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Early maladaptive schemas in misophonia

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ABSTRACT

Objective: The study aimed to identify early maladaptive schemas that may be characteristic of individuals with misophonia.

Method: A sample of 289 individuals were recruited from social media websites. Participants responded to the Young Schema Questionnaire-Short Form, which assesses early maladaptive schemas (EMS), and the New York Misophonia Scale, a two-part self-report instrument rating the severity of emotional distress to misophonic triggers and the nature of behavioural reactions to misophonic triggers. Gender differences in the study variables were first examined using a series of univariate analysis of variance. To test the relationship between features of misophonia and EMS, correlation coefficients were calculated. Multiple regression analyses were then conducted by including age, gender and YSQ-SF scores as predictors and misophonic distress, aggressive reactions, and non-aggressive reactions as outcomes.

Results: Results revealed that higher insufficient self-control EMS was a common predictor of all aspects of misophonia, while higher age, female gender and higher social isolation/alienation EMS were predictive of the aversive emotional reactions in misophonia. Higher dependence and unrelenting standards EMS were specific predictors of non-aggressive reactions while dependence and vulnerability to harm or illness EMS were specific predictors of aggressive reactions to misophonic triggers.

Conclusions: Findings imply that schema therapy may be an effective intervention to alleviate misophonic distress.

KEY POINTS

What is already known about this topic:

(1) Previous research has associated misophonia with psychopathological conditions such as obsessive-, anxiety, and depressive disorders.
(2) Childhood adversities and early maladaptive schemas have been implicated as risk factors in obsessive-compulsive, anxiety, and depressive disorders.
(3) Research on early maladaptive schemas that may be a common link shared by misophonia and obsessive-compulsive, anxiety, or depressive disorders is lacking.

What this topic adds:

(1) The current study revealed that schemas within the disconnection/rejection and over-vigilance/inhibition domains are common to both misophonia and anxiety disorders while those within the other-directedness domain may serve to distinguish misophonia. from anxiety disorders.
(2) Similarly, schemas associated with disconnection/rejection and impaired autonomy/performance domains that have been reported as significant predictors and maintaining factors of depressive symptoms are also found to be associated with misophonia.
(3) Furthermore, the insufficient self-control schema within the impaired limits domain appears to be the only one common across both misophonia and OCD.

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KEYWORDS
Early maladaptive schemas; misophonia; schema therapy; distress

Misophonia was first formulated by Jastreboff and Jastreboff (2001) and is a disorder in which specific sounds or stimuli related to those sounds decreases one's tolerance to the stimuli (Swedo et al., 2022). These specific sounds have been identified as trigger sounds and they include human-driven actions such as chewing, pen clicking, tapping, and lip-smacking (Edelstein et al., 2013). The misophonia criterion has been expanded to include visual stimuli such as cracking knuckles, jiggling, and swinging legs (Swedo et al., 2022) as well as olfactory and tactile stimuli (Dozier, 2015; Zhou et al., 2017). In response to the trigger stimuli, individuals with misophonia may experience distress as reflected by increased autonomic arousal

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and negative affect such as anger, irritation, disgust, or anxiety. The trigger stimuli may also evoke behavioural reactions such as escape or avoidance from the situations in which the trigger stimuli may be encountered, aggression directed towards the source of the trigger stimuli (Swedo et al., 2022) or mimicking of trigger sounds (Edelstein et al., 2013; Hadjipavlou et al., 2008).

Concerning auditory misophonia experiences, misophonia has been linked to an increased sensitivity between the functional connections of the auditory, limbic, and nervous systems (Schwartz et al., 2011). Research by Edelstein et al. (2013) demonstrated that misophonic patients show autonomic reactivity to sound but not to other sensory stimuli. Currently, misophonia is not recognized as a distinct psychiatric disorder, literature is limited and research on misophonia is still in its early stages. Swedo et al. (2022), who are responsible for formulating the consensus definition of misophonia, report that by January 2021, misophonia research had been conducted for less than 0 years with fewer than 100 peer-reviewed papers. Thus, a consensus definition was considered an important step for cohesion in research within an area where researchers and clinicians are still trying to understand causes and correlates in order to better serve and support those experiencing misophonia.

Although the research is limited and misophonia is not formally recognized as a psychiatric disorder, research and clinical practice in misophonia have associated misophonia with various psychopathological disorders such as obsessive-compulsive disorder (OCD), attention-deficit hyperactivity disorder (ADHD), depression, eating disorder, obsessive-compulsive personality disorder (OCPD), social anxiety disorder, post-traumatic stress disorder (PTSD), and anxiety (Rouw & Erfanian, 2018; Wu et al., 2014), in addition to audiological disorders such as tinnitus and hyperacusis (Greenberg, 2017; Jastreboff & Jastreboff, 2001).

Several studies have implicated childhood adversities (Bey et al., 2017; Castellini et al., 2018; Hayward et al., 2020; Tao et al., 2021), attachment insecurity (Cortés-García et al., 2020; Tasca, 2019; Van Assche et al., 2020; van Leeuwen et al., 2020), and distorted thinking patterns (Kube et al., 2019; Maric et al., 2010; Rowlands et al., 2021; Tibi et al., 2018) as risk factors or causal mechanisms in depression, anxiety, OCD, and eating disorders. Given the association between misophonia and such disorders there may be justification to assume that such risk factors are central to misophonia as well. A theoretical framework that refers to cognitive vulnerability for psychopathology is Young's schema theory. This theory builds on attachment theory and considers early maladaptive schemas (EMS) as central to the development and maintenance of psychopathology. As based on Young's theory, children have five core emotional needs which are: 1. Secure attachment with others, 2. Autonomy, 3. Freedom to express valid needs and emotions, 4. Spontaneity and play, and 5. Realistic limits and self-control. If these 5 core needs are not met a maladaptive representation of the environment is created leading to the creation of EMS. According to Young et al. (2003), an EMS is a dysfunctional thinking pattern about the self and others. In childhood, EMS are a representation of the child's reality, while in adulthood they may lead to dysfunctional clinical states because they selectively filter experiences. Young (1994), originally identified 18 early maladaptive schemas separated into 5 domains which mirror the 5 core emotional needs: (1) disconnection and rejection domain, (2) impaired autonomy and performance domain, (3) impaired limits domain, (4) other-directedness domain, and (5) over vigilance and inhibition domain. The Young Schema Questionnaire (YSQ) was created for EMS identification and assessment purposes and the Young Schema Questionnaire-Short Form (YSQ-SF) is a 75-item questionnaire which assesses 5 domains and 15 out of the original 18 EMS was further created for both compliance and accuracy since both may be compromised in clinical samples due to length (Oei & Baranoff, 2007). The five domains and their associated schemas are listed and explained in Table 1. The 3 EMS not assessed by the YSQ-SF are Approval Seeking/Recognition Seeking from the Other-Directedness Domain and from the Overvigilance/Inhibition Domain the Negativity/Pessimissm and the Punitiveness EMS.

Kizilagac (2019) claims that most early maladaptive schemas can be associated with several psychological disorders. Empirical attempts have been made to identify early maladaptive schemas characteristic of specific forms of psychopathology (see Table 2).

Given that misophonia also is characterized by heightened autonomic arousal and negative affect to specific trigger stimui along with avoidance tendencies (Cassiello-Robbins et al., 2020) and perfectionism (Jager et al., 2020), we anticipate schemas of social isolation/alienation, vulnerability to harm or illness, insufficient self-control and unrelenting standards to be more strongly associated with misophonia than the other schemas. The identification of distinct schema profiles in the various psychopathologies may not only provide insight on risk factors but also provide viable treatment options.

Young et al. (2003) suggested a form of therapy known as schema therapy which would aid individuals with psychological disorders. Schema therapy (ST), originally conceived as an option for treating non-responders to cognitive behavioural therapy such as those with personality disorders (Young et al., 2003),

Table 1. The five schema domains and the associated ems as assessed by the YSQ-SF.

Domain/Schema	Concise Description
Domain 1: Disconnection and Rejection	Detached, cold and rejecting family of origin. Core unmet need of secure attachment with others.
(1) Abandonment/Instability	There is an expectation that important people in one's life will not be there.
(2) Mistrust/Abuse	Expectation that important people in one's life will abuse, humiliate, lie, or manipulate.
(3) Emotional Deprivation	The expectation that the desired emotional connection will not be fulfilled and its broken down into a. deprivation of nurturance, b. deprivation of empathy, and c. deprivation of protection.
(4) Defectiveness/Shame	The perception that one is flawed, bad, inferior, worthless and unlovable.
(5) Social Isolation/Alienation	The individual feels different from the larger social unit outside the family.
Domain 2: Impaired Autonomy and Performance	The family of origin is undermining of the child's confidence and as an outcome the individual may manifest an inability to separate, survive, and function independently. Core unmet need of autonomy.
(6) Dependence/Incompetence	The individual experiences an inability to handle everyday responsibilities without the help from others.
(7) Vulnerability to Harm or Illness	There is the experience of exaggerated fear regarding catastrophe in one or more of these domains: a medical (disease), emotional (breakdown) and/or external (natural disaster) disaster could strike at any moment
(8) Enmeshment/Undeveloped Self	There is a lack of a real sense of identity due to overinvolvement with a parent or significant other.
(9) Failure to Achieve	There is an expectation that there will be failure in any attempt of achievement
Domain 3: Impaired Limits	Permissive parenting style resulting in a lack of direction, sense of superiority, and overindulgence. Core unmet need of realistic limits and self-control.
(10) Entitlement/Grandiosity	The individual develops feelings of superiority and entitlement to special rights
(11) Insufficient Self-Control	There is no regulation of emotion or impulse so as to achieve personal goals. Individual may avoid conflict or responsibility through discomfort avoidance.
Domain 4: Other-Directedness	The family structure was one where children felt conditional acceptance. Core unmet need of freedom to express valid needs and emotions.
(12) Subjugation	The individual will surrender to others either through 1. subjugation of needs, where one suppresses own preferences and 2. subjugation of emotions, where one suppresses emotional responses of happiness, anger etc. Individual becomes compliant and may present as passive-aggressive, experience uncontrolled outbursts or psychosomatic complaints.
(13) Self-Sacrifice	There is voluntary suppression of own needs of another's satisfaction.
Domain 5: Overvigilance and Inhibition	As children these individuals were required to exhibit self-control in regards to spontaneity and pleasure and usually express pessimism and worry as if everything could fall apart. Core unmet need of spontaneity and play.
(14) Emotional Inhibition	The individual expresses an 1. inhibition of anger, 2. inhibition of positive impulse, 3. difficulty expressing vulnerability, and 4. rationality at the expense of emotion.
(15) Unrelenting Standards	The belief that one must attain an internalized standard of achievement and failing to do so will bring criticism. When maladaptive, the belief may manifest as 1. perfectionism, 2. Rigid rules and 3. preoccupation with time and efficiency.

Adapted from Young et al. (2003, pp. 14–17).

Table 2. Schemas identified as characteristic in specific psychological disorders.

Psychological Disorder	Early Maladaptive Schemas
GAD	Schemas associated with the Other-Directedness and Over-Vigilance/Inhibition domains (Koerner et al., 2015) Schemas associated with Impaired Autonomy and Performance domain (Shorey et al., 2015) Emotional deprivation, abandonment, approval seeking (Popa et al., 2017)
Social anxiety	Schemas associated with the Disconnection and Rejection domain (Mairet et al., 2014)
Depression	Schemas associated with the disconnection and rejection and impaired autonomy/performance domains (Tariq et al., 2021; Wegener et al., 2013) Abandonment, dependence, vulnerability to harm, and insufficient self-control (Voderholzer et al., 2013) Schemas associated with Disconnection and Rejection and Impaired Limits domains (Shorey et al., 2015) Social isolation and defectiveness/shame (Bishop et al., 2022)
OCD	Social isolation, vulnerability to harm or illness, negativity and pessimism, emotional deprivation, defectiveness, failure, dependence/incompetence, subjugation, unrelenting standards, entitlement and approval seeking (Atalay et al., 2008) Abandonment, dependence, vulnerability to harm, and insufficient self-control (Voderholzer et al., 2013) Dependence and vulnerability to harm (Kim et al., 2013; Kwak & Lee, 2015) Enmeshment, failure, punitiveness, insufficient self-control and self-sacrifice (Kizilagac, 2019)
Bulimia	Insufficient self-control, and emotional deprivation (Pauwels et al., 2016)
Anorexia	Failure, subjugation, and unrelenting standards (Pauwels et al., 2016)
Bipolar disorder	Abandonment, failure, insufficient self-control, subjugation and unrelenting standards, enmeshment, entitlement (Nilsson et al., 2015)
Mania	Entitlement (Munuera et al., 2020)

has gained increased attention in recent years. Schema therapy has demonstrated efficacy across various disorders including cluster C personality disorders (Bamelis et al., 2014), mood and anxiety disorders (Malogiannis et al., 2014; Renner et al., 2015), eating disorders (McIntosh et al., 2016), posttraumatic stress disorder (Cockram et al., 2010) and when treating transdiagnostic factors such as emotional dysregulation (Dadomo et al., 2016). The multiphasic nature of ST incorporates a variety of psychotherapeutic theories and techniques including psychodynamic and attachment theory as well as experiential therapeutic approaches (e.g., two-chair technique) (Bachrach & Arntz, 2021). The activation of early maladaptive

schemas is assumed to initiate and perpetuate psychological distress and upon the triggering of early maladaptive schemas, the individual may employ one of three following categories of coping strategies: surrender, avoidance, and overcompensation. The combination of the maladaptive schema and the coping strategy utilized to help mitigate the distress from the activated schema describes the individual's emotional-cognitive-behavioural state or the individual's schema mode (Bachrach & Arntz, 2021). Therefore, the weakening of the maladaptive schema modes and strengthening of a functional schema mode is frequently a therapeutic goal (Wibbelink et al., 2022). Accordingly, in ST experiential techniques address maladaptive schema modes, providing patients with the opportunity to emotionally process aversive childhood memories which results in a change in their symptoms and their EMSs (Yakın et al., 2020). Change is achieved through an increase in awareness, understanding of childhood origin as well as environmental triggers, and in turn replacement of maladaptive with adaptive schema (Young et al, 2003). Furthermore, gender-specific EMS patterns have been reported for some psychological problems (Cudo et al., 2022; Marengo et al., 2019; Pozza et al., 2020), implying that gender-specific EMSs could impact on the delivery of therapy

Given its efficacious treatment of various disorders, ST may show promising results for misophonia too. The current exploratory study attempted to further our understanding of misophonia by examining early maladaptive schemas relevant to misophonic distress and subsequent behavioural reactions and any potential gender-specific patterns. Since EMS have been implicated with other forms of psychopathology exploring such influences in misophonia can give meaningful insight. Additionally, just as with any psychopathology, prevention and treatment initiatives can be advanced by the understanding of the associated factors. The schemas identified therefore, may not only be amenable to modification through schema therapy as treatment, but core needs in childhood may be targeted as a prevention strategy in vulnerable populations.

Method

Participants

G*Power software (free download: www.gpower.hhu.de) generated a sample size estimate based on the use of a fixed model multiple linear regression with 18 predictors. Cohen's f^2 is a measure of effect size used for a multiple regression. Effect size measures for $f^2$are 0.02, 0.15, and 0.35, indicating small, medium, and large, respectively. In previous research, for most EMSs in various forms of psychopathology, small to medium-sized effects have been reported (Bishop et al., 2022; Khosravani et al., 2017; Kim et al., 2013). Similarly, studies on gender differences in EMSs have revealed small to medium-sized effects (Janson et al., 2019; Shorey, Anderson, et al., 2012). Therefore, based on effect size confidence intervals in the small to medium range a minimum sample size of 217 was needed to detect an effect size of .10 at 80% power with an error rate probability of $p = 0.05$. Also, as per Cohen's suggestion, for an omnibus ANOVA of fixed effects of 15 variables across three groups (male, female and nonbinary), with a small to medium-sized effect, f^2 of .20, a total sample size of 246 (82 individuals in each group) would be necessary. Assuming that up to 5% to 10% of data might not be usable following data collection, we sought to recruit at least 280 participants for the study. Ethical approval (No. 2020-0779; 10/29/2020) was granted by the Ethics Committee of the City University of New York and all procedures were conducted following the Declaration of Helsinki. Participant recruitment occurred between July 2021 and September 2021. Informed written consent was obtained from all participants. Any participants either missing questionnaires or demographic data were excluded, leaving a sample of 289. Next, Mahalanobis distance, Cook's distance and leverage were used for multivariate outliers detection. Observations classified as outliers by at least two of the methods were removed leaving a final sample of 286 individuals. Ages ranged between 18 and 62 years (mean = 28.9 years, SD = 8.69), and 186 were female (65%), 85 were males (29.7%) and 15 were non-binary (5.2%). The demographic characteristics of the sample are presented in Table 3.

Measures

Young schema questionnaire-short form (YSQ-SF) *(Young, **1994**)*

The YSQ-SF is a seventy-five-item self-report measure designed to assess early maladaptive schemas (EMS). Early maladaptive schemas can develop during childhood and onward through an individual's lifetime. EMS are deeply rooted processes or themes that can give an individual set beliefs or perceptions about themselves and the world around them. Each item is rated on a 6-point Likert scale ranging from *1=completely untrue*

Table 3. Demographic characteristics of the sample (n = 286).

Variable		*f*	%
Sex	Male	85	29.7
	Female	186	65.0
	Nonbinary	15	5.2
Marital Status	Single, never married	149	52.1
	Married or in a relationship	132	46.1
	Divorced or Separated	5	1.7
Education	Less than high school diploma	11	3.8
	High school or equivalent	45	15.7
	Some college but no degree	52	18.2
	Associate degree	18	6.3
	Bachelor's degree	92	32.2
	Graduate degree	68	23.8
Race	White	225	78.7
	Asian	27	9.4
	Black or African American	8	2.8
	Hispanic or Latino	13	4.5
	From multiple races	10	3.5
	Other	3	1.0
Perceived SES	Lower class	26	9.1
	Lower middle class	63	22.0
	Middle class	138	48.3
	Upper middle class	52	18.2
	Upper class	6	2.1

of me to *6=describes me perfectly*. The reliability coefficients of the YSQ-SF subscales are provided in Table 4.

New york misophonia scale (NYMS; Barahmand et al., 2023)

To measure symptoms of misophonia, a newly developed scale called the NYMS was used. This scale was chosen as the authors designed the scale as an instrument for screening for misophonia in non-clinical situations. Furthermore, the measure provides separate scores for the emotional distress, aggressive behavioural reactions and non-aggressive behavioural responses of individuals experiencing misophonia (Barahmand et al., 2023). The NYMS is a two-part self-report instrument assessing (1) the severity of emotional distress to misophonic triggers and (2) the nature of behavioural reactions to misophonic triggers. Part 1 includes 25 triggers (e.g., someone chewing loudly) that are likely to elicit negative

Table 4. Scale reliabilities and results of the univariate analysis of variance for gender differences in the study variables (n = 286).

		Males(m)		Females(f)		Non-binary(n)			
Variables	Reliability Cronbach's α	*M*	*SD*	*M*	*SD*	*M*	*SD*	F/Welch's F	Eta^2
Misophonic Distress	.91	56.85	18.70	**64.09$_{m}$**	17.33	60.00	17.10	4.93**	.034
Aggressive Reactions	.85	25.29	7.47	**28.17$_{m}$**	7.33	25.60	5.75	4.88**	.033
Non-Aggressive Reactions	.71	14.05	3.12	**15.04$_{m}$**	3.10	**16.20$_{m}$**	1.97	4.70*	.032
Emotional Deprivation	.91	15.02	6.21	14.65	7.21	16.13	5.79	.46	.003
Abandonment	.91	12.66	5.87	**15.06$_{m}$**	6.93	14.67	7.51	4.30*	.026
Mistrust Abuse	.91	14.85	6.11	15.18	6.57	14.93	7.26	.08	.001
Social Isolation	.90	17.64	6.73	17.19	6.93	19.27	7.46	.68	.006
Defectiveness	.92	12.55	6.41	12.59	6.67	14.07	7.67	.36	.003
Failure	.94	12.59	6.63	14.67	7.17	**16.87$_{m}$**	5.41	3.82*	.026
Dependence	.87	11.84	5.47	12.54	6.07	14.13	5.50	1.10	.008
Vulnerability to harm or illness	.83	13.76	5.53	15.24	6.14	14.53	7.04	1.77	.012
Enmeshment	.82	10.13	4.62	10.02	5.25	11.47	7.50	.52	.004
Subjugation	.81	14.59	5.13	15.67	6.50	17.00	7.18	1.42	.010
Self-Sacrifice	.84	14.07	4.83	**16.56$_{m}$**	5.47	16.60	6.38	6.51**	.044
Emotional Inhibition	.89	73.04	5.22	72.31	5.57	72.87	4.90	.55	.004
Unrelenting Standards	.84	17.14	5.92	18.05	5.65	17.87	6.78	.73	.005
Entitlement	.79	**12.45$_{f,n}$**	4.77	11.78	4.32	9.00	2.45	9.75***	.027
Insufficient Self-Control	.90	17.09	5.96	17.23	6.74	19.47	7.85	.61	.006

*$p < .05$; **$p < .01$; ***$p < .001$.
Means of groups that differed are displayed in bold with the subscripts indicating the groups they differed from. Mean differences were indicated by the Games-Howell test.

emotions of annoyance and distress. Participants indicate how aversive they find each trigger to be on a 5-point Likert scale ranging from *0=doesn't bother me* to *4=disgusting*. Part 2 lists 13 behavioural reactions to the misophonic triggers (e.g., "I cover my ears"), and using a 5-point Likert scale ranging from *0=never* to *4=always*, participants report how often they engage in each of those behaviours. A summation of the responses to items in each part yields a subscale score of emotional distress that can range from 0 to 100 and a subscale score of behavioural reactions ranging from 0 to 52. The behavioural reactions component is further divided into two subscales, one measuring aggressive or confrontational coping responses and the other assessing non-aggressive avoidant coping. The scores of the two parts can be added to yield a total misophonia score which can range from 0 to 152. In this study, the scores on the first part (emotional distress), and the two subscale scores of the second part, aggressive behavioural reactions and non-aggressive behavioural reactions were used in the analysis of data. The NYMS is reported to have a well-established factor structure and sound psychometric properties (Barahmand et al., 2023). The NYMS has been reported to possess good internal consistency (Cronbach's α for the full scale =.94, for the misophonic distress subscale =.94, and for the behavioural reactions subscale =.85; Barahmand et al., 2021). In the present study, the reliability for the emotional distress and behaviour reactions subscales and the total scale were found to be .91, .86, and .93, respectively.

Procedure

Participants were recruited from social media platforms such as Reddit, LinkedIn, and Facebook as well as Survey Exchange sites such as "Survey Swap" and "Survey Tandem". The questionnaires were made available using Microsoft Forms and the link was generated and distributed. Participants who accessed the link were prompted with a description of the study, information about the researchers, and study directions. Contingent on providing informed consent to participate, access to the study questionnaires was granted. The next section that followed was general demographic questions followed by the Young Schema Questionnaire (YSQ; Young, 1994) and the New York Misophonia Scale (NYMS; Barahmand et al., 2023). At the end of the survey, participants were presented with a thank you message. Completion of the survey took, on average, 15–0 minutes to complete. No compensation was offered. All procedures and recruitment materials were approved by the CUNY Queens College IRB.

Data analyses

Taking unequal sample sizes into account along with the small number of non-binary individuals ($n = 15$) in the study, gender differences in the study variables were first examined using a series of univariate ANOVAs with robust Welch F test. Since the assumption of homogeneity of variance was not met for some variables, the Games-Howell *post hoc* test was used. To test the relationship between features of misophonia and EMS, Pearson's bivariate correlation coefficients were calculated between NYMS and YSQ-SF scores. Coefficient values were interpreted as: $0 < r < \pm|0.30|$ = weak, $|0.30| < r < \pm|0.50|$ = moderate, $|0.50| < r < \pm|0.70|$ = strong, $> \pm|0.70|$ = very strong. Steiger's Z coefficients were computed to compare the strength of the correlation coefficients between the scores on each one of the NYMS scales and the scores on each one of the YSQ-SF scales. Multiple regression analyses were conducted by including age, gender, and YSQ-SF scale scores as predictors and NYMS scores (misophonic distress, non-aggressive reactions, aggressive reactions scores) as outcomes. Statistical analyses were conducted through SPSS version 25.0 with a significance level set at $p < 0.05$.

Results

Gender differences

Levene's test indicated that homogeneity of variance was not met for the EMSs of emotional deprivation, abandonment, mistrust/abuse, entitlement and insufficient self-control. Therefore for these EMSs, the Welch's F was used. All post hoc comparisons were made using the Games-Howell test because it provides high power while maintaining control over Type I error (Sauder & DeMars, 2019). Pairwise comparisons revealed gender differences on all the subscales of the NYMS as well as on abandonment, self-sacrifice, entitlement and failure schemas, with females scoring significantly higher scores than males on misophonic distress (Hedges' $g = .41$), aggressive reactions (Hedges' $g = .39$), non-aggressive reactions (Hedges' $g = .32$), and on abandonment (Hedges' $g = .36$), and self-sacrifice schemas (Hedges' $g = .47$), and both males (Hedges' $g = .76$), and females (Hedges' $g = .66$), scoring higher than non-binary individuals on the entitlement schema. Males (Hedges' $g = .66$) and females

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(Hedges' $g = .31$) also scored lower than non-binary individuals on the failure schema (See Table 4).

Correlations between age, EMS, and NYMS subscales

Pearson's coefficients between age, NYMS, and YSQ-SF scores are presented in Table 5. Age correlated positively and weakly with the Distress subscale of the NYMS, and negatively and weakly with abandonment, defectiveness, failure, dependence, vulnerability to harm or illness, enmeshment, subjugation, and insufficient self-control schemas. All three subscales of the NYMS, distress, aggressive reactions, and non-aggressive reactions correlated positively with emotional deprivation, social isolation, defectiveness, failure, vulnerability to harm or illness, and insufficient self-control. In addition, the unrelenting standards schema scale correlated positively with both the aggressive and non-aggressive reactions subscales of the NYMS. Furthermore, while the self-sacrifice schema showed a significant positive association only with the distress subscale of the NYMS, the entitlement schema showed a significant negative association only with the non-aggressive reactions subscale of the NYMS (sample item: *I leave the place*), and the mistrust/abuse and subjugation schemas correlated positively only with the aggressive reactions subscale of the NYMS (sample item: *I become verbally aggressive*). Steiger's Z was used for testing the statistical significance of the difference between the correlations of each of the misophonia subscales with each of the schema scores. The results of Steiger's Z tests showed no significant differences in the strength of the correlations.

Predictive effect of EMS on misophonia subscales

Scatterplots showed that the relationships between each of the predictor variables and the criterion variables was linear. Analysis of collinearity statistics showed that the assumption was met as VIF scores were well below 10 (ranging from 1.3 to 3.1) and tolerance scores were above 0.2 (ranging from .31 to .72). The Durbin-Watson values were greater than 1.93 indicating that the values of the residuals are independent. Plots of standardized residuals versus standardized predicted values suggest that the assumption of homoscedasticity has been met. Furthermore, the P-P plots for the models suggested that the assumption of normality of the residuals have not been violated and Cook's Distance values were all under 1, indicating that individual cases were not unduly influencing the model. These findings indicate that the assumptions of multiple regression analyses have been met. The results of the multiple regression analysis are displayed in Table 6. Age, gender (dummy coded), and YSQ-SF scores were included as predictors and NYMS scores as outcomes. To get robust confidence intervals and significance tests of the model parameters, the model was re-estimated using bootstrapping. Bootstrap confidence intervals for each predictors and their significance values are displayed in Table 6. Higher age, female gender, social isolation/alienation and insufficient self-control schemas predicted higher misophonic distress ($R^2 = .161$, $F_{(18,\ 267)} = 2.84$, $p < .001$). Higher age, female gender, higher vulnerability to harm or illness, and insufficient self-control schema scores significantly predicted higher aggressive reactions to misophonic triggers ($R^2 = .190$, $F_{(18,\ 267)} = 3.48$, $p < .001$). Non-aggressive reactions to

Table 6. Bootstrap coefficients for significant effects of multiple linear regression of misophonic distress, aggressive reactions, non-aggressive reactions, and misophonia scores on age, sex and YSQ – SF scores (18 predictors) (n = 286).

				BCa 95% Confidence Interval for B	
	b	*SEb*	*p*	Lower Bound	Upper Bound
Misophonic Distress					
(Constant)	56.02	15.94	.002	23.936	86.711
Age	.253	.121	.041	.017	.517
Female gender	6.81	2.40	.006	1.612	12.048
Social isolation	.537	.205	.015	.117	.905
Insufficient self-control	.437	.199	.036	.034	.843
Aggressive Reactions					
(Constant)	14.99	6.61	.023	2.622	27.160
Age	.104	.047	.026	.014	.195
Female gender	2.32	.975	.021	.350	4.172
Vulnerability to harm or illness	.266	.092	.006	.085	.446
Insufficient self-control	.273	.068	.002	.141	.407
Non-Aggressive Reactions					
(Constant)	11.82	2.955	.001	6.073	17.185
Dependence/Incompetence	−.111	.053	.035	−.213	−.004
Unrelenting standards	.086	.033	.007	.024	.151
Entitlement schema	−.127	.056	.021	−.233	−.014
Insufficient self-control	.072	.031	.024	.014	.128
Misophonia					
(Constant)	82.84	22.27	.001	39.214	126.459
Age	.341	.167	.044	−.009	.699
Female gender	9.92	3.08	.003	4.001	16.183
Social isolation	.725	.270	.006	.156	1.305
Vulnerability to harm or illness	.618	.298	.035	.025	1.143
Insufficient self-control	.782	.254	.006	.267	1.331

misophonic triggers were significantly predicted by lower scores on dependence and entitlement schemas and higher scores on unrelenting standards and insufficient self-control schemas ($R^2 = .155$, $F_{(18,\ 267)} = 2.72$, $p < .001$). Finally, total misophonia scores ($R^2 = .192$, $F_{(18,\ 267)} = 3.54$, $p < .001$) were predicted by age, female gender, higher scores on social isolation, vulnerability to harm and illness, and insufficient self-control schemas. Scores on the other scales of the YSQ-SF did not significantly predict NYMS scores.

In conclusion, higher age and female gender were predictors of misophonic distress and aggressive reactions. Among the EMSs, higher insufficient self-control EMS was a common predictor of misophonic distress as well as aggressive and non-aggressive reactions to misophonic triggers. Also, while higher social isolation/alienation EMS was specifically predictive of misophonic distress, vulnerability to harm or illness EMS which was a specific predictor of aggressive reactions to misophonic triggers and lower entitlement and higher dependence and unrelenting standards EMS were specific predictors of non-aggressive reactions to misophonic triggers.

Discussion

This study was conducted to examine the early maladaptive schemas in misophonia and to determine similarities and differences in schemas relevant to misophonic distress and subsequent behavioural reactions. Gender differences were observed with females endorsing higher abandonment and self-sacrifice EMS while males endorsed more entitlement EMS and nonbinary individuals reported significantly more failure EMS. While little research has focused on differences in the presentation of EMS between men and women, current findings are consistent with previous studies in which self-sacrifice EMS was found to be higher in women (Janson et al., 2019; Pauwels et al., 2018) and entitlement EMS was higher in men (Pauwels et al., 2018; Tremblay & Dozois, 2009). A study examining EMS and gender in an Indian sample (Jain & Singh, 2019) found no differences between men and women on the self-sacrifice and entitlement EMS and found men endorsing higher rates of several other EMSs. These studies did not include non-binary individuals. Some studies on clinical populations using the long version of the YSQ have reported that women score higher on most EMSs including abandonment and self-sacrifice (Janson et al., 2019; Shorey, Anderson, et al., 2012; Shorey, Stuart, et al., 2012). Other studies report either no gender difference (Janson et al., 2019; Shorey, Anderson, et al., 2012) or higher scores in women (Shorey, Stuart, et al., 2012) on these EMSs. As it pertains to gender and misophonia our findings reveal that female gender is significant to the experience of misophonic distress and to the expression of aggressive reactions to misophonic triggers. These findings may reflect the finding of greater severity of misophonia in women (Siepsiak et al., 2020).

In this present study, social isolation emerged as a dominant schema predicting distress provoked by misophonic triggers, while insufficient self-control was found to be the dominant schema associated with both the aggressive and non-aggressive behavioural reactions to misophonic triggers. In addition, vulnerability to harm was associated with aggressive reactions while unrelenting standards, high dependence/incompetence and low entitlement were predictive of non-aggressive reactions.

The social isolation schema belongs to the disconnection and rejection domain and is the belief that one is different and alienated from the rest of the world. Individuals with this schema may avoid social contacts and social situations. Rouw and Erfanian (2018) found many sufferers of misophonia recollecting misophonia episodes that occurred in childhood. It is likely that the experience of distress and annoyance from exposure to misophonic triggers gradually strengthens the belief that these individuals are different from others, resulting in their withdrawal from others, or they may withdraw from social circles in an attempt to avoid the experience of distress and annoyance from misophonic triggers. Previous research by Schröder et al. (2019) identified avoidance as one of the coping strategies that individuals diagnosed with misophonia adopt, and this also suggests the connection between social isolation and misophonia. Individuals with misophonia may be submitting or surrendering (Young et al., 2003) to their social isolation EMS when it is activated.

The insufficient self-control schema falls within the impaired limits domain and is reflected by a deficit in emotion regulation and impulse control (Young et al., 2003). The strong and significant association of the insufficient self-control schema with the emotional and behavioural aspects of misophonia implies that individuals with misophonia may have deficits in exercising self-discipline, tolerating negative emotions, and controlling their impulses (Thimm, 2010), potentially resulting in a disregard for the rights of others. Dozier (2015) reported that when exposed to trigger stimuli, individuals with misophonia react with anger and with tension in the skeletal muscles which increases with the progressive worsening of symptoms. These findings suggest that the insufficient-self control schema may be activated by such physical reactivity. Since the present study did not record the length of symptoms or physical tension, future studies are required to address the veracity of this implication. It is also plausible that the two early maladaptive schemas of insufficient self-control and social isolation interact, with the difficulty of tolerating discomfort leading to increased social withdrawal.

Differences were observed concerning the schemas associated with nonaggressive and aggressive behavioural reactions to distressing misophonic triggers, with high dependence/incompetence, unrelenting standards and low entitlement characteristic of non-aggressive reactions while high vulnerability to harm or illness was associated with aggressive reactions.

The dependence/incompetence EMS belongs to the impaired autonomy and performance domain and manifests as feelings of incompetence, insecurity and hypervigilance (Saritas-Atalar & Altan-Atalay, 2018). The association of the dependence/incompetence EMS with non-aggressive reactions may be indicative of deficiencies in emotion regulation as this EMS has been reported to be associated with both anxiety and depression (Saritas-Atalar & Altan-Atalay, 2018) and emotion regulation difficulties have been reported in misophonia too (Cassiello-Robbins et al., 2020; Guetta et al., 2022; Barahmand et al., 2023).

The unrelenting standards EMS is part of the over-vigilance and inhibition domain and is characterized by perfectionism and rigidity (Young et al., 2003). Consistent with our findings, a recent study, Natalini et al. (2019) also found that the unrelenting schema was enhanced in patients with misophonia and comorbid personality disorders. Many studies have highlighted the relationship between perfectionism and misophonia and OCPD (Cowan et al., 2022; Edelstein et al., 2013; Jager et al., 2020; Schröder et al., 2013). The classification of unrelenting standards within the over vigilance and inhibition domain together with the current finding that unrelenting standards EMS were predictive of nonaggressive reactions implies the compliance of these individuals with social norms to refrain from acting aggressively when exposed to misophonia triggers.

The entitlement schema was negatively associated with nonaggressive reactions. The entitlement schema is part of the impaired limits domain, suggesting a deficit in self-discipline, a tendency to be selfish and narcissistic and the belief that normal rules and conventions do not apply to them. Specifically the entitlement schema refers to the belief that one is superior to other individuals and includes the assertion of power to control the behaviour of others. Our findings indicate a negative association between non-aggressive reactions and the entitlement schema implying that individuals with misophonia may consider the behaviour of others to be "incorrect" when it is not in line with their desires, however they do not feel superior or of special privilege and, therefore, react non-aggressively to misophonic triggers so as to not violate social rules. Taken together, the emotional

impulsivity of the insufficient self-control EMS and the deficiency in emotion regulation of the depencence/incompetence EMS in conjunction with the rigid perfectionism of the unrelenting standards EMS and conformity of the low entitlement schema could explain the experience of emotional distress when exposed to misophonia triggers as well the nonaggressive reactions to them.

The current study found that vulnerability to harm or illness, a schema within the impaired autonomy and performance domain, was related to aggressive reactions. The vulnerability to harm or illness schema is seen in individuals hypersensitive to potential dangers and preoccupied with concerns about their inability to cope with them (Young et al., 2003). Misophonic triggers activate the early maladaptive schemas which, in turn, activate cognitions, and the subsequent behavioural reactions are mechanisms to cope with the cognitions and may or may not be adaptive. The maladaptive coping responses to a schema are surrender, avoidance or overcompensation (Young et al., 2003). Overcompensation for the vulnerability to harm schema is to act without regard towards danger which can include aggressive reactions. A bivariate analysis conducted by Shorey et al. (2015) revealed that the impaired autonomy and performance domain was positively associated with overall aggression, aggressive attitude, physical aggression, and verbal aggression; however, their regression model suggested that the impaired autonomy and performance domain may not be a reliable predictor of aggression. In contrast, Şenkal Ertürk et al., (2020) found that the impaired autonomy schema domain was associated with low levels of aggression in adults. While our findings seem consistent with the theoretical frameworks of Young's theory, the contradictory findings regarding the associations of the impaired autonomy schema domain and aggression may mean that vulnerability to harm or illness alone is not enough to predict an aggressive reaction in individuals. Rather, other schemas may act along with vulnerability to harm or illness to produce such aggressive behaviour. Our findings imply that the schemas leading to the behavioural reactions to misophonic triggers may be different. This is similar to the proposal of Dozier (2015) that emotional reaction to misophonia may be summoned by several factors that may not always result in an overt aggressive reaction. And this may be why some misophonics report attempts to resist aggressive impulses.

Based on previous research (Koerner et al., 2015; Mairet et al., 2014; Popa et al., 2017; Shorey et al., 2015), it appears that schemas within the disconnection/rejection and overvigilance/inhibition domains are common to both misophonia and anxiety disorders while those within the other-directedness domain may serve to distinguish misophonia from anxiety disorders. Similarly, schemas associated with disconnection/rejection and impaired autonomy/performance domains that have been reported as significant predictors and maintaining factors of depressive symptoms (Tariq et al., 2021; Wegener et al., 2013) are also found to be associated with misophonia. Therefore, we see that misophonia, anxiety, and depression share the schemas associated with the disconnection/rejection domain, suggesting that an individual with any of these disorders tends to engage in avoidance coping strategies to avoid distress from unmet needs in social relationships which, in the long run, promotes further social withdrawal.

The insufficient self-control schema within the impaired limits domain appears to be the only one common across both misophonia and OCD, indicating that issues regarding setting personal and interpersonal limits are relevant to both these disorders. Overall, the finding that schemas from the disconnection and rejection domain are common to misophonia, anxiety and depression disorders, while schemas from the impaired limits domain are common to misophonia and OCD, suggests that misophonia is essentially a condition characterized by problems in emotion and impulse regulation

The early maladaptive schema model is the theoretical model in support of schema therapy that focuses on the identification and modification of EMS. Schema therapy has been documented to be effective for depression (Carter et al., 2010), anxiety and obsessive-compulsive disorders (Peeters, Passel, et al., 2021; Peeters, Stappenbelt, et al., 2021), and eating disorders (Calvert et al., 2018). Now that relevant early maladaptive schemas associated with misophonia have been identified, insight can be gained into early developmental correlates of misophonia and therapeutic intervention through schema therapy may be implemented.

Limitations and future directions

The study has several limitations. Results and conclusions are based on self-reported, retrospective responses collected largely from non-clinical English speaking participants who were primarily female. Also, the scale used to assess misophonia is a newly-developed instrument. Although the authors of the scale have reported sound psychometric properties, the scale has not yet been widely used, warranting replication of the current findings using other measures of misophonia. The low base rate of non-binary

individuals in the present study may have compromised the power. Power may also have been compromised due to multiple testing. Replication of the study with larger samples of non-binary individuals and replication focused on specific EMSs is recommended. Future studies comparing healthy controls with individuals scoring high on misophonia is warranted. Yet, considering that our sample consisted of participants from a variety of countries with a range of scores on misophonia indicates that our results may be replicated. The finding of a positive association between insufficient self-control EMS and aggressive reactions to misophonic triggers indicates that it might be worthwhile to examine if there is an association with length of symptoms. Similarly, as the social isolation EMS associated with misophonic distress, future research into the relationship between social withdrawal and misophonic distress may be of interest. Considering that intolerance of uncertainty and perfectionism have been found to be transdiagnostic factors, the role of these variables in misophonia needs to be empirically determined. Finally, given that misophonia overlaps with temperamental factors as well (Daniels et al., 2020), the obtained associations between features of misophonia and EMS might be due to the shared influence of a third variable, such as neuroticism (Cassiello-Robbins et al., 2020). Future research may delineate the contributions of neuroticism and EMS to symptoms of misophonia. Since there was a connection between some early maladaptive schemas and misophonia, it can be stated that some individuals with misophonia could benefit from schema therapy. There has been no research that highlights the effect of schema therapy on misophonia, thus, further research should be implored to investigate these claims.

Disclosure statement

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

Data availability

All data will be shared upon reasonable request.

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