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Emotion dysregulation in misophonia: Findings from a nationally representative sample

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ABSTRACT

A core feature of misophonia is the emotional distress that occurs in response to specific sounds (e.g., slurping, pen clicking). Despite the theorized connection between emotion dysregulation and misophonia, there is very little research on this topic. Examining emotion dysregulation and identifying the specific emotion regulation deficits that are associated with worse misophonia symptoms would advance our understanding of potential transdiagnostic factors central to misophonia symptoms; thereby informing the development of more targeted interventions. The current study sought to: 1) characterize emotion dysregulation among individuals with misophonia, 2) compare emotion dysregulation between individuals with clinical and subclinical misophonia, and 3) examine the unique role of emotion dysregulation across three domains of misophonia symptoms. This study included a large, nationally representative sample of U.S. adults ($N = 4005$; 51.5% female; 62.5% White, non-Hispanic). Participants completed self-report questionnaires to assess misophonia symptoms (i.e., misophonia sounds, emotional and behavioral reactions to misophonia sounds, and misophonia-related impairment), stress, and emotion dysregulation. The results revealed participants with misophonia reported significantly worse emotion regulation abilities compared to individuals with subclinical levels of misophonia. In addition, emotion dysregulation was significantly associated with sensitivity to misophonia sounds, reactions to misophonia sounds, and misophonia-related impairment, even after accounting for covariates. Results support emotion dysregulation as an important element in misophonia and suggest certain dimensions of emotion dysregulation should be considered in future research and in the evaluation of treatment strategies used to reduce misophonia symptoms.

1. Introduction

Misophonia is a disorder characterized by reduced tolerance and intense negative responses to specific sounds (Swedo et al., 2022). Trigger sounds can be generated by a variety of sources and include eating sounds (e.g., slurping), nasal sounds (e.g., sniffing), mouth sounds (e.g., coughing), repetitive sounds (e.g., pen clicking), rustling sounds (e.g., plastic bags), and environmental sounds (e.g., clock ticking; Jager et al., 2020). Ongoing research suggests visual stimuli (e.g., leg swinging, seeing someone eat from across the room) may also trigger reactions in misophonia (Edelstein et al., 2013; Jager et al., 2020). Although as many as 27.6–78.5% of individuals report sensitivity to misophonia sounds (Dixon et al., 2024; Zhou et al., 2017), population-based studies estimate 2.2–12.8% of adults experience clinical levels of misophonia (Dixon et al., 2024; Jakubovski et al., 2022; Kılıç et al., 2021). For those with clinical levels of misophonia, severe impairment is observed across life domains including impaired occupational (e.g., difficulties performing work tasks), social (e.g., social isolation), and academic functioning (e.g., concentration difficulties; Rouw and Erfanian, 2018). Misophonia has also been shown to have a significant impact on individuals' mental health, with studies showing high rates of co-occurring psychological disorders (Jager et al., 2020; Rosenthal et al., 2022), suicidal thoughts due to misophonia symptoms (Rouw and Erfanian, 2018), and increased risk of self-harm and suicidality (Simner and Rinaldi, 2023).

A key component of misophonia is the intense, negative emotional response to trigger sounds. More broadly, emotions involve a multidimensional response that incorporates physiological, expressive, cognitive, and motivational changes (Levenson, 2014), and the dispositional manner in which someone experiences, processes, and responds to this input of information is characterized by the (in)ability to regulate emotions. In particular, Gratz and Roemer's (2004) acceptance-based

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model of emotion regulation emphasizes the awareness and acceptance of emotions and the ability to use strategies to engage in goal-directed behaviors and refrain from engaging in impulsive behaviors when experiencing negative emotions. Within misophonia, individuals experience a myriad of reactions to trigger sounds, ranging from irritation to rage, along with disgust and anxiety (Jager et al., 2020; Rouw and Erfanian, 2018), which are accompanied by corresponding behavioral expressions (e.g., verbal aggression, crying, moving away from sounds), physiological symptoms (e.g., muscle tension, increased heart rate, trembling), and cognitive responses (negative thoughts, attention difficulties, hyperfocus; Edelstein et al., 2013; Erfanian et al., 2019; Jager et al., 2020; Rosenthal et al., 2021).

Extensive research has provided support for emotion dysregulation as a transdiagnostic factor affecting the development and maintenance of symptoms across psychopathology (Aldao et al., 2010; Gratz et al., 2018), as well as contributing to worse outcomes in chronic health disease (Wierenga et al., 2017). Moreover, interventions that indirectly or directly target emotion dysregulation have been shown to improve emotion regulation and clinical outcomes (Gratz et al., 2015; Sakiris and Berle, 2019). Consequently, emotion dysregulation may be critical in further understanding the clinical presentation of misophonia and informing the development of effective treatments. However, only a few studies to date have investigated emotion dysregulation in relation to misophonia. This research has shown misophonia symptom severity is positively associated with general emotion dysregulation in college and community-based samples (Cassiello-Robbins et al., 2020; Guetta et al., 2022; Kadivarian et al., 2023), with one study demonstrating associations between misophonia and specific emotion regulation deficits, including difficulties in engaging in goal-directed behavior, inhibiting impulsive urges and controlling behavior when upset, limited perceived access to emotion regulation strategies, and lack of emotional clarity (Cassiello-Robbins et al., 2020). In addition, Cassiello-Robbins et al. (2020) found difficulties in the ability to control impulsive behaviors mediated the relationship between neuroticism and misophonia symptoms, suggesting this factor of emotion dysregulation may be particularly influential in the expression of misophonia symptoms. Building upon this work, Guetta et al. (2022) demonstrated a unique association between emotion dysregulation and misophonia symptoms after controlling for mental health symptoms. Altogether, this work documents preliminary evidence for a connection between emotion dysregulation and misophonia; however, additional research is needed to replicate and extend these findings to delineate associations between specific deficits in emotion regulation and different types of misophonia symptoms in more representative samples.

The purpose of this study was to evaluate emotion dysregulation in misophonia, and in particular, identify specific deficits that are associated with worse misophonia symptoms using a large, nationally representative sample of U.S. adults. This research is important for advancing our understanding of possible mechanisms underlying misophonia symptoms, which has the potential to inform the development of more targeted interventions for misophonia. The aims of this study were to: 1) characterize emotion regulation difficulties among individuals with clinical levels of misophonia; 2) compare difficulties in emotion regulation between individuals with clinical and subclinical levels of misophonia, and 3) examine the unique role of emotion regulation difficulties across three domains of misophonia symptoms, including sensitivity to sounds, emotional and behavioral reactions to misophonia sounds, and misophonia-related impairment. We hypothesized emotion dysregulation would be significantly higher among individuals with clinical levels of misophonia compared to those with subclinical symptoms (i.e., individuals who endorsed sensitivity to misophonia sounds but scored below the clinical threshold). In addition, greater difficulties with emotion regulation were expected to account for unique variance in misophonia symptoms, after accounting for covariates.

2. Methods and materials

2.1. Participants and procedures

This sample was comprised of 4005 adults aged 18 years and older who completed a survey through Ipsos KnowledgePanel (KnowledgePanel®). KnowledgePanel was used to recruit a large, nationally representative sample for a parent study that examined misophonia in the U.S. population (see Dixon et al., 2023, 2024 for additional information). KnowledgePanel uses address-based sampling methodology to select a truly random sample of adults based on all known households identified by the latest Delivery Sequence File from the U.S. Postal Service, and geodemographic benchmarks from the latest U.S. Census Bureau's Current Population Survey are used to calculate study-specific post-stratification weights, which corrects for potential over- or under-sampling of certain subgroups (Ipsos Public Affairs, n.d.). This study was approved by the university's institutional review board.

Consistent with the demographics of the U.S. population, 51.5% of participants were female and 62.5% identified as White, non-Hispanic, with 16.9% identifying as Hispanic; 12.0% Black, Non-Hispanic; 7.2% Other, non-Hispanic; and 1.4% multiracial, non-Hispanic. The mean age was 48.32 years (SD = 17.76), 56.6% reported they were currently married, and 62.1% reported having at least some college education (see Supplementary Materials).

2.2. Measures

Stress. The 4-item version of the Perceived Stress Scale (PSS-4; Cohen et al., 1983) was used to control for recent stress. The PSS-4 assesses perceived stress (e.g., unable to control important things) in the past month. Items are rated on a Likert-type scale from 0 (never) to 4 (very often), with higher total scores indicating greater levels of stress. Perceived stress was included as a covariate to account for current distress given its association with emotion dysregulation (Gratz et al., 2018), misophonia (Guetta et al., 2024), and functional impairment (McQuaid et al., 2022). The PSS-4 has been demonstrated to have good validity and reliability (Herrero and Meneses, 2006). In this study, internal reliability was good (α = .70).

Emotion dysregulation. A brief version of the Difficulties in Emotion Regulation Scale (DERS) was used to assess emotion dysregulation (DERS-16; Bjureberg et al., 2016). The DERS-16 reduces participant burden and demonstrates strong internal reliability, good test-retest reliability, and good convergent and discriminant validity that is consistent with the original DERS (Bjureberg et al., 2016; Hallion et al., 2018; Sörman et al., 2022). Items are rated on a Likert-type scale from 1 (almost never) to 5 (almost always). The DERS-16 includes five subscales that correspond with the DERS, including lack of emotional clarity (Clarity), difficulties engaging in goals (Goals), difficulties controlling emotions when experiencing distress (Impulse), limited access to effective emotion regulation strategies (Strategies), and nonacceptance of emotional responses (Nonacceptance). The DERS-16 total and subscale scores are computed by summing the relevant items, and higher scores indicate greater difficulties regulating emotions. In this study, internal validity was good for the DERS-16 total (α = .96) and each of the subscales (αs = .85 - .96).

Misophonia Symptoms. The Misophonia Questionnaire (MQ; Wu et al., 2014) was used to measure two facets of misophonia symptoms, including sensitivity to certain sounds (MQ Sounds Scale) and emotional and behavioral reactions to misophonia sounds (MQ Emotions and Behaviors Scale). The MQ Sounds Scale includes seven items assessing the presence of specific misophonia sound sensitivities (e.g., people eating) on a Likert-type scale from 0 (not at all true) to 4 (always true). The MQ Emotions and Behaviors Scale includes 10 items assessing emotions (e.g., anger) and actions (e.g., cover ears) that occur after hearing a trigger sound on a Likert-type scale from 0 (never) to 4 (always). Total scores are computed by summing the relevant items for each scale. In this

study, good internal consistency was observed for the Sounds Scale (α = .87) and Emotions and Behaviors Scale (α = .87).

Misophonia-related Impairment. The Work and Social Adjustment Scale (WSAS; Mundt et al., 2002) was used to measure functional impairment due to misophonia across five domains, including ability to work, tasks for the home, social leisure activities, private leisure activities, and relationships with others. The items are each rated on a Likert-type scale from 0 (not at all) to 8 (very severely) and summed to create a total score, with higher scores indicating greater impairment. In this sample, good internal consistency was observed (α = .90).

2.3. Statistical analyses

Data were analyzed using SPSS Version 28.0. KnowledgePanel sample weights were applied for all analyses. Data were initially screened, and after accounting for the questionnaire's skip logic, findings from Little's Missing Completely at Random Test indicated data were missing at random. Mean imputation was used to compute total scores where participants responded to ≥75% of items on the scale.

First, descriptive statistics were examined, and zero-order correlations were computed to explore associations between key study variables. Next, a series of independent samples *t*-tests were conducted to test the hypothesis that those with clinical levels of misophonia would evidence greater difficulties in emotion regulation than individuals with subclinical misophonia symptoms. Individuals with scores ≥7 on the MQ Severity Scale (Wu et al., 2014) and ≥10 on the Amsterdam Misophonia Scale (Schröder et al., 2013) were identified as having clinically significant misophonia symptoms (n = 185; see Dixon et al., 2024). The subclinical misophonia group was comprised of the remaining individuals who endorsed at least some level of sensitivity to one or more sounds on the MQ Sounds Scale (n = 3490). Given the difference in sample sizes, equal variances were not assumed and Hedges' g effect sizes were calculated.

Next, a series of three-step hierarchical linear regression analyses were conducted in the full sample to test the hypothesis that greater emotion dysregulation would be uniquely associated with misophonia sounds (MQ Sounds Scale), emotional and behavioral reactions to misophonia sounds (MQ Emotions and Behavior Scale), and misophonia-related impairment (WSAS), after accounting for relevant covariates. In Step 1, demographic factors were entered, including: age (continuous variable), gender (female = 0, male = 1), race/ethnicity (0 = individuals identifying as Black/African American, Non-Hispanic; Other, Non-Hispanic; Hispanic; Multiple Races, Non-Hispanic [Persons of Color]; 1 = White, Non-Hispanic [White]), education (0 = high school or less; 1 = at least some college), marital status (0 = not married [never married, widowed, or divorced/separated]; 1 = now married), income (0 = household income < $75,000, 1 = household income ≥ $75,000), and employment (0 = part-time employment or unemployed, 1 = employed full time). Race/ethnicity, education, marital status, and employment were dichotomized based on identified social determinants factors known to increase health risk (World Health Organization (WHO), n.d.), and income was dichotomized based on median household income in the U.S. (Guzman and Kollar, 2023). In Step 2, current stress (PSS-4) was entered, and facets of emotion regulation difficulties (DERS-16 subscales) were entered in Step 3 as the primary variables of interest. Multicollinearity was observed for the DERS-16 Strategies subscale (variance inflation factors [VIFs] > 5, tolerance values < 0.20) when all DERS-16 subscales were simultaneously entered in Step 3 of the regression analyses. Therefore, Strategies subscale was omitted from the model. Multicollinearity was not detected in the updated models (VIFs <3; tolerance values > 0.35). All statistical tests were two-tailed with alpha = .01.

3. Results

3.1. Descriptive statistics and zero-order correlations

The means, standard deviations, sample size, ranges, and correlations for the study variables are provided in Table 1. Positive and statistically significant correlations (ps < .001) were observed between all study variables. The associations between each of the emotion dysregulation scales and sensitivity to misophonia sounds were small (rs = .21–.27). Moderate associations were observed for each factor of emotion dysregulation and misophonia emotions and behaviors (rs = .43 - .49) and misophonia-related impairment (rs = .41 - .49).

3.2. Independent samples t-tests

Means, standard deviations, independent samples *t*-test results, and Hedge's g are reported in Table 2. Consistent with hypothesis, participants with clinical levels of misophonia reported significantly greater difficulties regulating emotions across each dimension, compared to those with subclinical misophonia symptoms. Large effects were observed (Hedge's g = 1.26–1.54).

3.3. Hierarchical regression analyses

Three hierarchical regression model were conducted to examine predictors of misophonia symptoms. The change in R^2, unstandardized coefficients, standard errors, and significance level for each model are reported in Table 3.

3.3.1. Misophonia sounds

With regard to sensitivity to misophonia sounds, demographic factors accounted for 3.8% of the variance in Step 1 (F [7, 3888] = 22.09, p < .001), and stress contributed 4.8% additional variance in Step 2 (F [8, 3887] = 46.12, p < .001). The emotion dysregulation factors were entered in Step 3 and accounted for an additional 3.8% of the variance in sensitivity to misophonia sounds (F [12, 3883] = 46.07, p < .001), indicating a small effect (f^2 = .04). In the last step, Clarity, Goals, and Nonacceptance each emerged as significant predictors. The full model accounted for 12.5% of the variance in sensitivity to misophonia sounds, demonstrating a small-medium effect (f^2 = .14).

3.3.2. Reactions to misophonia sounds

In the model predicting emotional and behavioral reactions to misophonia sounds, demographic factors accounted for 6.5% of the variance in Step 1 (F [7, 3594] = 35.86, p < .001), and stress contributed 9.9% additional variance in Step 2 (F [8, 3593] = 88.42, p < .001). Emotion dysregulation factors were entered in Step 3 and accounted for an additional 11.2% of the variance in reactions to misophonia sounds (F [12, 3589] = 114.48, p < .001), indicating a medium effect (f^2 = .15). All four emotion dysregulation subscales emerged as significant predictors. The full model accounted for 27.7% of the variance in reactions to misophonia sounds, demonstrating a large effect (f^2 = .38).

3.3.3. Misophonia-related impairment

In the model predicting misophonia-related impairment, demographic factors accounted for 4.1% of the variance in Step 1 (F [7, 3688] = 22.57, p < .001), and stress contributed 12.2% additional variance in Step 2 (F [8, 3687] = 89.64, p < .001). Emotion dysregulation factors were entered in Step 3 and accounted for an additional 11.9% of the variance in misophonia-related impairment (F [12, 3683] = 120.62, p < .001), indicating a medium effect (f^2 = .17). The Clarity, Goals, and Impulse subscales emerged as significant predictors. The full model accounted for 28.2% of the variance in impairment, demonstrating a large effect (f^2 = .39).

Table 1
Descriptive statistics and zero-order correlations for study variables.

	1	2	3	4	5	6	7	8	9	10
1. Stress	–									
2. Emotion Dysregulation Total	.597	–								
3. Clarity	.528	.829	–							
4. Goals	.513	.885	.656	–						
5. Impulse	.464	.834	.678	.665	–					
6. Strategies	.596	.956	.754	.809	.753	–				
7. Nonacceptance	.515	.888	.706	.713	.664	.814	–			
8. Misophonia Sounds	.211	.270	.234	.265	.212	.239	.255	–		
9. Misophonia Reactions	.389	.491	.427	.430	.456	.454	.431	.535	–	
10. Misophonia Impairment	.397	.492	.457	.412	.460	.459	.420	.342	.555	–
Mean	5.04	25.80	3.03	5.69	4.17	7.97	4.96	9.71	8.61	2.68
SD	3.32	11.99	1.63	2.92	2.10	4.15	2.67	6.01	6.07	4.98
Range	0–16	16–80	2–10	3–15	3–15	5–25	3–15	0–28	0–40	0–40
n	3984	3957	3944	3969	3971	3961	3966	3969	3,667[a]	3,753[a]

Note. All correlations were significant at the $p < .001$ level. Stress = Perceived Stress Scale-4, Emotion Dysregulation Total = Difficulties in Emotion Regulation Scale – 16 (DERS-16) total score, Clarity = DERS-16 Clarity subscale, Goals = DERS-16 Goals subscale, Impulsive = DERS-16 Impulse subscale, Strategies = DERS-16 Strategies subscale, Nonacceptance subscale, MQ = Misophonia Questionnaire, MQ Sounds = MQ Sounds Scale, MQ Emotions and Behaviors = MQ Emotions and Behaviors Scale, Misophonia Impairment = Work and Social Adjustment Scale, SD = standard deviation.

[a] Smaller sample size due to skip logic used in the survey, wherein the items for MQ Emotions and Behaviors Subscale and WSAS were only presented to individuals who had endorsed sensitivity to misophonia sounds on prior items in the survey.

Table 2
t-Tests Comparing Subclinical and Clinical Misophonia Groups on Emotion Dysregulation.

	Subclinical		Clinical		*t*	*df*	*p*	*g*
	n = 3490		*n* = 185					
	M	*SD*	*M*	*SD*				
Emotion Dysregulation Total	25.31	11.15	42.96	16.21	14.57	191.96	<.001	1.54
Clarity	2.97	1.54	5.17	2.27	12.98	191.54	<.001	1.39
Goals	5.62	2.79	9.17	3.50	13.57	196.18	<.001	1.26
Impulse	4.07	1.91	6.94	3.49	11.08	189.47	<.001	1.42
Strategies	7.80	3.89	13.59	5.49	14.11	192.54	<.001	1.45
Nonacceptance	4.88	2.53	8.20	3.67	12.14	192.99	<.001	1.28

Note. M = mean, SD = standard deviation, t = *t*-test statistic, df = degrees of freedom, g = Hedge's *g*. Emotion Dysregulation Total = Difficulties in Emotion Regulation Scale – 16 (DERS-16) total score, Clarity = DERS-16 Clarity subscale, Goals = DERS-16 Goals subscale, Impulse = DERS-16 Impulse subscale, Strategies = DERS-16 Strategies subscale, Nonacceptance = DERS-16 Nonacceptance subscale.

4. Discussion

This study used a large, nationally representative sample to elucidate the role of emotion dysregulation in misophonia. Two of the prominent findings that emerged were that individuals with clinical levels of misophonia had significantly greater difficulties in emotion regulation compared to those with subclinical symptoms, and emotion dysregulation was significantly associated with misophonia symptoms – above and beyond variance accounted for by demographic factors and current stress. These findings and the specific patterns observed across the results help inform the conceptualization of misophonia symptoms.

The first aim was to characterize emotion regulation difficulties in a large, diverse sample of adults with clinical levels of misophonia. The scores on the DERS-16 in the misophonia sample were similar to means reported by community samples of adults reporting emotion dysregulation (e.g., Bjureberg et al., 2016); whereas the subclinical group reported scores consistent with nonclinical, community-based samples (e.g., Sörman et al., 2022). These findings are not surprising; yet, the descriptive results established by this nationally representative sample of adults with clinical and subclinical levels of misophonia provide a useful reference point for understanding levels of emotion regulation difficulties among individuals with misophonia in research and clinical settings. That is, clinicians and researchers who administer the DERS-16 or DERS to individuals with misophonia can use the means from this study to help contextualize the scores on these measures. In particular, this information may be helpful for detecting strengths or weaknesses in emotion regulation abilities and comparing patterns across samples.

As hypothesized, significantly greater difficulties in emotion regulation were observed in the misophonia group compared to the subclinical group. Large effect sizes were observed for the DERS-16 total score and each of the subscales, indicating difficulties across the dimensions of emotion regulation. These findings dovetail with past research showing worse emotion regulation abilities in clinical compared to control samples (e.g., Miola et al., 2022; Oldershaw et al., 2015; Stellern et al., 2023). Collectively, this evidence indicates emotion dysregulation is central to many disorders, particularly when negative emotions are present, and misophonia is no exception. As those with misophonia exhibited deficits across all emotion regulation abilities, future research should conduct comparisons with clinical groups to identify deficits that may be particularly unique to misophonia symptomatology.

Consistent with prior work (Guetta et al., 2022), difficulties in emotion regulation accounted for unique variance in misophonia symptoms after controlling for demographic factors and current stress. Given this result was observed in a nationally representative sample, this finding is particularly noteworthy and indicates a robust relationship between these variables that is not influenced by sampling and selection biases that are inherent to most studies. The models examining emotion dysregulation as a predictor of reactions to misophonia sounds and misophonia-related impairment yielded medium effects and accounted for a larger portion of variance compared to the model predicting sensitivity to misophonia sounds where a small effect was observed. This pattern aligns with theoretical models of emotion regulation (Gratz et al., 2018; Gratz and Roemer, 2004) that emphasize how individuals

Table 3
Hierarchical regression analyses examining the unique role of emotion dysregulation in misophonia.

	Misophonia Sounds				Misophonia Reactions				Misophonia Impairment			
		$n = 3896$				$n = 3602$				$n = 3696$		
	ΔR^2	*B*	*SE*	*p*	ΔR^2	*B*	*SE*	*p*	ΔR^2	*B*	*SE*	*p*
Step 1	.038			<.001	.065			<.001	.041			<.001
Gender		−2.12	.19	<.001		−1.13	.20	<.001		.01	.16	.944
Age		.00	.01	.961		−.07	.01	<.001		−.05	.01	<.001
Race/Ethnicity		.75	.20	<.001		−.30	.21	.155		−.17	.17	.305
Education		.55	.21	.008		−.36	.22	.100		−.12	.18	.501
Marital Status		.06	.21	.863		−.30	.22	.167		−.28	.18	.121
Employment		−.24	.21	.243		−.32	.22	.143		−.94	.18	<.001
Income		−.20	.21	.358		−.76	.22	.001		−.60	.18	.001
Step 2	.048			<.001	.099			<.001	.122			<.001
Gender		−1.90	.19	<.001		−.81	.19	<.001		.29	.15	.059
Age		.03	.01	<.001		−.03	.01	<.001		−.01	.01	.024
Race/Ethnicity		.71	.19	<.001		−.31	.20	.112		−.18	.16	.262
Education		.74	.20	<.001		−.07	.21	.741		.15	.17	.372
Marital Status		.18	.21	.386		−.11	.21	.642		−.10	.17	.553
Employment		−.08	.20	.709		−.11	.21	.599		−.75	.17	<.001
Income		.16	.21	.434		−.23	.21	.279		−.13	.17	.460
Stress		.43	.03	<.001		.63	.03	<.001		.57	.03	<.001
Step 3	.038			<.001	.112			<.001	.119			<.001
Gender		−1.70	.19	<.001		−.60	.18	.001		.46	.14	.001
Age		.04	.01	<.001		−.01	.01	.084		.01	.01	.127
Race/Ethnicity		.44	.19	.020		−.66	.18	<.001		−.46	.15	.002
Education		.61	.20	.002		−.04	.19	.856		.21	.16	.173
Marital Status		.29	.20	.154		.05	.19	.780		.08	.16	.606
Employment		.10	.20	.612		.23	.19	.241		−.45	.16	.003
Income		.19	.21	.344		−.24	.20	.222		−.13	.16	.414
Stress		.20	.04	<.001		.23	.03	<.001		.25	.03	<.001
Clarity		.24	.09	.008		.31	.08	<.001		.50	.07	<.001
Goals		.25	.05	<.001		.19	.05	<.001		.11	.04	.005
Impulse		.08	.07	.225		.62	.06	<.001		.50	.05	<.001
Nonacceptance		.15	.06	.009		.19	.05	<.001		.09	.04	.031

Note. The sample size varied across the outcomes due to skip logic used in the survey. *P* values < .01 indicate significant associations. *B* = unstandardized beta values, SE = standard error. Gender is coded female = 0, male = 1; race/ethnicity 0 = Persons of Color, 1 = White; education is coded 0 = high school or less; 1 = at least some college; marital status is coded 0 = not married, 1 = now married; income is coded 0 = household income <$75,000, 1 = household income ≥ $75,000; and employment is coded 0 = unemployed or part-time employment, 1 = full-time employment. Stress = Perceived Stress Scale-4, Clarity = Difficulties in Emotion Regulation Scale – 16 (DERS-16) Clarity subscale, Goals = DERS-16 Goals subscale, Impulse = DERS-16 Impulse subscale, Nonacceptance = DERS-16 Nonacceptance subscale.

understand and respond to emotions (e.g., distress elicited by misophonia sounds) rather than how often distress is experienced, or in this case, how often one is exposed to misophonia sounds. Nevertheless, emotion regulation accounted for a small, but significant portion of variance in sensitivity to misophonia sounds. In this model, the Clarity, Goals, and Nonacceptance subscales were significant, which corresponds to difficulties in knowing and being clear about one's emotions, focusing on and engaging in goal-directed behaviors, and having a tendency to be less accepting of distress reactions and experiencing secondary negative reactions to the distress (e.g., anger, embarrassment), respectively. Although it is possible that these aspects of emotion dysregulation may predispose someone to greater sensitivity to or perception of trigger sounds, it seems unlikely that these factors would influence the frequency of exposure to misophonia sounds. However, in light of the cross-sectional nature of the study design, one consideration is that greater frequency of exposure to misophonia sounds may worsen one's abilities to regulate emotions in these specific ways. Future studies using experimental and experience sampling methodologies are needed to understand the temporal associations among these processes.

With regard to the model predicting emotional and behavioral reactions to misophonia, all tested dimensions of emotion dysregulation were significant, and emotion dysregulation accounted for a larger portion of the variance than current stress or demographic factors. Prior work has similarly found a unique association between general emotion dysregulation and misophonia emotions and behaviors (Guetta et al., 2022) and shown that difficulties inhibiting impulsive behaviors when distressed mediated the relationship between trait neuroticism and misophonia symptoms (Cassiello-Robbins et al., 2020). The current results extend the literature by specifically identifying emotional clarity, emotional acceptance, and the abilities to remain in control of one's behaviors and engage in goal-directed behaviors when distressed as important factors that may affect one's reaction to misophonia triggers. Moreover, three of the four emotion regulation abilities, including the Clarity, Goals, and Impulse subscales, were also significant predictors of misophonia-related impairment. The results are the first to demonstrate that emotion dysregulation is significantly and uniquely associated with impaired functioning in misophonia. Taken together, these findings may be useful for informing treatments for individuals with misophonia. Specifically, clinicians should consider implementing treatment strategies that may directly or indirectly target these respective emotion regulation abilities to improve misophonia symptoms (see Gratz et al., 2015).

Although this study advances research on emotion regulation processes in misophonia and the methodology addresses sampling and selection biases inherent to other studies, there are notable limitations that should be considered. First, this study was cross-sectional and causality cannot be inferred from the current results. Prospective studies are needed to examine which factors of emotion dysregulation predict the onset and worsening of misophonia. Second, the number of survey items was limited. Although the questionnaires included in this study have been shown to have strong psychometric properties, more comprehensive questionnaires may offer additional insights on patterns of emotion regulation in misophonia. In addition, future work should consider the use recently developed measures of misophonia that emphasize the criteria provided by the consensus definition of misophonia (e.g., Duke Vanderbilt Misophonia Screening Questionnaire; Williams et al., 2022)

and consult ongoing research in this area. Third, stress was included as a control variable to capture current distress resulting from external stressors and psychological symptoms; however, future studies should consider accounting for additional diagnoses or psychological processes that may impact emotion dysregulation and misophonia symptoms (e.g., anxiety, depression). Fourth, in the absence of diagnostic criteria, this study identified individuals with clinical levels of misophonia by using two criterion that have been established in prior research (Dixon et al., 2024; Jakubovski et al., 2022; Möllmann et al., 2023). However, misophonia is a heterogenous disorder. The current findings indicate emotion dysregulation is important in misophonia, and in particular, reactions to misophonia sounds and impairment. Nevertheless, additional research is needed to comprehensively understand how emotion regulation abilities and strategies factor into the development, maintenance, and treatment of misophonia.

Finally, we were unable to examine the specific role of engagement in emotion regulation strategies (i.e., DERS-16 Strategies subscale) due to multicollinearity; however, moderate bivariate correlations were observed for its association with reactions to misophonia sounds and misophonia-related impairment. Additional studies are needed to explicate how this specific emotion regulation ability relates to misophonia symptoms in the context of other psychological factors. Furthermore, this study used Gratz and Roemer's conceptualization of emotion dysregulation, which is posited to function as the higher-level processing of emotions in a situation that subsequently informs the selection and deployment of discreet emotion regulation strategies (e.g., reappraisal, suppression) that are further delineated by Gross's process model of emotion regulation (Gratz et al., 2018; Gross, 2015). Future research should consider the repertoire of emotion regulation abilities and strategies that may be most beneficial to individuals with misophonia to further inform the development of effective treatment packages.

5. Conclusions

In sum, this is one of the first studies to examine specific factors of emotion dysregulation in misophonia. The results indicate emotion dysregulation is important in misophonia by differentiating individuals with clinical levels of misophonia from those with subclinical misophonia and demonstrating significant associations with misophonia symptoms. Moreover, medium effects were observed for the unique role of emotion dysregulation, beyond demographics and stress, in models examining reactions to misophonia sounds and misophonia-related impairment. These findings are strengthened by this study's rigorous methodology, including probability-based sampling and a sample representative of the U.S. population, and underscore the need for additional research examining this factor in misophonia, particularly given the limited treatment options for misophonia and the ability to address emotion dysregulation through psychological interventions to improve outcomes (Gratz et al., 2015; Sakiris and Berle, 2019).

CRediT authorship contribution statement

Laura J. Dixon: Writing – review & editing, Writing – original draft, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Carey J. Sevier:** Writing – review & editing, Writing – original draft. **Alexandra M. Freshley:** Writing – review & editing, Writing – original draft.

Data statement

Data and materials from this study will be made available upon reasonable request.

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Declaration of competing interest

The authors have no other competing interests to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpsychires.2024.10.022.

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