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Systematic Review

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Effects of cognitive behavioral therapy for misophonia: A systematic review

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Abstract

Background: Misophonia is a condition characterized by intense physical and emotional reactions to everyday sounds, commonly known as triggers. Despite its prevalence, with estimates suggesting that 6% to 20% of students are affected, research on effective treatments remains limited. Misophonia is believed to stem from enhanced connectivity between the limbic system and auditory structures, rather than auditory abnormalities. Comorbidities with mental disorders such as PTSD, OCD, and major depressive disorder are common. While no definitive treatment has been established, cognitive behavioral therapy (CBT) shows promise. Studies indicate that CBT can reduce distress and improve coping strategies, with significant symptom improvement reported after CBT interventions.

Methods: We included randomized controlled trials, open-label studies, and pilot cases focused on misophonia, using PubMed, PsycINFO, Web of Science, and Google Scholar for our search. Non-English studies, animal research, and case reports were excluded. Data extraction covered study parameters and outcomes, and biases were evaluated using the Cochrane Collaboration method.

Results: Screening 28 studies led to inclusion of six, including randomized controlled trials and an open-label study. Results show cognitive behavioral therapy (CBT) significantly reduces misophonia symptoms, with studies reporting up to 48% improvement in A-MISO-S scores and sustained benefits over time. These findings underscore CBT's potential as a promising treatment for misophonia, though further research is needed to establish standardized protocols and long-term efficacy.

Conclusion: This systematic review confirms CBT as effective for treating misophonia, highlighting its symptom reduction and quality of life improvements. Further research is needed to refine CBT protocols and explore alternative treatments.

Keywords: Misophonia, Cognitive behavioral therapy (CBT), Psychotherapy, Treatment

1. Introduction

Misophonia is a new condition in which people have highly adverse physical and emotional reactions to certain everyday sounds, such as chewing, slurping, nose sniffing, or breathing, frequently referred to as triggers. The first definition of misophonia was "an abnormally strong reaction is triggered by a sound with a specific pattern and meaning to an individual," according to Jastreboff (*Jastreboff et al., 2014*). Misophonia sufferers frequently exhibit avoidance or escape behaviors in an attempt to avoid being around sounds that trigger them, which can have detrimental effects on interpersonal relationships and cause them to become isolated. Misophonia sufferers usually perceive sound normally, so hearing threshold problems cannot be the cause of their negative responses (*Schröder et al., 2013; Schröder et al., 2014; Jastreboff & Jastreboff, 2015*). Cavanna and Seri suggest that misophonic reactions could result from enhanced limbic system and auditory structure connectivity (*Cavanna and Seri. 2015*).

According to the few currently available sources, 6% and 20% of students are thought to have misophonia (*Wu et al., 2014; Zhuo et al., 2017*). Given the large number of people with this disorder, it is clear that more research is required to identify effective treatment and prevention methods. Despite the disorder's high prevalence, little research has been done on it up to this point. So, the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) does not define misophonia precisely (*Ghorbani et al., 2022*). Studies already conducted indicate that people with misophonia corresponded to with the criteria of at least one additional mental disorder. Erfanian et al. found that post-traumatic stress disorder (PTSD, 15.4%), obsessive-compulsive disorder (OCD, 11.5%), major depressive disorder (9.6%), and anorexia nervosa (9.6%) are among the most common comorbidities (*Erfanian et al., 2019*).

It has not yet been reported that any conclusive treatment is effective. However, the results of Lewin et al. suggest that CBT can be an appropriate approach to start a psychotherapeutic intervention for misophonia (*Lewin et al., 2021*). This comprehensive approach not only alleviates the immediate distress caused by trigger sounds but also contributes to long-term coping strategies that enhance daily living. Nonetheless, six studies utilizing CBT have produced encouraging outcomes (*Bernstein et al., 2013; Dozier, 2015a, b; McGuire et al., 2015; Reid et al., 2016; Rosenthal et al., 2023*). As one of the main symptoms of misophonia is heightened attention to trigger sounds, the principal objective of CBT is to lessen the arousal that these sounds cause (*Jager et al., 2021*). In a study by Schröder et al., after eight

sessions of CBT once every two weeks, about half (48%) of the 90 participants reported improvement on the Clinical Global Impression-Improvement scale (CGI-I) and a reduction of 4.5 points on the Amsterdam Misophonia Scale (range 0 to 20) (*Schröder et al., 2017*).

In addition, after three months of CBT, patients' misophonic symptoms significantly decreased compared to the waiting-list group (*Jager et al., 2021*). According to the results of several case studies, CBT can effectively target the symptoms of misophonia (*Mattson et al., 2023*) and lead to significant improvements in mental and physical dysfunction and increased areas of functioning in patients (*McMahon et al., 2024*).

Fortunately, further research is underway to find effective therapeutic interventions for preventing and reducing misophonic symptoms. Thus, we decided to conduct this systematic review after reviewing various studies and the lack of a comprehensive review on the effectiveness of CBT on misophonia.

2. Method

This review followed the PRISMA-ScR checklist (*Moher et al., 2015*) for reporting systematic reviews ([Fig 1](#)). First, the purpose of the investigation and its rationale were established. A thorough, comprehensive approach to literature was used to identify the relevant research. The selection of studies was carried out using defined search parameters. The findings were gathered, incorporated, and presented. Experts then examined the results in the field.

2.1. Eligibility criteria

The PICO framework, consisting of Population, Intervention, Comparison, and Outcome, is commonly used by researchers to formulate clear and focused research questions. By defining these components, PICO helps establish inclusion and exclusion criteria, guiding the literature review process and ensuring a structured approach to research. This framework is essential for conducting valid, valuable research, as it helps focus the inquiry and facilitates systematic evidence searches (*Schardt et al., 2007*).

We included records if they a) reported randomized controlled trials (RCTs), open-label studies, and pilot cases where the effectiveness of a treatment was documented and tested, and misophonia was the primary complaint or treatment target. b) They have to describe a population of patients with misophonia. c) Treatment outcomes should have been accurately reported in trials. d) They included all ages and comorbidities. e) The data were limited to studies submitted in English.

As part of our rigorous selection process, records that reported on animal research or that were case reports or case studies (personal or expert opinions) were not included. Furthermore, records lacking an English full-text translation were excluded from our analysis.

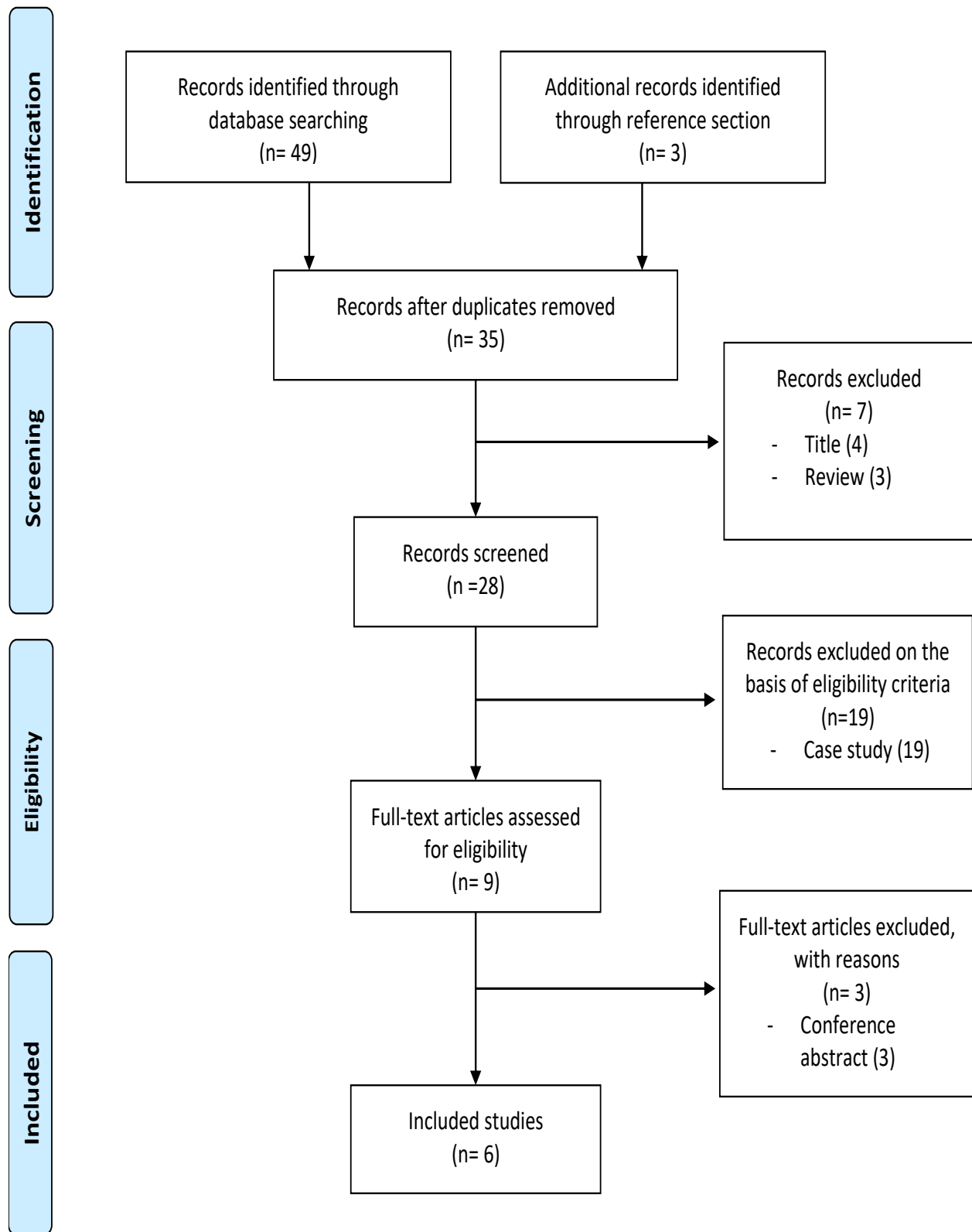


Fig. 1 PRISMA diagram

2.2. Information sources and search strategy

We searched PubMed, PsycINFO, Cochrane Central, Web of Science, and Google Scholar on November 17, 2023, for the keywords: “misophonia,” “Cognitive behavioral therapy (CBT),” and “misophonia treatments,” or “decreased sensitivity to sound.” In addition, there is a reference section to find other related sources that have not been found in the initial primary search; the relevant sources have been searched. In December 12, 2024, the searches were last renewed.

2.3. Study selection

Initially, all abstracts and article titles were independently evaluated according to predefined criteria. Subsequently, the full texts of the selected articles were thoroughly reviewed. During this evaluation, there was no disagreement between the researchers as to whether or not an article should have been submitted.

2.4. Data extraction

The researchers extracted all information from the articles into an Excel file based on the following items: Year of publication, study type, study objective, number of participants, the average age of participants, age range, the gender ratio of participants, clinical symptoms or concurrent physical or mental illnesses of participants, method of participant grouping, randomization of participants, blinding of grouping, blinding of therapists to the type of intervention, blinding of therapists to the type of intervention, triggering sounds, a treatment used, outcome measures, primary outcomes, number of treatment sessions, recommended techniques, medications or complementary treatments, assessment time, article outcome, conditions and limitations, weaknesses or strengths, and notes. Then, disagreements in the extracted data were minimized, and the researchers reached a final agreement through reassessment.

2.5. Risk of bias

The Cochrane Collaboration technique was employed to evaluate each study's potential for bias (*Higgins et al., 2003*). The writers assessed the risk of biases in reporting, performance, detection, attrition, and selection. The ultimate verdict is shown in [Table 1](#). There were three categories for the risk of biases: low, high, and undetermined. The numbers in the first row represent the reference numbers of the included studies, a (+) indicates low risk, a (?) indicates unclear risk, and a (-) indicates high risk. Other biases were associated with a possible source of bias

related to study design, insufficient data to determine an essential risk of bias or insufficient evidence regarding a significant issue.

Bias/ Included studies	Jager et al., 2020	Schröder et al., 2017	Ghorbani et al., 2022	Lewin et al., 2021	Rappoldt et al., 2023	McMahon et al., 2024
Random sequence generation	+	-	+	+	+	?
Allocation concealment	-	-	+	?	+	?
Selective reporting	?	?	+	?	+	+
Participants blinding	-	-	-	-	-	-
Outcome assessment blinding	+	-	?	+	+	?
Incomplete outcome data	+	+	?	?	?	+
Other biases	-	-	-	+	+	-

The numbers in the first row represent the reference numbers of the included studies, a (+) indicates low risk, a (?) indicates unclear risk, and a (-) indicates high risk. Other biases were related to potential sources of bias in study design, insufficient information to assess significant risks, or a lack of evidence regarding important matters

Table. 1 Risk of bias assessment for the included studies

3. Results

A total of 28 resources were eligible for initial screening after removing duplicates containing seven items. Of these, 19 were excluded due to being case studies, and the remaining nine were moved to the following screening stage. Finally, six studies remained after excluding three additional resources because they did not meet our study criteria, as shown in Figure 1. Of the included studies, five were RCTs and one was an open-label study. Four studies also had adjunctive treatments, but only the results from CBT are presented in the results table. [Table 2](#) gives information on the studies in question.

All interventions were conducted on individuals with misophonia, and most studies used the A-MISO-S (*Schröder et al., 2013*). To ensure the validity of our findings, we employed the Cochrane Collaboration technique, a widely recognized and rigorous method for assessing the potential for bias in each study (*Higgins et al., 2003*).

3.1. Definition of misophonia

Misophonia, a condition that can significantly disrupt daily life, is characterized by exceptionally strong negative responses to particular sounds (*Jastreboff & Jastreboff, 2014*). The seemingly innocuous sounds of chewing, breathing, or typing can trigger intense emotions like anger, disgust, and rage, accompanied by physical symptoms such as sweating and elevated heart rate (*Jager et al., 2020; Schröder et al., 2017; Ghorbani et al., 2022; Lewin et al., 2021; Rappoldt et al., 2023; McMahon et al., 2024*). These reactions can be so severe that they lead to social distancing and

avoidance behaviors (*Potgieter et al., 2019; Köroğlu et al., 2024; Campbell, 2023; Vitoratou et al., 2021; Bernstein et al., 2013; Brout et al., 2018; Dozier, 2015*).

Some authors have included the literal meaning of misophonia in their definitions as hatred of sound (*Edelstein et al., 2013; Giorgi, 2015; Kumar et al., 2014; Schröder, Vulink et al., 2013; Wu et al., 2014*). While the exact cause of misophonia remains unknown, it is believed to be a complex interplay of neurological and psychological factors, as described by Erfanian et al. (*Erfanian et al., 2019*). Although there is no universally accepted treatment for misophonia, there are promising approaches, such as CBT, that offer hope for managing the condition (*Erfanian et al., 2019; Köroğlu et al., 2024; Campbell, 2023; Vitoratou et al., 2021; Bernstein et al., 2013; Brout et al., 2018; Cavanna et al., 2015*).

Definitions of misophonia also include a wide range of emotional reactions. The broad spectrum of emotional responses includes discomfort, distress, anxiety (*Johnson et al., 2013; Wu et al., 2014*), hatred, irritability, anger, loss of self-control, and disgust (*Boyce, 2015; Colucci, 2015; Dozier, 2015a, 2015b, 2015c; Giorgi, 2015; Kumar et al., 2014, 2017; Reid et al., 2016; Schröder, Mazaheri, et al., 2013; Schröder et al., 2015, 2017; Webber et al., 2014; Wu et al., 2014*). Some definitions also mention physiological arousal (as a stimulus) and emotional reactions (*Bernstein et al., 2013; Edelstein et al., 2013; Vidal et al., 2017*).

3.1.1 Comorbid disorders

Misophonia may also be comorbid with a number of mental disorders, including anxiety, depression, and obsessive-compulsive disorder (OCD) (*Cavanna et al., 2015*). According to Jager et al, 28% of 27 individuals diagnosed with misophonia also received concurrent diagnoses based on Axis I of the DSM-IV diagnostic system for mental disorders (*Jager et al., 2021*). Notably, anxiety disorders were the most common comorbid condition with misophonia, with a prevalence of 45% reported by Ghorbani et al. (*Ghorbani et al., 2022*). Comorbidity with neurological disorders such as Tourette's syndrome and auditory system disorders also has been observed (*Naguy et al., 2022; Neal & Cavanna, 2013*). Refer to the "Comorbid Disorder(s)" section of [Table 2](#).

Table. 2 Overview of Selected Studies Based on Specific Criteria *

First author, year [Ref]	Sample information	Sessions	Age of onset (mean)	Triggers (%)	Comorbid disorder(s) (N)	Treatment	Outcomes	Categories	Control	Tools to assess outcomes	
								1. Face to face CBT 2. Online CBT	0. Waiting-list 1. Active control 2. Pre-test/ post- test 3. Other	Primary outcomes	Outcome measures
Schröder et al., 2017	- 90 participants - Age average: 35.8 - The individuals ranged in age from 18 to 64 years. - The study included 65 women and 25 men.	8 sessions bi-weekly	12.5	- Eating sounds (77%) - Ambient sounds (51%)	- Skinpicking disorder (5) - ADHD (4) - Obsessive-compulsive disorder (3) - Hypochondria (1) - Bulimia/anorexia (3) - Tourette syndrome (2) - Body dysmorphic disorder (1) - Bipolar II disorder (1) - Dysthymic disorder (2) - Depressive disorder (1)	G-CBT	- Patients with moderate misophonia symptoms saw an improvement to mild misophonia after CBT. - Almost half (48%) of the patients achieved a significant reduction in symptoms (at least 30% on a misophonia rating scale). - 9% of patients achieved complete remission of symptoms. - The severity of misophonia symptoms before treatment predicted the level of improvement. - Interestingly, experiencing disgust alongside anger as a triggered emotion was associated with a better response to treatment.	1	0	- A-MISO-S score - CGI-I	SCL-90
Jager et al., 2020	- 27 participants - Age average: 31.30 - The individuals ranged in age from 18 to 70 years. - The study included 21 women and 6 men.	3 months of weekly sessions	10.7	Not reported	- Irritable bowel syndrome (3) - Migraine (2) - Hypothyroidism (2) - Obsessive-compulsive disorder (1) - Depressive disorder (1) - (3) patients had tinnitus, but it clarifies that none of the participants reported hyperacusis, hearing loss, or other hearing problems.	G-CBT	- CBT significantly reduced misophonia symptoms compared to a waiting list group (3 months after treatment). - This improvement was sustained even 1 year after treatment ended. - Clinicians rated 74% of CBT completers as showing clinical improvement. - These results support previous findings about CBT's benefits for misophonia. - While symptoms improved, there wasn't a clear impact on overall quality of life (QoL) as measured by the used questionnaires.	1	0	- AMISOS- R score - CGI-I	- CGI-S score - SCL-90-R - EQ5-D - SDS - WHOQoL-BREF

*Note: Studies included in this table were selected based on predefined inclusion criteria mentioned in Fig. 1.

<i>First author, year [Ref]</i>	<i>Sample information</i>	<i>Sessions</i>	<i>Age of onset (mean)</i>	<i>Triggers (%)</i>	<i>Comorbid disorder(s) (N)</i>	<i>Treatment</i>	<i>Outcomes</i>	<i>Categories</i>	<i>Control</i>	<i>Tools to assess outcomes</i>	
								<i>1. Face to face CBT 2. Online CBT</i>	<i>0. Waiting-list 1. Active control 2. Pre-test/ post- test 3. Other</i>	<i>Primary outcomes</i>	<i>Outcome measures</i>
Lewin et al., 2021	- 48 participants and 4 pilot cases - Mean age of pilot participants were 15.5 years and 75% of participants were female.	10 sessions of 1 hour in 12 weeks	Not reported	Not reported	Not reported	- Family-based CBT (or UP-C/A) - RE	- The study proposes a novel approach using a modified family-based CBT program (UPC/A) that emphasizes exposure and distress tolerance for treating misophonia in adolescents. - Phase 1 pilot results with a small sample size suggest this approach is feasible, acceptable to patients and families, and shows promise for improvement in misophonia symptoms and overall well- being.	2	1	- CGI-S/I - CSR	- ADIS-5 C/P - MAI - CGAS - MQ-Y - AMISO-S - MAQ - MAS-1 - RCADS (-P Parent version) - BASC-3 - SDS - CASI - DTS - TAQ - CSQ - ERQ
Ghorbani et al., 2022	- 16 participants - Age average: 29.43 - The study included 15 women and 1 men.	10 online sessions via Skype	Childhood (5) Teenager (6) Adult (5)	The eating sound was the most frequently reported annoying sound.	- Anxiety disorders (9) - OCPD (7) - Depression/depressive disorders (3) - ADD/ADHD (2) - Obsessive-compulsive disorder (1)	- OG-CBT - OG-MACT	- CBT (OG-CBT) showed effectiveness in reducing misophonia symptoms over time (pre-test to post-test with sustained improvement at follow-up). - A high percentage (69%) of participants in the CBT group achieved clinically significant reductions in misophonia symptoms. The study suggests better outcomes might be linked to higher attendance in therapy sessions. - Alongside reduced misophonia, CBT also led to improvements in anxiety, depression, and distress tolerance.	2	2	MQ	- MQ - DTS - DASS-21 - WHOQOL-BREF

First author, year [Ref]	Sample information	Sessions	Age of onset (mean)	Triggers (%)	Comorbid disorder(s) (N)	Treatment	Outcomes	Categories	Control	Tools to assess outcomes	
								1. Face to face CBT 2. Online CBT	0. Waiting-list 1. Active control 2. Pre-test/ post- test 3. Other	Primary outcomes	Outcome measures
Rappoldt et al., 2023	- 80 participants - Age average: 13 - The individuals ranged in age from 8 to 18 years. - The study included 38 women and 42 men.	7 sessions of 1/5 hours in 7 weeks	13	Not reported	Not reported	- G-CBT - PMT	- This study aims to assess if a combined CBT/PMT treatment program can effectively lessen the severity of misophonia in children and adolescents. - Validation of new misophonia questionnaires specifically designed for children is expected to improve screening and diagnosis accuracy. - The research may provide valuable insights into the characteristics of misophonia in this age group. - If successful, this study could lead to the establishment of a reliable treatment approach for childhood misophonia.	1	0	AMISOS-Y	- Misophonia Screening List-Child and Youth - CBCL - TRF - YSR - ADHD-vragenlijst; AVL - SSP-NL - AASP-NL - CGI-I - CHQ - CarerQoI - COI - Standardized social validity forms - Coercive Disruptive Behavior Scale – Misophonia
McMahon et al., 2024	- The first study included 8 and the second one included 10 participants. - Age average of the first study: 35 - The individuals ranged in age from 8 to 18 years. - The study included 38 women and 42 men.	16 sessions	Not reported	- Chewing - Rustling - People eating	- MDD (3) - PDD (1) - AG (2) - SOC (3) - GAD (7) - BPD (1) - AFI (1) - SAD (3) - OSA (1) - PTSD (1) - OCD (1) - OSO (2) - PMD (2) - AUD (1) - CD (1) - ADHD (2) - SP (1)	- Unified Protocol - CBT - Mindfulness	- Patients with misophonia found the UP (both standard and adapted versions) acceptable and helpful in managing their symptoms. - The UP showed promise in reducing emotional and behavioral responses to misophonia triggers. - Some patients reported improvements in misophonia symptoms (sensitivity to sounds) and anxiety. - The UP appears to teach patients coping skills for managing misophonia effectively, even if the trigger sounds remain somewhat bothersome.	1	3 (single-case experimental design)	- MQ - OASIS - ODSIS - OAnSIS	- MQ - OASIS - ODSIS - OAnSIS - DMQ

T2. Summary of studies. Abbreviations: (G-CBT): Group cognitive behavioral therapy, (SCL-90): Symptom Checklist-90, (A-MISO-S): Amsterdam Misophonia Scale, (CGI-I): Clinical Global Impression-Improvement score, (QoL): Quality of Life, (AMISOS-R): Amsterdam Misophonia Scale-Revised, (CGI-S) Clinical Global Impressions – Severity score, (SCL-90-R): Symptom Checklist-90-Revised, (EQ5-D): a questionnaire that assesses health in five key areas: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression, (SDS): Sheehan Disability Scale, (WHOQoL-BREF): World Health Organization Quality of Life Brief Version, (UP-C/A): Unified Protocol for Transdiagnostic Treatment of Emotional Disorders in Children and Adolescents, (RE): Relaxation Training, (CSR): clinician severity rating, (ADIS-5 C/P): Anxiety Disorders Interview Schedule for DSM-5 Parent/ child, (MAI): Misophonia Assessment Interview, (CGAS): Child's Global Assessment Scale, (MQ-Y): Misophonia Questionnaire – Youth, (MAQ): Misophonia Assessment Questionnaire, (MAS-1): Misophonia Activation Scale, (RCADS): Revised Children's Anxiety and Depression Scale, youth self-report and parent report, (BASC-3): Behavior Assessment System for Children (3rd edition), (CASI): Childhood Anxiety Sensitivity Index, (DTS): Distress Tolerance Scale, (TAQ): Treatment Acceptability Questionnaire, (CSQ): Client Satisfaction Questionnaire, (ERQ): Expectancy Rating Questionnaire, (OCPD): obsessive-compulsive personality disorder, (ADD/ADHD): attention deficit disorder/attention deficit hyperactivity disorder, (OG-CBT): Online group-CBT, (OG-MACT): Online group-mindfulness -and acceptance-based therapy, (MQ): Misophonia questionnaire, (DASS-21): depression, anxiety, and stress scale, (PMT): psychomotor therapy, (AMISOS-Y): Amsterdam Misophonia Scale – Youth, (CBCL): Child Behavior Checklist, (TRF): Teacher Report Form, (YSR): Youth Self Report for children older than 11, (ADHD-vragenlijst; AVL): Attention problems will be assessed by the Dutch ADHD questionnaire, (SSP-NL): Sensory processing will be assessed by the Short Sensory Profile – NL, (AASP-NL): Adolescent/Adult Sensory Profile – NL, (CHQ): Child Health Questionnaire, (CarerQoI): Care-related quality of life, (COI): Cost of illness, (MDD): major depressive disorder, (PDD): persistent depressive disorder, (AG): agoraphobia, (SOC): Social Anxiety Disorder, (GAD): generalized anxiety disorder, (BPD): borderline personality disorder, (AFI): avoidant/restrictive food intake disorder, (SAD): social anxiety disorder, (OSA): other specified anxiety disorder, (PTSD): posttraumatic stress disorder, (OSO): other specified obsessive compulsive and related disorder, (PMD): premenstrual dysphoric disorder, (AUD): alcohol use disorder, (CD): cyclothymic disorder, (SP): specific phobia, (OASIS): Overall anxiety severity and impairment scale, (ODSIS): Overall depression severity and impairment scale, (OAnSIS): Overall anger severity and impairment scale, (DMQ): Duke Misophonia Questionnaire

3.2. Cognitive Behavioral Therapy (CBT)

CBT is a well-researched and structured short-term therapy that aims to address maladaptive thought patterns and behaviors, commonly applied in treating mental health disorders such as anxiety, depression, and post-traumatic stress, by involving techniques that help patients identify and challenge distorted cognitions, leading to improved emotional and behavioral responses, and is recognized for its effectiveness in reducing symptoms and improving overall psychological functioning (*Hofmann et al., 2012*).

Although limited results have been obtained so far for the effective treatment of misophonia, CBT has been recognized as the most effective approach. In a study by Schröder and colleagues, 90 patients with moderate misophonia received CBT sessions bi-weekly (*Schröder et al., 2017*). The components of this therapy included task concentration exercises, counterconditioning, stimulus manipulation, and relaxation exercises. The task concentration exercises aimed to redirect the patient's attention from the triggering sound to something else whenever they encountered the sound. In counterconditioning, pleasant stimuli, like the person's favorite music, were paired with triggering sounds, like chewing noises, to establish positive associations. Dozier initially used this approach in his case studies (*Dozier 2015a, 2015b, 2015c*). The triggering sounds were made manageable through stimulus manipulation so that people could do so in a secure setting, like on a computer. Finally, relaxation techniques were used to lessen agitation brought on by the triggering noises.

Nine percent of patients experienced total symptom remission following group cognitive behavioral therapy (G-CBT), and 48% had a 30% or higher decrease in their A-MISO-S scores (*Schröder et al., 2017*). Furthermore, after three months of CBT, a significant decrease in misophonia symptoms was seen in a study by Jager and colleagues compared to the waiting list group. This improvement persisted a year after the treatment's conclusion (*Jager et al., 2021*). In research conducted at Tehran's Tarbiat Modares University, 69% of participants reported improved misophonia symptoms following CBT. This therapy also led to reductions in anxiety and depression and increased distress tolerance (Ghorbani et al. reported results for OG-CBT and OG-MACT separately, ensuring clarity in their individual effectiveness) (*Ghorbani et al., 2022*).

4. Discussion

This systematic review aimed to investigate the effectiveness of CBT for misophonia. We found six studies that met our inclusion criteria, five being RCTs

and one being an open-label study. The studies provided encouraging evidence that CBT can be a practical treatment approach for misophonia, leading to significant reductions in symptoms and improved quality of life for patients (*Schröder et al., 2017; Bernstein et al., 2013; Dozier 2015a, 2015 b; McGuire et al., 2015; Reid et al., 2016; Rosenthal et al., 2023*).

CBT is effective in treating misophonia by developing coping skills to prevent and appropriately respond to its distressing symptoms (*Brout et al., 2018; Jager et al., 2021*). It is assumed that this disorder is not caused by anatomical abnormalities leading to auditory problems (*Møller, 2011*) but rather by an overly sensitive connection between the limbic and sympathetic nervous systems (*SNS; Jastreboff & Hazell, 2008*). Some authors believe this hypersensitivity in individuals with misophonia can be altered by changing their cognition and behavior (*Swedo et al., 2022*). Furthermore, CBT helps patients with misophonia to have greater control over their emotions and behavioral reactions, allowing them to exhibit fewer negative responses whenever they hear or anticipate triggering sounds (*Ferrer-Torres & Giménez-Llort, 2022*).

A key strength of this review is its focus on RCTs, which provide a robust methodology that strengthens the overall findings and increases confidence in the results. Notably, all studies reported positive outcomes for CBT, with a significant decrease in misophonia symptoms observed in both treatment groups compared to controls. This consistency across studies using diverse methodologies suggests that CBT offers a robust and generalizable treatment approach for misophonia (*Schröder et al., 2017*).

4.1. Limitations and Future Directions

Despite the promising findings, some limitations need to be addressed. First, the sample sizes in the included studies were relatively small. However, the potential of larger-scale studies with more extended follow-up periods to confirm the long-term efficacy of CBT for misophonia is a beacon of hope. Additionally, the studies included participants with varying degrees of misophonia severity, and this opens the door for future research to explore whether CBT is equally effective for all severity levels.

Another limitation is the potential for comorbid conditions. Misophonia is often comorbid with other mental health disorders, such as anxiety and depression (*Erfanian et al., 2019*). The studies included in this review did not control for these comorbidities, which could potentially influence the treatment outcomes. Future

research should investigate the effectiveness of CBT for misophonia in patients with comorbid conditions (*Erfanian et al., 2019*).

Finally, it is essential to acknowledge that CBT may not be suitable for all patients with misophonia. Some individuals may have difficulty engaging in therapy or may require additional treatment modalities in conjunction with CBT. Further research is needed to identify factors that predict treatment response and to develop alternative treatment options for patients who do not respond well to CBT.

5. Conclusion

This systematic review suggests that CBT is a promising treatment approach for misophonia, with the potential to reduce symptoms and improve the quality of life for patients significantly (*Jager et al., 2021; Schröder et al., 2017; Bernstein et al., 2013; Dozier 2015a, 2015 b; McGuire et al., 2015; Reid et al., 2016; Rosenthal et al., 2023*). However, further research is needed to address the limitations identified in this review and to optimize CBT interventions for misophonia. Future studies should explore the effectiveness of CBT for different severities of misophonia, investigate the impact of comorbid conditions on treatment outcomes, and identify factors that predict treatment response. Additionally, research into alternative treatment modalities for misophonia is crucial to ensure that all patients have access to effective interventions.

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