (Siepsiak et al. 2022). For this translation, two Polish researchers translated the questionnaire from Polish to English. Following this, a third person, a native speaker familiar with misophonia, corrected the translation for linguistic accuracy. They also approved that there was a back-translation of MisoQuest during the process.

### 2.4. Procedures

The study, conducted between May and July 2023, invited participants to complete an online survey on sound sensitivity, hosted on Qualtrics (Provo, USA, <https://www.qualtrics.com>). After consenting and receiving study information, participants provided demographic details (age, gender, education, ethnicity, religion, employment) and completed questionnaires assessing misophonia, hyperacusis, tinnitus, mental health, hearing, stress, sleep, and fatigue (see Section 2.5 for details). [Supplementary Figure 1](#) illustrates the stages of participant involvement. Although follow-up interviews were planned after the test-retest phase, only 14 participants agreed to participate.

#### 2.4.1. Test-retest reliability

To assess test-retest reliability, participants completed the survey twice over a two-week interval, as recommended by Franzen et al. (1987). A total of 154 participants engaged in this phase, providing data on the stability of responses over time.

#### 2.4.2. Assessing the effect of administration mode (self-administered vs interview-based)

Following the test-retest phase, participants were invited to an optional online interview to compare self-administered responses with those gathered in a researcher-administered setting. Fourteen participants took part in this third phase, which occurred immediately following the second phase. This allowed for a comparison between self-administration and researcher-administration of MisoQuest.

#### 2.4.3. Screening questions for tinnitus and hearing

Participants completed screening questions for tinnitus. Those with tinnitus were asked to complete the Tinnitus Impact Questionnaire (TIQ; Aazh et al. (2022a)). All participants answered a hearing status question, and those indicating hearing loss completed the Hearing Handicap Inventory (HHI; Cassarly et al. (2020)).

## 2.5. Measures

The primary measure in this study was MisoQuest. Additional measures were administered to evaluate MisoQuest's convergent and discriminant validity:

**MisoQuest** (Siepsiak et al. 2020a): This 14-item questionnaire uses a five-point Likert scale (1  $\frac{1}{2}$  "strongly disagree" to 5  $\frac{1}{2}$  "strongly agree") to evaluate sensitivity to bothersome sounds. Originally developed in Polish, it demonstrated a Cronbach's  $\alpha$  of 0.96 and ICC of 0.84 in reliability tests. The authors of MisoQuest (Siepsiak et al. 2020a) acknowledged that they translated the questionnaire into English, and we employed this English version in our study. A cut-off value of 61 has been established to identify individuals who may be experiencing misophonia by Siepsiak et al. (2020).

**The Amsterdam Misophonia Scale- Revised** (Jager, Vulink, et al. 2020): A 10-item scale with a 0-4 rating for misophonia severity, where scores of 0-10 indicate subclinical, 11-20 mild, 21-30 moderate, and 31-40 severe symptoms. The English version of AMISO-R demonstrated a Cronbach's  $\alpha$  of 0.81 (Naylor et al. 2021) and was included to assess the convergent validity of MisoQuest.

**Misophonia Impact Questionnaire** (Aazh, Najjari, et al. 2024): An 8-item scale measuring the impact of misophonia, with items 0-3 (0  $\frac{1}{2}$  0-1 day, 1  $\frac{1}{2}$  2-6 days, 2  $\frac{1}{2}$  7-10 days, 3  $\frac{1}{2}$  11-14 days), with a total score range of 0-24. Scores  $\geq 12$  indicate significant impact (Erfanian and Aazh 2023). The MIQ demonstrated strong reliability, with a Cronbach's  $\alpha$  of 0.94 (Aazh, Najjari, et al. 2024). This measure was used to assess convergent validity.

**Sound Sensitivity Symptoms Questionnaire** (Aazh et al. 2022b): 5 item explores several sound sensitivity symptoms, including loudness hyperacusis, pain or discomfort hyperacusis, annoyance hyperacusis/misophonia, and fear hyperacusis, over two weeks. For each item, a score of 0, 1, 2, or 3 is assigned to the response categories of 0 to 1 day, 2 to 6 days, 7 to 10 days, and 11 to 14 days, respectively. A score of five or more indicates a clinically significant sound intolerance problem. In a clinical sample, the SSSQ demonstrated a reliability coefficient of Cronbach's  $\alpha$  0.87 (Aazh et al. 2022b). SS4 (item 4 in SSSQ) specifically evaluates the severity of misophonia symptoms by assessing how often participants felt angry or anxious when exposed to specific sounds associated with eating noises, lip smacking, sniffing, breathing, clicking sounds, and tapping over the past two weeks. Consequently, we employed SS4 to measure convergent validity. The sum of items 1, 2, 3, and 5 quantifies hyperacusis symptoms, and this part was used to assess discriminant validity.

**Hyperacusis Impact Questionnaire** (Aazh et al. 2022b): An 8-item tool assessing the hyperacusis impact with items scored 0-3 based on frequency (0  $\frac{1}{2}$  0-1 day, 1  $\frac{1}{2}$  2-6 days, 2  $\frac{1}{2}$  7-10 days, 3  $\frac{1}{2}$  11-14 days), giving a total score range of 0-24. Scores of 12 or higher indicate a clinically significant impact. The HIQ showed high reliability, with a Cronbach's  $\alpha$  of 0.93 (Aazh et al. 2022b). This instrument was applied to assess discriminant validity.

**Tinnitus Impact Questionnaire** (Aazh et al. 2022a): A 7-item measure assessing tinnitus impact daily activities, mood, and sleep. Each item is rated 0-3 to indicate frequency (0  $\frac{1}{2}$  0-1 day, 1  $\frac{1}{2}$  2-6 days, 2  $\frac{1}{2}$  7-10 days, 3  $\frac{1}{2}$  11-14 days), yielding a total score range of 0-21. Internal consistency is high, with Cronbach's  $\alpha$  0.89 (Aazh et al. 2022a). Scores below 5 indicate no impact, 5-6 mild impact, 7-8 moderate impact, and 9 or higher severe impact. TIQ was used to assess discriminant validity.

**Screening for Anxiety & Depression in Tinnitus** (Aazh et al. 2023b): The SAD-T contains four items that match those for the physical health questionnaire (PHQ-4; Kroenke et al. 2009). Two items relate to the experience of anxiety, and two relate to the experience of depression. Each item is scored 0-3, corresponding to 0-1 day, 2-6 days, 7-10 days, and 11-14 days. The total score ranges from 0 to 12, with scores of 4 or more indicating symptoms of anxiety and/or depression. The SAD-T has high reliability (Cronbach's  $\alpha$  0.91; Aazh et al. (2023b) and was used to assess discriminant validity.

**Hearing Handicap Inventory** (Cassarly et al. 2020): A 10-item measure assessing the social and emotional impact of hearing loss. Responses are scored as "yes" (4), "sometimes" (2), or "no" (0), with total scores ranging from 0 to 40. Score ranges: 0-8 (no handicap), 10-24 (mild-moderate), 26-40 (severe). Higher scores indicate greater perceived handicap. The HHI shows high internal consistency (Cronbach's  $\alpha$  0.95; Cassarly et al. (2020) and was used to assess discriminant validity.

**A single-item measure of stress symptoms** (Elo, Leppanen, and Jahkola 2003): A one-item questionnaire assesses the stress symptoms. The scores range from 1-5. Higher scores showed greater stress levels. The single-item measure has been found valid in terms of content and criterion validity by Elo, Leppanen, and Jahkola (2003). We used this questionnaire to examine the discriminant validity because it assesses stress symptoms.

**Single Item Sleep Quality Scale** (Snyder et al. 2018): One item measure that evaluates sleep quality. The scores "0": Terrible, "1-3": Poor, "4-6": Fair, "7-9": Good, "10": Excellent. The test-retest reliability of this measure was found to be 0.74 in stable patients with depression and 0.62 in insomnia patients during a 4-week period, and it demonstrated good convergent and discriminant validity. We used this item to assess the discriminant validity due to its focus on measuring sleep quality.

**Three-Dimensional Fatigue Inventory** (Frone and Tidwell 2015): The 3D-WFI is an 18-item tool assessing fatigue across three dimensions: physical, mental, and emotional (six items each). Responses are on a five-point Likert scale (1  $\frac{1}{2}$  every day to 5  $\frac{1}{2}$  never). Internal consistency for each dimension is high, with reliability estimates exceeding 0.90 (Frone, Reis, and Ottenstein 2018). The 3D-WFI was used to assess the discriminant validity of the English version of MisoQuest.

## 2.6. Data analysis

Descriptive statistics and normality tests, including the Kolmogorov-Smirnov test, were calculated for all administered measures. Normality was assessed visually through histograms and quantitatively to ensure data met parametric assumptions. All analyses, except CFA, were conducted in IBM SPSS version 28.0. The structural validity of the English MisoQuest was assessed by CFA using IBM SPSS Amos version 28, following initial analysis in AMOS, a re-assessment was conducted in R using "lavaan" package with the Weighted Least Squares Mean and Variance adjusted (WLSMV) estimator to account for the ordinal nature of the data. Model fit was evaluated using Root Means Square of Approximation (RMSEA), Standardised Root Mean Square Residual (SRMR), Tucker Lewis Index (TLI), Comparative Fit Index (CFI), Goodness of fit indexes (GFI), CMIN (Chi-square/df). Following Schermelleh-Engel, Moosbrugger, and Müller (2003), a good model fit was defined by SRMR  $\leq 0.05$ ; RMSEA  $\leq 0.05$ , TLI  $\geq 0.97$ , CFI  $\geq 0.97$ , GFI  $\geq 0.95$  and  $\chi^2/df \leq 2$ .



Reliability analyses included internal consistency (Cronbach's  $\alpha$  and McDonald's  $\chi$ ), test-retest reliability, and measurement error. Internal consistency was considered acceptable with  $\alpha$  or  $\chi$  values  $> 0.7$  (Hayes and Coutts 2020). Cronbach's  $\alpha$  and McDonald's  $\chi$  have a value between 0 and 1, where a value greater than 0.7 is considered acceptable (Raykov and Marcoulides 2011). Confidence intervals (CIs) for Cronbach's  $\alpha$  were determined using bias-corrected and accelerated (BCA) bootstrap with 1,000 bootstrap samples. To provide a comprehensive understanding of MisoQuest's reliability, we also reported model-based measurement error, such as item reliability within the measurement model, which offers additional information beyond what is provided by Cronbach's  $\alpha$  and McDonald's  $\chi$ .

Test-retest reliability over a two-week interval was assessed by intra-class correlation coefficient (ICC), using a two-way mixed model with absolute agreement, with ICC  $> 0.75$  indicating good reliability (Fapta and Ms 2015). Measurement error was further analysed using the standard error of measurement (SEM), the minimal detectable change (MDC<sub>95</sub>), and Bland-Altman analyses. The SEM assesses the variability within subjects when measuring them repeatedly as a group (Haley and Fragala-Pinkham 2006). The MDC<sub>95</sub> represents the smallest detectable change exceeding measurement error, indicating a significant change with 95% confidence (Schuck and Zwingmann 2003). Bland-Altman analyses were used to identify systematic bias between repeated measurements. The Bland-Altman plot shows agreement between two test occasions and highlights potential outliers. If the 95% confidence interval (CI) of the mean difference includes zero, it suggests no significant systematic bias. The 95% limit of agreement (LOA) was used to examine natural variation, with narrower LOA indicating greater stability (Bland and Altman 1986).

Convergent validity of the English MisoQuest was assessed by Pearson correlation coefficients between MisoQuest scores and other misophonia measures (AMISOS-R, MIQ, SS4). Discriminate validity was examined by correlating MisoQuest scores with measures unrelated to misophonia (HIQ, SSSQ excluding item 4, SAD-T, TIQ, sleep and stress measures, 3D-WFI, HHI). Correlation strength was categorised as strong ( $>0.5$ ), moderate (0.30–0.49), or weak (0.10–0.29) (Cohen 1992). Moderate to strong positive correlations supported convergent validity, while weak correlations supported discriminant validity.

Finally, a paired t-test was used to compare MisoQuest scores between self- and researcher-administered conditions in the third stage, assessing the effect of administration mode.

### 3. Results

#### 3.1. Participants' characteristics and descriptive statistics

Demographic data of the 451 respondents who completed the survey are provided in the [Supplementary Table 1](#). Most participants identified as female ( $N=272$ , 60.3%), white ( $N=346$ , 76.7%), married ( $N=243$ , 53.9%), employed full-time ( $N=235$ , 52.1%), not having any religion ( $N=184$ , 40.8%), having a bachelor's degree ( $N=165$ , 36.6%). The average age of the sample was 36.46 years ( $SD=12.81$ ).

Participants were recruited from the general population, student groups, and support communities for hyperacusis, misophonia, and tinnitus. For detailed descriptive statistics and findings for each questionnaire and item in the English version of the MisoQuest, please refer to [Table 1](#) and [2](#).

The study included 451 participants across various groups: "General" (205), "Student" (109), "SoQuiet (misophonia charity)" (61), and "Other Support Groups" (76, including social media, tinnitus patients, and a tinnitus charity).

#### 3.2. Prevalence of misophonia, tinnitus, hyperacusis, hearing loss, sleep disturbance, and mental health symptoms among all respondents

Approximately 21.7% of respondents (98/451) were identified as having misophonia based on the MisoQuest, with a higher prevalence in females (60/98). A Chi-Square test showed a significant difference in misophonia prevalence between females and males ( $\chi^2(1) = 16.52$ ,  $p < .001$ ). Among those with misophonia, 32.1% reported tinnitus, and 16.7% reported hearing loss. Misophonia prevalence also varied by employment status: 10% among students, 18% among employed individuals, and 5% among retired individuals, with a significant association found ( $\chi^2(2) = 19.48$ ,  $p < .005$ ). Regarding tinnitus, 39% of participants reported experiencing it, with varying levels of impact (9.3% mild, 12.1% moderate, 42.2% severe). Hyperacusis had a clinically significant impact on 35.5% of participants, while 20% reported hearing loss, with 44% experiencing bilateral loss. Sleep disturbance varied, with 18% reporting poor sleep and 34.1% reporting good sleep quality. This sleep-specific questionnaire is separate from the tinnitus measure and assesses sleep quality in general, regardless of tinnitus. Additionally, 61% of participants showed possible symptoms of anxiety and/or depression based on SAD-T. Misophonia prevalence varied by the questionnaire used: 21.7% with MisoQuest, 36.6% with MIQ, and 80% with AMISOS-R, which also categorised symptoms as 34.1% mild, 35.5% moderate, and 10.2% severe to extreme.

#### 3.3. Structural validity

The initial CFA model, based on Siepsiak et al. (2020a), was tested on the present dataset to confirm the one-factor structure of 14 items. Model fit was poor:  $\chi^2 = 295.73$ ,  $\chi^2/df = 3.84$  (above the recommended threshold of 2), RMSEA = 0.07 (exceeding the 0.05 limit), CFI = 0.94, and TLI = 0.93 (both below the 0.97 cut-off), though SRMR was acceptable at 0.04. Modification indices were then used to address misspecifications, resulting in improved fit indices:  $\chi^2 = 180.53$ ,  $df = 72$ ,  $\chi^2/df = 2.50$ , RMSEA = 0.05, SRMR = 0.03, CFI = 0.97, and TLI = 0.96 (Please see [Supplementary Figure 2](#)). In a subsequent analysis, the model fit was reassessed using the WLSMV estimator to better align with the ordinal nature of the data, yielding slightly better fit indices compared to the modified model:  $\chi^2/df = 2.41$ , SRMR = 0.04, RMSEA = 0.05, CFI = 0.97, TLI = 0.97.

#### 3.4. Reliability and measurement error

Cronbach's  $\alpha$  and McDonald's  $\chi$  for the English version of the MisoQuest were both robust, each with a value of 0.93 in this sample. Factor loadings for each item were analysed to assess their relationship with the underlying latent construct. These loadings, along with the corresponding item reliability ( $R^2$ ) values, are presented in [Table 2](#). The factor loadings, ranging from 0.62 to 0.76, are considered moderate to very good, indicating that the items effectively represent the intended construct. The  $R^2$  values, which range from 0.38 to 0.58, suggest moderate to good reliability, confirming that a significant portion of the

**Table 1.** Descriptive statistics and reliability of administered questionnaires.

Questionnaires	N	Mean (SD)	Min	Max	Skewness	Kurtosis	K-S Statistics	K-S p-value	Reliability (95% CI)
MisoQuest	451	48.90 (12.30)	14	70	-0.40	-0.03	0.07	.08	0.93 (0.92-0.94)
HIQ	451	9.60 (6.12)	0	24	0.37	0.11	0.09	.20	0.90 (0.89-0.91)
MIQ	451	9.30 (6.82)	0	24	0.39	-0.67	0.11	.05	0.93 (0.92-0.94)
TIQ	173	7.73 (6.03)	0	21	0.44	-0.79	0.12	<.05	0.92 (0.91-0.94)
SAD-T	451	4.85 (3.38)	0	12	0.48	-0.61	0.12	<.05	0.87 (0.85-0.89)
SSSQ	451	6.60 (4.26)	0	18	0.46	-0.31	0.14	0.06	0.80 (0.77-0.83)
AMISO-R	451	18.81 (9.20)	0	40	-0.15	-0.52	0.14	<.05	0.92 (0.91-0.93)
HHI	87	21.17 (9.40)	0	40	-0.24	-0.39	0.09	0.20	0.84 (0.78-0.88)
Stress	451	3.60 (1.09)	1	5	-0.67	-0.48	0.15	<.01	Not applicable
Sleep	451	5.45 (2.10)	0	10	-0.47	-0.73	0.32	<.01	Not applicable
3D-WFI	451	66.25 (15.27)	18	90	-0.48	-0.13	0.09	.20	0.95 (0.95-0.96)

Notes: HIQ, Hyperacusis Impact Questionnaire; MIQ, Misophonia Impact Questionnaire; TIQ, Tinnitus Impact Questionnaire; SAD-T, Screening for Anxiety and Depression in Tinnitus; SSSQ, Sound Sensitivity Symptoms Questionnaire; AMISO-R, The Amsterdam Misophonia Scale- Revised; HHI, Hearing Handicap Inventory; Stress: A single item measure of stress symptoms; Sleep, Single Item Sleep Quality Scale; 3D-WFI, Three- Dimensional Fatigue Inventory; N, Number of participants; K-S: Kolmogorov Smirnov.

**Table 2.** Descriptive statistics, factor loadings and item reliability for MisoQuest items.

Item	Mean (SD)	Min	Max	Skewness	Kurtosis	Factor Loadings (k)	R <sup>2</sup> (Item Reliability)
MisoQuest Item 1	3.72 (1.10)	1	5	-0.63	-0.33	0.76	0.58
MisoQuest Item 2	3.78 (1.08)	1	5	-0.72	-0.15	0.69	0.48
MisoQuest Item 3	3.41 (1.17)	1	5	-0.42	-0.78	0.71	0.51
MisoQuest Item 4	3.52 (1.19)	1	5	-0.42	-0.79	0.73	0.53
MisoQuest Item 5	3.55 (1.19)	1	5	-0.46	-0.80	0.72	0.53
MisoQuest Item 6	3.25 (1.21)	1	5	-0.23	-0.93	0.62	0.38
MisoQuest Item 7	3.50 (1.22)	1	5	-0.53	-0.48	0.72	0.50
MisoQuest Item 8	3.24 (1.22)	1	5	-0.31	-0.95	0.64	0.41
MisoQuest Item 9	3.42 (1.23)	1	5	-0.31	-0.97	0.68	0.47
MisoQuest Item 10	3.74 (1.16)	1	5	-0.70	-0.38	0.76	0.58
MisoQuest Item 11	3.59 (1.22)	1	5	-0.56	-0.71	0.74	0.55
MisoQuest Item 12	3.62 (1.26)	1	5	-0.56	-0.82	0.75	0.57
MisoQuest Item 13	3.11 (1.28)	1	5	-0.01	-1.15	0.66	0.47
MisoQuest Item 14	3.44 (1.19)	1	5	-0.47	-0.75	0.72	0.53

Note: N (number of participants) = 451

**Table 3.** Discriminant validity: correlations coefficients.

	HIQ	SS1235	SAD-T	TIQ	Sleep Quality	Stress	HHI	3D-WFI
MisoQuest	$r_{451} = 0.34$ $p < 0.01$ $N_{451}$	$r_{451} = 0.25$ $p < 0.01$ $N_{451}$	$r_{451} = 0.23$ $p < 0.01$ $N_{451}$	$r_{176} = -0.11$ $p_{176} = 0.931$ $N_{176}$	$r_{451} = -0.14$ $p_{451} = 0.04$ $N_{451}$	$r_{451} = 0.25$ $p < 0.01$ $N_{451}$	$r_{94} = -0.06$ $p_{94} = 0.57$ $N_{94}$	$r_{451} = 0.312$ $p < 0.01$ $N_{451}$

HIQ, Hyperacusis Impact Questionnaire; SS1235, Items 1,2,3, and 5 on Sound Sensitivity Symptoms Questionnaire; SAD-T, stress and depression; TIQ, Tinnitus Impact Questionnaire; HHI, Hearing Handicap Inventory; HHI, Hearing Handicap Inventory. The number of participants is indicated by N.

variance in each item is explained by the latent factor, thus supporting the overall reliability and validity of the MisoQuest scale.

The ICC analysis showed good test-retest reliability for the English MisoQuest (ICC = 0.89, 95% CI [0.85, 0.92]) using a two-way mixed effects model for absolute agreement. The SEM was 3.19, indicating the standard deviation of an observed score around the true score, and the MDC<sub>95</sub> was 8.81, reflecting the minimum detectable change. Bland-Altman analysis revealed no significant systematic bias, with the mean difference close to zero. Eight outliers fell outside the 95% limits of agreement (LOA), which were narrow, indicating minimal variability and high stability of the MisoQuest scores. This narrow range suggests small, consistent differences between repeated measures, supporting the instrument's reliability (Please see [Supplementary Figure 3](#)). The assumption of normality for the mean differences in the Bland-Altman analysis was also met, validating the results.

### 3.5. Convergent validity

The convergent validity of the English version of MisoQuest was evaluated by calculating Pearson correlation coefficients between

the AMISOS-R, MIQ and SS4. The convergent validity of the English MisoQuest was supported by strong positive correlations with the AMISOS-R ( $r_{449} = 0.65$ ,  $t(449) = 18.11$ ,  $p < 0.01$ ), and moderate positive correlations with the MIQ ( $r_{449} = 0.66$ ,  $t(449) = 11.29$ ,  $p < 0.01$ ) and SS4 ( $r_{449} = 0.659$ ,  $t(449) = 10.84$ ,  $p < 0.01$ ).

### 3.6. Discriminant validity

Table 3 reveals a weak positive correlation between the English version of MisoQuest and SS1235, SAD-T, stress and sleep quality measures and very weak, non-significant negative correlations with TIQ and HHI, supporting the discriminant validity of the English version of MisoQuest. Contrary to our expectations, there were positive moderate correlations between MisoQuest and HIQ and 3D-WFI.

### 3.7. Mode of administration of the MisoQuest results

The participant-administered and researcher-administered MisoQuest were compared using a paired t-test. The mean score for participant-administered was 53.31 ( $SD_{451} = 11.16$ ), and for

researcher-administrated was 53.88 ( $SD_{i\%}13.0$ ). The paired t-test analysis indicated no statistically significant difference between the two methods, as the mean difference was  $-2.43$  (95% CI  $[-5.3, 0.49]$ ),  $t(12)_{i\%} -1.7$ ,  $p_{i\%}0.97$ . The effect size, Cohen's  $d$ , was estimated at  $-0.44$ , with a 95% confidence interval ranging from  $-0.95$  to  $0.08$ . In addition, a correlation analysis revealed a strong positive correlation between the scores of participant-administered and researcher-administered MisoQuest, with a correlation coefficient of  $0.91$  ( $p < 0.01$ ). This suggests a high degree of agreement between the two methods of delivery. These results indicate that when participants completed the questionnaire alone, it did not significantly impact the scores, and the two methods demonstrated a strong correlation.

#### 4. Discussion

The study aimed to assess the psychometric properties of the English MisoQuest following COSMIN guidelines (Mokkink et al. 2018) for translated questionnaire. CFA initially indicated a one-factor structure consistent with the model proposed by Siepsiak et al. (2020a). However, the initial model fit was poor, so modifications were made to improve model fit. These changes addressed shared variance among items with similar emotional and behavioural responses to trigger sounds, improved the overall model fit. Nonetheless, since these adjustments were data-driven rather than theory-based, they might suggest potential multidimensionality within the measure. Subsequent reassessment using the WLSMV estimator, which accounts for the ordinal nature of the data, yielded improved yet still adequate fit compared to the modified ML model, with persistent evidence of multidimensionality. Persistent evidence of multidimensionality suggests that future studies should further refine the model to align it more closely with theoretical frameworks.

The internal consistency of the English version of MisoQuest with Cronbach's  $\alpha$  and McDonald's  $\chi$  of  $0.93$ , closely aligns with the original scale developer's reported Cronbach's  $\alpha$  of  $0.96$  by Siepsiak et al. (2020a), highlighting the robustness of the questionnaire's reliability across different sample characteristics. Our study found a test-retest reliability ICC value of  $0.89$  for the English version of MisoQuest, slightly higher than the original developer's reported value of  $0.84$ , indicating strong consistency in responses over a two-week period.

While Siepsiak et al. (2020a) addressed measurement error in the original Polish version of MisoQuest, and Raymond and Butler (2024) have previously examined convergent and discriminant validity in the English version, our study provides a comprehensive psychometric analysis following COSMIN standards. This approach offers a robust evaluation of the English MisoQuest, supporting its suitability for clinical and research applications.

Our examination of convergent validity showed moderate to strong correlations between MisoQuest scores and those from AMISOS-R, MIQ, and SS4, indicating that these instruments assess related constructs. However, discrepancies were observed in the proportion of participants diagnosed with misophonia across these tools, which relates to diagnostic or differential validity rather than convergent validity. Specifically, AMISOS-R identified a higher prevalence than both MisoQuest and MIQ, likely due to differences in design and conceptual frameworks. Each tool approaches misophonia measurement uniquely: AMISOS-R focuses on experiences triggered in the past three days, MisoQuest has no specified timeframe, and MIQ assesses the impact of misophonia on patients' lives over a two-week

period. Therefore, these differences reflect the diverse approaches used in each questionnaire. Future studies should explore whether a distinction between misophonia as a trait or a disorder can be made using MisoQuest and AMISOS-R and how these might be related to the impact of misophonia on the patient's life measured via MIQ.

The English version of MisoQuest demonstrates reasonably good discriminant validity, as evidenced by its weak correlations with tinnitus impact, hearing loss, sleep, stress, depression, and anxiety. However, there was a moderate correlation between MisoQuest and HIQ that assesses hyperacusis. This means that MisoQuest may be influenced by hyperacusis symptoms. Hyperacusis is different to misophonia and is characterised by the perception of certain everyday sounds, such as domestic noise or noise in public places, as too loud or painful (Aazh et al. 2014). One explanation is that HIQ may be influenced by misophonia in addition to hyperacusis. However, this is unlikely as Aazh, Najjari, et al. (2024) reported that the mean of HIQ score among patients with misophonia was  $8.8$  ( $SD_{i\%}8.2$ ) compared with  $18.5$  ( $SD_{i\%}6.9$ ) among patients with hyperacusis. This indicates that HIQ is reasonably specific in differentiating the impact of hyperacusis from misophonia. Another explanation for the moderate relationship observed between MisoQuest and HIQ is a possible overlap between misophonia and one form of hyperacusis (i.e. annoyance hyperacusis). According to Tyler et al. (2014) hyperacusis has four subtypes: loudness hyperacusis, pain hyperacusis, annoyance hyperacusis, and fear hyperacusis. Previous studies also suggest possible relationship or comorbidity between hyperacusis and misophonia (Aazh et al. 2022; Aazh, Najjari, et al. 2024).

The English version of MisoQuest indicated a moderated correlation with fatigue measure (3D-WFI). This result is consistent with findings from Dibb and Golding (2022), who also reported a moderate correlation between misophonia and fatigue. There is a need for future studies to further explore the relationships between misophonia, hyperacusis and fatigue.

No significant correlation was found between hearing loss and misophonia, consistent with previous studies (Aazh et al. 2022; Siepsiak et al. 2022). In terms of mental health, we observed a weak correlation between misophonia and anxiety-depression, differing from the moderate correlation reported by Wu et al. (2014), likely due to sample differences, as their study focused on students while ours involved a more diverse population. Similarly, we found a weak correlation between misophonia and stress, which contrasts with the moderate correlation reported by McKay et al. (2018). This discrepancy may be due to differences in participant demographics and the use of different questionnaires, as their study focused on U.S. participants and used the Misophonia Questionnaire (Wu et al. 2014) and Depression Anxiety Stress Scale (Lovibond and Lovibond 1995). These findings underscore the need for future studies to further investigate the relationship between misophonia and mental health and stress, particularly using validated tools such as MisoQuest.

Additionally, we found a weak but significant negative correlation between MisoQuest scores and sleep quality, indicating that higher misophonia symptoms are associated with poorer sleep. Although no prior studies have explored this relationship, research on hyperacusis has shown a connection between sound sensitivity and sleep problems, with 30% of participants reporting sleep issues (Fioretti, Fusetti, and Eibenstein 2013). Further research should explore the impact of misophonia on sleep quality to expand our understanding of this relationship.



Some limitations should be considered when interpreting the outcomes of this study. First, female and male participant numbers in our study were unequal. This imbalance, however, is consistent findings from other online misophonia studies (Dibb, Golding, and Dozier 2021), which also observed a higher proportion of female participants. In addition, Siepsiak et al. (2020a) who investigated the invariance based on gender, found that women demonstrated higher misophonia symptoms compared to men. However, it is important to note that in studies with representative samples of the population, there is no clear evidence that females score higher than males. Therefore, conclusions from convenience samples like ours should not be generalised to the whole population.

Single-item measures offer simplicity but also come with limitations. While test-retest reliability can be evaluated, internal consistency cannot be measured, as there is only one item. This limitation is especially important in cross-sectional studies like ours, where comprehensive reliability assessment is critical. For single-item measures, certain reliability aspects remain uncertain, so the findings should be interpreted with caution. Furthermore, single-item measures may be effective for straightforward constructs (e.g. sleep quality), but as noted by Elo, Leppanen, and Jahkola (2003), may not fully capture more complex, multidimensional constructs such as stress.

Lastly, we did not measure responsiveness to change for MisoQuest, which refers to ability to detect changes over time in the construct (Mokkink et al. 2018). Therefore, further research is needed to measure changes in MisoQuest scores before and after any intervention.

## 5. Conclusions

The English MisoQuest is a reliable and valid tool for assessing misophonia in English-speaking populations for both research and clinical use. High reliability was indicated by Cronbach's  $\alpha$  and McDonald's  $\chi^2$  values of 0.93. CFA results demonstrated adequate overall model fit but did not fully support a one-factor structure, as some items shared variance beyond what was explained by the latent variable, suggesting potential multidimensionality within the measure. Test-retest reliability was strong, with an ICC of 0.89, factor loadings between 0.62 and 0.76, and item reliability ( $R^2$ ) values from 0.38 to 0.58. Convergent validity was shown through moderate to strong correlations with related measures (AMISOS-R, MIQ), while discriminant validity was supported by weak correlations with distinct constructs (TIQ, HHI, sleep, stress, and SAD-T). One limitation is the moderate correlation with HIQ, a hyperacusis measure, suggesting a need for future studies to further explore the relationship between misophonia and hyperacusis and to refine psychometric tools for their differentiation.

## Acknowledgements

This project was part of the first author's PhD thesis at University of Surrey which is funded by the Ministry of National Education of the Republic of Turkey for supporting her graduate education. HA was supported by an R&D fund from Hashir International Specialist Clinics & Research Institute for Misophonia, Tinnitus and Hyperacusis Ltd.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## References

- Aazh, H., A. Najjari, and B. C. J. Moore. 2024. "A Preliminary Analysis of the Clinical Effectiveness of Audiologist-Delivered Cognitive Behavioral Therapy Delivered via Video Calls for Rehabilitation of Misophonia, Hyperacusis, and Tinnitus." *American Journal of Audiology* 33 (2):559–574. [https://doi.org/10.1044/2024\\_aja-23-00254](https://doi.org/10.1044/2024_aja-23-00254).
- Aazh, H., B. C. Moore, T. Scaglione, and N. Remmert. 2024. "Psychometric Evaluation of the Misophonia Impact Questionnaire (MIQ) Using a Clinical Population of Patients Seeking Help for Tinnitus, Hyperacusis and/or Misophonia." *Journal of the American Academy of Audiology* 35 (1-02):1–12. <https://doi.org/10.1055/a-2192-5668>.
- Aazh, H., C. Hayes, B. C. J. Moore, and S. Vitoratou. 2022a. "Psychometric Evaluation of the Tinnitus Impact Questionnaire Using a Clinical Population of Adult Patients with Tinnitus Alone or Combined with Hyperacusis." *International Journal of Audiology* 62 (9):835–844. <https://doi.org/10.1080/14992027.2022.2101027>.
- Aazh, H., C. Hayes, B. C. Moore, A. A. Danesh, and S. Vitoratou. 2022b. "Psychometric Evaluation of the Hyperacusis Impact Questionnaire (HIQ) and Sound Sensitivity Symptoms Questionnaire (SSSQ) Using a Clinical Population of Adult Patients with Tinnitus Alone or Combined with Hyperacusis." *Journal of the American Academy of Audiology* 33 (5):248–258. <https://doi.org/10.1055/a-1780-4002>.
- Aazh, H., C. Hayes, M. Erfanian, B. C. J. Moore, and S. Vitoratou. 2023b. "Confirmatory Factor Analysis of the Hyperacusis Impact Questionnaire (HIQ), Sound Sensitivity Symptoms Questionnaire (SSSQ), and Screening for Anxiety and Depression in Tinnitus (SAD-T), Including the Preliminary Analysis of The Parent-Version of the Three Scales for Use in Children." *Journal of American Academy of Audiology* 35 (03/04):81–92. <https://doi.org/10.1055/a-2255-7643>.
- Aazh, H., D. McFerran, R. Salvi, D. Prasher, M. Jastreboff, and P. Jastreboff. 2014. "Insights from the First International Conference on Hyperacusis: Causes, Evaluation, Diagnosis and Treatment." *Noise & Health* 16 (69): 123–126. <https://doi.org/10.4103/1463-1741.132100>.
- Aazh, H., M. Erfanian, A. A. Danesh, and B. C. Moore. 2022. "Audiological and Other Factors Predicting the Presence of Misophonia Symptoms among a Clinical Population Seeking Help for Tinnitus and/or Hyperacusis." *Frontiers in Neuroscience* 16:900065. <https://doi.org/10.3389/fnins.2022.900065>.
- Arias, V. B., L. Garrido, C. Jenaro, A. Martinez-Molina, and B. Arias. 2020. "A Little Garbage in, Lots of Garbage Out: Assessing the Impact of Careless Responding in Personality Survey Data." *Behavior Research Methods* 52 (6):2489–2505. <https://doi.org/10.3758/s13428-020-01401-8>.
- Bland, J. M., and D. G. Altman. 1986. "Statistical Methods for Assessing Agreement between Two Methods of Clinical Measurement." *The Lancet* 327 (8476):307–310. [https://doi.org/10.1016/S0140-6736\(86\)90837-8](https://doi.org/10.1016/S0140-6736(86)90837-8).
- Cassarly, C., L. J. Matthews, A. N. Simpson, and J. R. Dubno. 2020. "The Revised Hearing Handicap Inventory and Screening Tool Based on Psychometric Reevaluation of the Hearing Handicap Inventories for the Elderly and Adults." *Ear and Hearing* 41 (1):95–105. <https://doi.org/10.1097/AUD.0000000000000746>.
- Chandler, J., I. Sisso, and D. Shapiro. 2020. "Participant Carelessness and Fraud: Consequences for Clinical Research and Potential Solutions." *Journal of Abnormal Psychology* 129 (1):49–55. <https://doi.org/10.1037/abn0000479>.
- Cohen, J. 1992. "Statistical Power Analysis." *Current Directions in Psychological Science* 1 (3):98–101. <https://doi.org/10.1111/1467-8721.ep10768783>.
- Comrey, A. L., and H. B. Lee. 2013. *A First Course in Factor Analysis*. New York, NY: Psychology Press.
- Dibb, B., and S. E. Golding. 2022. "A longitudinal Investigation of Quality of Life and Negative Emotions in Misophonia." *Frontiers in Neuroscience* 16: 900474. <https://doi.org/10.3389/fnins.2022.900474>.
- Dibb, B., S. Golding, and T. Dozier. 2021. "The Development and Validation of the Misophonia Response Scale." *Journal of Psychosomatic Research* 149:110587. <https://doi.org/10.1016/j.jpsychores.2021.110587>.
- Dixon, L. J., M. J. Schadeegg, H. L. Clark, C. J. Sevier, and S. M. Witcraft. 2024. "Prevalence, Phenomenology, and Impact of Misophonia in a Nationally Representative Sample of US Adults." *Journal of Psychopathology and Clinical Science* 133 (5):403–412. <https://doi.org/10.1037/abn0000904>.



- Edelstein, M., D. Brang, R. Rouw, and V. S. Ramachandran. 2013. "Misophonia: Physiological Investigations and Case Descriptions." *Frontiers in Human Neuroscience* 7:296. <https://doi.org/10.3389/fnhum.2013.00296>.
- Elo, A. L., A. Leppanen, and A. Jahkola. 2003. "Validity of a Single-Item Measure of Stress Symptoms." *Scandinavian Journal of Work, Environment & Health* 29 (6):444–451. <https://doi.org/10.5271/sjweh.752>.
- Enzler, F., C. Lorient, P. Fournier, and A. J. Norena. 2021. "A Psychoacoustic Test for Misophonia Assessment." *Scientific Reports* 11 (1):11044. <https://doi.org/10.1038/s41598-021-90355-8>.
- Erfanian, M., and H. Aazh. 2023. *Comparing Tinnitus and Misophonia Patients Profiles: Audiological Characteristics and their Impact* [Conference presentation]. Misophonia Convention Albuquerque, New Mexico, USA.
- Fapta, L. G. P. D. P., and M. P. W. D. Ms. 2015. *Foundations of Clinical Research: Applications to Practice*. Philadelphia, PA: F.A. Davis Company.
- Fioretti, A. B., M. Fusetti, and A. Eibenstein. 2013. "Association between Sleep Disorders, Hyperacusis and Tinnitus: Evaluation with Tinnitus Questionnaires." *Noise & Health* 15 (63):91–95. <https://doi.org/10.4103/1463-1741.110287>.
- Franzen, M. D., A. C. Tishelman, B. H. Sharp, and A. G. Friedman. 1987. "An Investigation of the Test-Retest Reliability of the Stroop Colorword Test across Two Intervals." *Archives of Clinical Neuropsychology: The Official Journal of the National Academy of Neuropsychologists* 2 (3):265–272. <https://doi.org/10.1093/arclin/2.3.265>.
- Frone, M. R., and M.-C. O. Tidwell. 2015. "The Meaning and Measurement of Work Fatigue: Development and Evaluation of the Three-Dimensional Work Fatigue Inventory (3D-WFI)." *Journal of Occupational Health Psychology* 20 (3):273–288. <https://doi.org/10.1037/a0038700>.
- Frone, M. R., D. Reis, and C. Ottenstein. 2018. "A German version of the Three-Dimensional Work Fatigue Inventory (3 D-WFI): Factor Structure, Internal Consistency, and Correlates." *Stress and Health: journal of the International Society for the Investigation of Stress* 34 (5):674–680. <https://doi.org/10.1002/smi.2828>.
- Hair, J. F., Jr, M. L.d.s. Gabriel, D. da Silva, and S. Braga Junior. 2019. "Development and Validation of Attitudes Measurement Scales: Fundamental and Practical Aspects." *RAUSP Management Journal* 54 (4): 490–507. <https://doi.org/10.1108/RAUSP-05-2019-0098>.
- Haley, S. M., and M. A. Fragala-Pinkham. 2006. "Interpreting Change Scores of Tests and Measures used in Physical Therapy." *Physical Therapy* 86 (5): 735–743. <https://doi.org/10.1093/ptj/86.5.735>.
- Hayes, A. F., and J. J. Coutts. 2020. "Use Omega rather than Cronbach's Alpha for Estimating Reliability. But ...." *Communication Methods and Measures* 14 (1):1–24. <https://doi.org/10.1080/19312458.2020.1718629>.
- Jager, I. J., N. C. Vulink, I. O. Bergfeld, A. J. van Loon, and D. A. Denys. 2020. "Cognitive Behavioral Therapy for Misophonia: A Randomized Clinical Trial." *Depression and Anxiety* 38 (7):708–718. <https://doi.org/10.1002/da.23127>.
- Jager, I., P. de Koning, T. Bost, D. Denys, and N. Vulink. 2020. "Misophonia: Phenomenology, Comorbidity and Demographics in a Large Sample." *PloS One* 15 (4):e0231390. <https://doi.org/10.1371/journal.pone.0231390>.
- Kroenke, K., R. L. Spitzer, J. B. W. Williams, and B. Lowe. 2009. "An Ultra-brief Screening Scale for Anxiety and Depression: The PHQ-4." *Psychosomatics* 50 (6):613–621. <https://doi.org/10.1176/appi.psy.50.6.613>.
- Kula, F. B., M. Cropley, and H. Aazh. 2022. "Hyperacusis and Misophonia: A Systematic Review of Psychometric Measures." *Journal of the American Academy of Audiology* 33 (7-08):417–428. <https://doi.org/10.1055/a-1896-5032>.
- Leys, C., C. Ley, O. Klein, P. Bernard, and L. Licata. 2013. "Detecting Outliers: Do not Use Standard Deviation Around the Mean, Use Absolute Deviation Around the Median." *Journal of Experimental Social Psychology* 49 (4):764–766. <https://doi.org/10.1016/j.jesp.2013.03.013>.
- Lovibond, P. F., and S. H. Lovibond. 1995. "The Structure of Negative Emotional States: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories." *Behaviour Research and Therapy* 33 (3):335–343. [https://doi.org/10.1016/0005-7967\(94\)00075-u](https://doi.org/10.1016/0005-7967(94)00075-u).
- McKay, D., S.-K. Kim, L. Mancusi, E. A. Storch, and C. Spankovich. 2018. "Profile Analysis of Psychological Symptoms Associated with Misophonia: A Community Sample." *Behavior Therapy* 49 (2):286–294. <https://doi.org/10.1016/j.beth.2017.07.002>.
- Mokkink, L. B., H. C. De Vet, C. A. Prinsen, D. L. Patrick, J. Alonso, L. M. Bouter, and C. B. Terwee. 2018. "Cosmin Risk of Bias Checklist for Systematic Reviews of Patient-reported Outcome Measures." *Quality of Life Research: An International Journal of Quality of Life Aspects of Treatment, Care and Rehabilitation* 27 (5):1171–1179. <https://doi.org/10.1007/s11136-017-1765-4>.
- Naylor, J., C. Caimino, P. Scutt, D. J. Hoare, and D. M. Baguley. 2021. "The Prevalence and Severity of Misophonia in a UK Undergraduate Medical Student Population and Validation of the Amsterdam Misophonia Scale." *The Psychiatric Quarterly* 92 (2):609–619. <https://doi.org/10.1007/s11126-020-09825-3>.
- Raykov, T., and G. A. Marcoulides. 2011. *Introduction to Psychometric Theory*. New York, NY: Routledge.
- Raymond, K., and B. Butler. 2024. "Evidence of Validity for the English-translated MisoQuest." *Journal of Hearing Science* 14 (3):82.
- Rosenthal, M. Z., K. McMahon, A. S. Greenleaf, C. Cassiello-Robbins, R. Guetta, J. Trumbull, D. Anand, E. S. Frazer-Abel, and L. Kelley. 2022. "Phenotyping Misophonia: Psychiatric Disorders and Medical Health Correlates." *Frontiers in Psychology* 13:941898. <https://doi.org/10.3389/fpsyg.2022.941898>.
- Rouw, R., and M. Erfanian. 2018. "A Large-scale Study of Misophonia." *Journal of Clinical Psychology* 74 (3):453–479. <https://doi.org/10.1002/jclp.22500>.
- Schermelleh-Engel, K., H. Moosbrugger, and H. Müller. 2003. "Evaluating the Fit of Structural Equation Models: Tests of Significance and Descriptive Goodness-of-fit Measures." *Methods of Psychological Research Online* 8 (2):23–74.
- Schröder, A., N. Vulink, and D. Denys. 2013. "Misophonia: Diagnostic Criteria for a New Psychiatric Disorder." *PloS One* 8 (1):e54706. <https://doi.org/10.1371/journal.pone.0054706>.
- Schuck, P., and C. Zwingmann. 2003. "The 'Smallest Real Difference' as a Measure of Sensitivity to Change: A Critical Analysis." *International Journal of Rehabilitation Research* 26 (2):85–91. [https://journals.lww.com/intjrehabiles/Fulltext/2003/06000/The\\_smallest\\_real\\_difference\\_as\\_a\\_measure\\_of\\_2.aspx](https://journals.lww.com/intjrehabiles/Fulltext/2003/06000/The_smallest_real_difference_as_a_measure_of_2.aspx). <https://doi.org/10.1097/01.mrr.0000070759.63544.65>.
- Siepsiak, M., A. M. Sobczak, B. Bohaterewicz, Ł. Cichocki, and W. Ł. Dragan. 2020. "Prevalence of Misophonia and Correlates of its Symptoms among Inpatients with Depression." *International Journal of Environmental Research and Public Health* 17 (15):5464. <https://doi.org/10.3390/ijerph17155464>.
- Siepsiak, M., A. Sliwinski, and W. Łukasz Dragan. 2020a. "Development and Psychometric Properties of Misoquest—A New Self-report Questionnaire for Misophonia." *International Journal of Environmental Research and Public Health* 17 (5):1797. <https://doi.org/10.3390/ijerph17051797>.
- Siepsiak, M., M. Rosenthal, D. Raj-Kozia, and W. Dragan. 2022. "Psychiatric and Audiologic Features of Misophonia: Use of a Clinical Control Group with Auditory Over-responsivity." *Journal of Psychosomatic Research* 156: 110777. <https://doi.org/10.1016/j.jpsychores.2022.110777>.
- Snyder, E., B. Cai, C. DeMuro, M. F. Morrison, and W. Ball. 2018. "A New Single-Item Sleep Quality Scale: Results of Psychometric Evaluation in Patients with Chronic Primary Insomnia and Depression." *Journal of Clinical Sleep Medicine: JCSM: official Publication of the American Academy of Sleep Medicine* 14 (11):1849–1857. <https://doi.org/10.5664/jcsm.7478>.
- Swedo, S., D. M. Baguley, D. Denys, L. J. Dixon, M. Erfanian, A. Fioretti, P. J. Jastreboff, S. Kumar, M. Z. Rosenthal, R. Rouw, et al. 2022. "Consensus Definition of Misophonia: a delphi study." *Front. Neurosci* 16: 841816. <https://doi.org/10.1101/2021.04.05.21254951>.
- Tyler, R. S., M. Pienkowski, E. R. Ronceanco, H. J. Jun, T. Brozoski, N. Dauman, N. Dauman, G. Andersson, A. J. Keiner, A. T. Cacace, et al. 2014. "A Review of Hyperacusis and Future Directions: Part I. Definitions and Manifestations." *American Journal of Audiology* 23 (4):402–419. [https://doi.org/10.1044/2014\\_AJA-14-0010](https://doi.org/10.1044/2014_AJA-14-0010).
- Vitoratou, S., C. Hayes, N. Uglik-Marucha, O. Pearson, T. Graham, and J. Gregory. 2023. "Misophonia in the UK: Prevalence and Norms from the S-Five in a UK Representative Sample." *PloS One* 18 (3):e0282777. <https://doi.org/10.1371/journal.pone.0282777>.
- Wu, M. S., A. B. Lewin, T. K. Murphy, and E. A. Storch. 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>.

**MisoQuest – a questionnaire for assessing decreased sound tolerance**

authors: *Siepsiak, M., Sliwerski, A., Dragan, W. Ł*

Some people are less sensitive to certain sounds, while other people are more sensitive to certain sounds. Are there any sounds which you find particularly burdensome? Please indicate how much you agree or disagree with the following statements using the following scale:

- 1 – I definitely do not agree
- 2 – I do not agree
- 3 – Hard to say
- 4 – I agree
- 5 – I definitely agree

1	Some sounds bother me so much that I have difficulty controlling my emotions.	1	2	3	4	5
2	Unpleasant sounds make me feel overwhelmed.	1	2	3	4	5
3	I become anxious at the mere thought of an unpleasant sound.	1	2	3	4	5
4	I believe that my reactions to sounds are exaggerated, but I can't get rid of them.	1	2	3	4	5
5	When I hear unpleasant sounds, I start sensing emotions in my body (e.g. I sweat, feel pain, feel pressure, my muscles tens).	1	2	3	4	5
6	I start feeling anger the moment I see a thing/animal/person that might make an unpleasant sound at any time.	1	2	3	4	5
7	I put a lot of effort into controlling emotions when I hear an unpleasant sound.	1	2	3	4	5
8	If I can, I avoid meeting with certain people because of the sounds they make.	1	2	3	4	5
9	I find some sounds made by the human body unbearable.	1	2	3	4	5
10	I feel that my mental state worsens if I cannot leave a place where there's an unpleasant sound.	1	2	3	4	5
11	I often think about how to drown out unpleasant sounds.	1	2	3	4	5
12	Some unpleasant sounds make me instantly angry.	1	2	3	4	5
13	I am scared that unpleasant sounds may impact my future.	1	2	3	4	5
14	When meeting with other people, I am sometimes irritated because of unpleasant sounds that are present.	1	2	3	4	5