Online Emotion Regulation for an Adolescent with Misophonia: A Case Study

Nicolò Zarotti[a*] (ORCID 0000-0002-8129-6151), Amber Tuthill[b], Paul Fisher[a] (ORCID 0000-0003-4232-1198)

[a] *Department of Clinical Psychology and Psychological Therapies, Norwich Medical School, University of East Anglia, Norwich, UK*

[b] *Child Family and Young Person Service Central Norfolk, Norfolk and Suffolk NHS Foundation Trust, Norwich, UK*

[*] Corresponding author. E-mail: n.zarotti@uea.ac.uk. Address: Department of Clinical Psychology and Psychological Therapies (CPPT), Norwich Medical School, University of East Anglia, Norwich Research Park, Norwich NR4 7TJ, UK.

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Ethical Standards

All procedures performed in the study were run in accordance with the ethical standards of the institutional and/or national research committees, as well as the Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent and Consent to Publish

Written informed consent to participate and consent to publish were obtained from both the adolescent participant and her mother.

Abstract

Misophonia is a novel diagnosis characterised by extreme and uncontrollable autonomic reactions and emotional responses to selective auditory stimuli, which can significantly impair an individual's daily life. No agreed diagnostic criteria are currently available for misophonia, and any therapeutic guidance is yet to be formalised. In this case study, a tailored psychological intervention based on the cognitive model and developed around emotion regulation principles and techniques was adopted to treat misophonia in a 16-year-old female from the United Kingdom. The treatment lasted for 15 weeks and was delivered online due to the ongoing COVID-19 social distancing regulations. The results showed that the intervention was feasible and acceptable, and effective at reducing levels of misophonic symptoms from severe to moderate/mild while also improving emotion dysregulation and overall anxiety and depression. Particular improvements were observed for specific skills such as acceptance and awareness of emotional responses and increased access to emotion regulation strategies. These findings also translated into a number of reported daily life improvements in the client's psychological and social well-being. As the current evidence base on misophonia continues to develop, more methodologically rigorous research is warranted to build on the present findings and inform the adoption of further psychotherapeutic approaches to treat this new condition.

Keywords: misophonia, emotion regulation, psychotherapy, cognition, adolescent.

Introduction

Misophonia (from the Greek *mísos*, 'hatred', and *phoné*, 'sound') has been defined as a chronic condition in which extreme and unpleasant emotional experiences and hyperarousal are observed in response to specific sounds (Cavanna, 2014; Potgieter et al., 2019). First described at the turn of the century (Jastreboff & Jastreboff, 2002), over the past two decades misophonia has received increasing attention in the clinical literature (Bernstein et al., 2013; Kumar et al., 2017), in particular due to the significant impact it can have on daily well-being and psychosocial functioning (Potgieter et al., 2019). Most affected individuals appear to get triggered by sounds linked to human actions such as breathing (e.g., sniffing), eating and drinking (e.g., chewing), or body manipulations (e.g., knuckle cracking; Edelstein et al., 2013), and tend to experience intense reactions characterised by anger, disgust, and increased autonomic arousal. Neuroimaging studies have also linked the condition to a hyperactivation of the limbic system, and in particular the amygdala (Kumar et al., 2017; San Giorgi, 2015).

Anticipation of triggers can cause considerable levels of worry and anxiety, and typical coping mechanisms include avoidance (e.g., wearing earplugs, avoiding social situations), self-harm (e.g., cutting, skin pinching), and compulsions (Cavanna & Seri, 2015; Webber & Storch, 2015). Interestingly, responses to triggers tend to be stronger when these come from closer people (e.g., family members, friends; Edelstein et al., 2013), and people with misophonia cannot 'self-trigger' by producing similar sounds (Potgieter et al., 2019). Occasionally, people may also begin to respond to soundless visual stimuli which remind them of auditory triggers (e.g., seeing people eat; Potgieter et al., 2019). No clear cause has been identified so far for misophonia and no official diagnostic criteria are currently available (Kumar et al., 2017).

The onset of difficulties tends to be during childhood or early teenage years and typically occurs in absence of neurological deficits, auditory impairments, or autism (Ferreira et al.,

2013; Schröder et al., 2013). Occasionally, comorbidity has been observed with mood and anxiety disorders, obsessive-compulsive disorder (OCD), attention deficit hyperactivity disorder (ADHD), and Tourette syndrome (Bruxner, 2016; Ferreira et al., 2013; Johnson et al., 2013; McGuire et al., 2015; Neal & Cavanna, 2013; Schröder et al., 2013; Webber et al., 2014). Prevalence estimates are currently sparse, with reports of mild to moderate symptoms ranging between 12% and 37%, but rates of clinically significant impairments of daily life between 0.3% and 6%; (Naylor et al., 2020; Zhou et al., 2017). As affected individuals often report other family members who share similar difficulties, a number of developmental, behavioural, and genetic aetiological hypotheses have been formulated (Potgieter et al., 2019).

With regards to psychological interventions for misophonia, the current literature is still quite scarce, with the majority of the evidence coming from single case studies (Potgieter et al., 2019). The most commonly adopted approach is traditional cognitive behavioural therapy (CBT), which proved to be effective in a number of investigations (e.g., Bernstein et al., 2013; McGuire et al., 2015; Schröder et al., 2017). Other case studies using mindfulness and acceptance and commitment therapy (ACT; Schneider & Arch, 2017), dialectical behaviour therapy (DBT; Kamody & Del Conte, 2017), retraining counselling (Vanaja & Abigail, 2020), and counterconditioning (Dozier, 2015) also showed promising results. Little to no benefits were instead reported for exposure therapy (Hadjipavlou et al., 2008) or psychiatric medication alone (Tunç & Başbuğ, 2017). Moreover, except for counterconditioning, all of the treatments above were administered face to face.

Despite the current evidence suggesting that misophonia is strongly linked to an individual's emotional system (Palumbo et al., 2018; Potgieter et al., 2019) – especially in terms of accepting and regulating emotional responses (Cassiello-Robbins et al., 2020) – to our knowledge no investigation has so far explored the adoption of an intervention tailored to target

these difficulties specifically. In addition, the feasibility of delivering psychotherapy online with this population is still unclear. This study illustrates the case of an adolescent with severe misophonia successfully treated with a tailored online emotion regulation intervention.

Methods

Case presentation

Sophie[†], a 16-year-old white British female, was referred by her General Practitioner (GP) to a local Youth Psychology Service in late 2020 due to difficulties with regulating emotions. The second of three children, she was currently living with her mother and younger sister. Her first year of high school had just been disrupted abruptly by the second wave of the COVID-19 pandemic in the UK, leading to a worsening of her difficulties. At the time of evaluation, Sophie had no previous history of involvement with mental health services and, due to social distancing regulations, any interaction with her had to take place remotely via Zoom®.

Presenting problems

Sophie presented as a bright adolescent who was consistently experiencing extreme autonomic and emotional reactions in response to specific auditory stimuli, which included the sound of people sniffing, chewing, and eating. Once triggered, she would start feeling a marked body temperature increase, followed by anger, sensory overload, skin crawling sensations, and the urge to be verbally aggressive towards the source of the sounds and escape the situation. After a variable cooling-down time (e.g., minutes or hours), she would eventually feel saddened and guilty for her reaction. As a consequence, Sophie would also often experience anticipatory anxiety for triggers, self-deprecating thoughts, and rumination around her difficulties and not

[†] The name has been changed to preserve anonymity.

being able to control herself. These were made even worse by the fact that her reactions tended to be more severe when the triggers came from people close to her, such as friends and relatives, while the same sounds had no effect if she was the one producing them.

In an effort to prevent herself from getting triggered, Sophie had started being less sociable and going out more rarely with her friends. She would also wear noise-cancelling headphones or earplugs on most daily occasions, including during classes at school, while watching movies, or when having meals at home with her family. Despite this, over time she had noticed that she could still get triggered at least partially by *seeing* people chew or sniff. In these and similar overwhelming situations, she would frequently isolate and start to knock her head or pinch her skin as a way to distract herself from the triggers.

Personal History

Sophie reported having had a happy childhood. Even though her parents had divorced when she was around 11, they had maintained a positive rapport, which allowed her to enjoy a good relationship with the whole family. Accordingly, Sophie could not identify any traumatic or critical incidents while she was growing up, nor any significant psychological difficulties other than her presenting problems. With regards to these, although unable to recall the exact time of onset, Sophie remembered having struggled with specific sounds since at least age eight or nine – around the time of her earliest memory of being triggered by chewing noises while sitting at a lunch table in primary school.

However, issues with auditory stimuli were not new to Sophie while growing up, as her mother (and later her younger sister) showed signs of having somewhat similar difficulties, albeit much less impactful and characterised by sensitivity for different sounds (e.g., knuckle cracking). If initially this had allowed Sophie to find a somewhat understanding environment at home, as her reactions had become increasingly stronger so had her thoughts of being the only person

having an actual ‘problem’. Combined with the stress caused by the outbreak of the COVID-19 pandemic, this had eventually led her to be referred to the Youth Psychology Service for evaluation, which was carried out by the first author and supervised by the second author.

Assessment

A semi-structured approach was adopted for the initial assessment with Sophie. The clinical interview showed that, based on her selective and isolated difficulties, Sophie’s presentation was compatible with the description of misophonia available in the current literature. Sophie herself was aware of this, as she had previously carried out a number of internet searches on the topic which had allowed her to find some useful validation. However, some of these searches had also upset her by returning results compatible with autism spectrum disorder (ASD). Due to the tendency of misophonia to present in absence of ASD (Ferreira et al., 2013; Schröder et al., 2013) – and since Sophie did not display any evident neurodivergent features at evaluation – a first collaborative hypothesis was then formulated with her to exclude the potential masking of autistic traits during social interactions.

To test this, Sophie completed the Camouflaging Autistic Traits Questionnaire (CAT-Q; Hull et al., 2019), on which she scored 79 out of 175 – well below the average score of autistic women (M = 124, SD = ± 23.27) and in line with the average score of non-autistic women (M = 91, SD = ± 27.67; Hull et al., 2020). It was therefore agreed with her that ASD appeared unlikely to be the cause of her difficulties. Following this, Sophie was then administered the Amsterdam Misophonia Scale (A-MISO-S; Schröder et al., 2013), a validated misophonia self-report measure (Naylor et al., 2020). On this, she scored 17 out 24 – a result compatible with ‘severe misophonia’ and representing less than 0.5% of the normative data sample consisting of young adults (Naylor et al., 2020). Thus, in light of Sophie’s history and specific presenting problems, the outcome of her initial assessment, and the lack of formalised diagnostic criteria,

a working diagnosis of misophonia was agreed with her to be used as the basis for the conceptualisation of her case.

Case Conceptualisation

Sophie's presenting difficulties were conceptualised from a cognitive behavioural perspective, whereby her selective emotional difficulties – conceived in light of her working diagnosis of misophonia – had paved the way for the development of several potentially unhelpful cognitive and behavioural coping strategies, which would in turn further increase her emotional distress (Gross, 2013). As highlighted during the initial assessment, these difficulties translated in the sounds of people sniffing, chewing, or drinking acting as selective and overwhelming emotional triggers for Sophie, especially within familiar contexts like school or home. Her immediate emotional reaction consisted of fits of rage and disgust, as well as signs of autonomic arousal such as increased body temperature, sensory overload, and skin crawling sensations throughout her entire body. In response, Sophie would then feel compelled to act out behaviourally, often by shouting at the people causing the triggers, storming out of the room, or engaging with mild forms of self-harm like head knocking or skin pinching.

Under this perspective, over time the awareness of her misophonic difficulties had led Sophie to develop multiple negative and self-deprecating thoughts, which mainly revolved around being different (*"I am wrong"*), uncontainable (*"I just can't control myself"*), powerless ("*nothing I do seems to work"*), and beyond help (*"there is no treatment"*). In turn, these often caused her to feel increased anxiety, shame, guilt, and sadness, all potentially exacerbated by selective attention for triggers, which worsened the autonomic reactions and bodily sensations caused by misophonia. Moreover, any validation from her mother and younger sister showing similar yet milder difficulties appeared to be largely supplanted by feeling the 'wrong one' experiencing the most severe reactions. Ultimately, the combination of these factor had led

Sophie to develop a set of preventative behaviours – including self-isolation and avoidance (e.g., wearing headphones) – which significantly impaired her daily well-being.

Therapy Goals and Intervention Design

Due to the impact of her difficulties on her day-to-day quality of life, Sophie wanted to focus her therapy work on her here and now experience. In particular, her main goals were to improve her knowledge about emotions and misophonia, as well as to learn better ways to cope with her triggers and accept and regulate her emotional reactions. In light of this and the current lack of formal therapeutic guidance around misophonia (Potgieter et al., 2019), a plan for an individual emotion regulation intervention was discussed and agreed with Sophie, to be tailored around her case conceptualisation and specific goals.

For the intervention design, technical eclecticism was adopted as a conceptual framework (Lazarus & Beutler, 1993). This was considered appropriate as it granted the adoption of the cognitive model as a coherent theoretical base on which the case conceptualisation was built (Beck, 1979), while also allowing for a broader selection of techniques from other evidence-based therapies (Castelnuovo, 2010). More specifically, a number of emotion regulation elements were drawn from third wave approaches – such as mindfulness, ACT, and DBT – and were combined with more traditional techniques such as psychoeducation, progressive muscle relaxation (PMR), and cognitive restructuring (Gross, 2013; Leahy et al., 2011).

Outcome Measures

Three standardised clinical outcome measures were adopted to monitor Sophie's progress.

Amsterdam Misophonia Scale (A-MISO-S; Schröder et al., 2013)

The A-MISO-S is a 7-item self-report questionnaire measuring the severity of misophonic symptoms on a 5-point Likert scale. It yields a total score ranging from 0 to 24, divided into five categories of severity: subclinical (0–4), mild (5-9), moderate (10-14), severe (15-19), and extreme (20-24). The A-MISO-S has been validated in a population of young adults, showing robust psychometric properties (Naylor et al., 2020).

Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004)

The DERS is a 36-item self-report measure of emotion regulation difficulties rated on a 5-point Likert scale. Its maximum score is 180, with a higher score corresponding to more difficulties. Six subscale scores are also provided: nonacceptance of emotional responses, difficulties engaging in goal directed behaviour, impulse control difficulties, lack of emotional awareness, limited access to emotion regulation strategies, and lack of emotional clarity. The DERS has consistently shown good validity and reliability (Gratz & Roemer, 2004; Ritschel et al., 2015).

Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983)

The HADS is one of the most widely adopted measures of anxiety and depression and consists of 14 items rated on a 4-point scale. It yields separate scores out of 21 for both anxiety and depression – with a suggested clinical cut-off of 8/21 – and is characterised by very robust psychometric properties (Bjelland et al., 2002). The HADS was adopted to monitor Sophie's levels of anxiety and depression throughout the intervention stage.

Results

Course of Treatment

Sophie's treatment consisted of 15 weekly sessions lasting approximately one hour, with the addition of a follow-up session after one month. These were delivered online by the first author

under the supervision of the second author and were organised as illustrated below. With the exception of the A-MISO-S, which was also part of the initial assessment, each outcome measure was administered at the beginning of the practical emotion regulation work (Session 4) and repeated at the start of each subsequent therapy component (Session 8 and Session 11), at the end of treatment (Session 15), and at follow-up (1-month). Regular risk assessments were carried out within the multidisciplinary team throughout the whole course of treatment, to monitor Sophie's safety and in particular any potential worsening of self-harming behaviours.

Sessions 1-3: Psychoeducation

Following the initial assessment, the first three sessions were dedicated to psychoeducation around emotions, their evolutionary meaning, and their associated neuroanatomical bases. The current evidence around misophonia was also discussed, in order to challenge unhelpful myths (e.g., being untreatable). For these sessions, several digital resources were adopted, such as the Ekmans' Atlas of Emotions (http://atlasofemotions.org), YouTube videos (e.g., TED Talks), extracts from books (e.g., *Emotions Revealed*; Ekman, 2003), and interactive 3D brain models.

Sessions 4-7: Basics of Emotion Regulation

Sessions 4 to 7 marked the beginning of active therapeutic work and focused on the fundamentals of emotion regulation as a coping strategy. These included exercises on awareness, identification, and acceptance of emotions drawn from ACT and DBT (Harris, 2009; Linehan, 2015). Mindfulness and PMR were also introduced around this time, and exercises such as body scan, mindful breathing and eating, and mindfulness of emotions were practised and assigned to Sophie as homework. Mindfulness skills were deemed particularly important for the intervention due to previous encouraging results with people with misophonia (Schneider & Arch, 2017), as well as evidence showing that they can mediate the relationship between resilience and emotion regulation strategies in young adults (Zarotti et al., 2020).

Sessions 8-10: Distress Tolerance

Sessions 8 to 10 were dedicated to introducing Sophie to the DBT concept of distress tolerance (Linehan, 2015). This was meant to provide Sophie with the skills to tolerate her auditory triggers prior to engaging with more cognitively focused strategies. Exercises adopted in these sessions included TIPP (Temperature, Intense exercise, Paced breathing, Paired muscle relaxation), ACCEPTS (Activities, Contributing, Comparisons, Emotions, Push away, Thoughts, Sensation), IMPROVE (Imagery, Meaning, Prayer, Relaxation, One thing in the moment, Vacation, Encouragement), self-soothing, and radical acceptance (Linehan, 2015).

Sessions 11-13: Cognitive Restructuring

The last three sessions before the end of the intervention were focused on introducing cognitive restructuring strategies tailored around Sophie's emotion regulation needs. These built on the distress tolerance skills she had developed in the previous weeks, and included exercises such as distinguishing thoughts from feelings, avoiding emotional thinking, looking for the evidence, and 'Advice I would Give a Friend'. Cognitive restructuring was included as an 'antecedent' emotion regulation strategy, whereby emotional impacts of events can be reduced by modifying their cognitive interpretations (Gross, 2013; Leahy et al., 2011).

Sessions 14-15: Ending

The last two sessions of the intervention were dedicated to providing Sophie with a summary of the therapy work she had undergone. This was then used to review the intervention components which had proved most feasible and acceptable for her – i.e., TIPP, IMPROVE, mindfulness, and PMR – and to build a relapse prevention plan around them.

Follow-Up

One month after the end of the intervention Sophie attended a further session to monitor her progress and complete the outcome measures once more.

Table 1

Sophie's Scores on All Outcome Measures Across the Intervention.

Measure	IA	S4	S8	S11	S15	1-month	RCI
A-MISO-S	17	14	15	13	11	10	3*
DERS_TOTAL		134	117	116	95	80	5.03*
DERS_NONACCEPT		19	21	9	7	6	4.64*
DERS_GOALS		25	23	24	20	19	2.15*
DERS_IMPULSE		26	24	26	24	17	0.86
DERS_AWARE		17	11	15	10	7	2.41*
DERS_STRATEGIES		36	28	29	23	21	4.29*
DERS_CLARITY		11	10	13	11	10	0
HADS_A		10	11	12	7	6	1.33
HADS_D		8	6	9	4	2	1.92

Note. * = clinically reliable change (i.e., > 1.96); 1-month = 1-month follow-up; A-MISO-S = Amsterdam Misophonia Scale; DERS_AWARE = lack of emotional awareness; DERS_CLARITY = lack of emotional clarity; DERS_GOALS = difficulty engaging in goal-directed behaviour; DERS_IMPULSE = impulse control difficulties; DERS_NONACCEPT = nonacceptance of emotional responses; DERS_STRATEGIES = limited access to emotion regulation strategies. DERS_TOTAL = total difficulties in emotion regulation; HADS_A = Hospital Anxiety and Depression Scale Anxiety Score; HADS_D = Hospital Anxiety and Depression Scale Depression Score; IA = initial assessment; RCI = Reliable Change Index (between IA/S4 and S15); S = Session.

Outcome

Sophie's results on all outcome measures during the intervention are shown in Table 1 and discussed below. Figure 1 illustrates the total score trends for each measure across sessions, while Figure 2 shows the pre, post, and follow-up comparisons on the DERS subscales.

Misophonia

Sophie's presenting level of misophonic difficulties, as measured by the A-MISO-S at initial evaluation, was 17/24 and categorised as 'severe misophonia'. Prior to beginning the practical emotion regulation work (Session 4), which followed familiarisation with her therapist and three sessions of psychoeducation, her score had dropped to 14/24, at the highest end of the 'moderate misophonia' range. While this might have been the result of engaging and building rapport with a mental health professional for the first time and psychoeducation impacting on her view of her difficulties, the change was also not sufficiently large to exclude variation due to simple measurement unreliability (Reliable Change Index, RCI = 1.5; Jacobson & Truax, 1991). By Session 8 her difficulty level had raised to 15, potentially due to the increased distress which can characterise the early stages of practical therapeutic work, in particular when involving distress tolerance techniques. However, across the following sessions Sophie's misophonia score showed a constant decreasing trend, reaching the lowest end of the 'moderate misophonia' range and achieving a clinically reliable change to 11 by the end of the intervention (RCI = 3). A further 1-point decrease was observed at the 1-month follow-up, which placed Sophie only one point away from the 'mild misophonia' range.

Emotion Regulation Difficulties

Sophie's total difficulties in emotion regulation showed a marked decrease throughout the entire intervention, starting with a DERS Total Score of 134 at Session 4 and reaching a clinically reliable change to 95 at the end of treatment (RCI = 5.03), with a further 15-point improvement to 80 after one month. Similarly, her DERS subscale scores also showed clinically reliable changes between pre- and post-treatment and additional improvements at follow-up for most specific dimensions of emotion regulation difficulties. Among these, the most reliable changes were observed for nonacceptance of emotional responses (RCI = 4.64),

lack of emotional awareness (RCI = 2.41), and limited access to emotion regulation strategies (RCI = 4.29). This result was consistent with Sophie's therapeutic goals set out at the intervention design stage, which included accepting and regulating her emotional reactions and developing a number of strategies to cope with misophonic triggers.

Anxiety and Depression

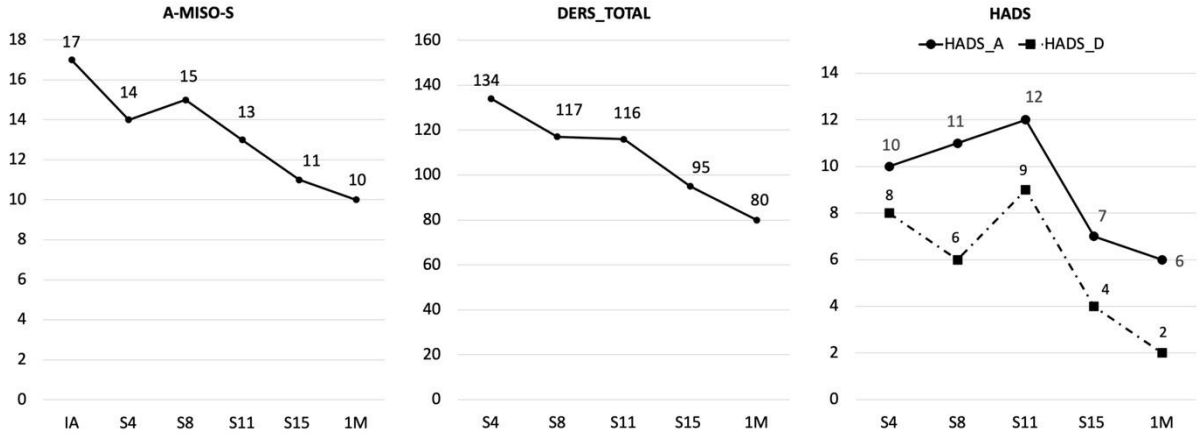
Based on the suggested cut-off of 8/21 for the HADS (Bjelland et al., 2002), Sophie initially presented with clinical levels of anxiety (HADS_A = 10) and depression (HADS_D = 8). Both scores also appeared to increase slightly halfway through the intervention (S11). This may have been a result from engaging with cognitive restructuring exercises, but it was also noted that Sophie was undergoing a particularly stressful period in school at that time. Indeed, following a reduction of school-related workload, at Session 15 (end of treatment) her scores had decreased by five points. While this change was not clinically reliable when compared to her pre-intervention levels (HADS_A RCI = 1.33; HADS_D RCI = 1.92), Sophie's anxiety and depression did drop below the clinical cut-off, thus making her change clinically significant (Jacobson & Truax, 1991), and further improvements were observed at the 1-month follow-up.

Feasibility and Acceptability

At the end-of-treatment review (Session 15), Sophie was enthusiastic about the progress she had made and claimed to have found the therapy work very acceptable overall. In particular, she identified in mindfulness, PMR, and distress tolerance techniques such as TIPP and IMPROVE the components which she felt were the most acceptable for her. She also mentioned how being able to watch YouTube videos and interact with 3D brain models via live screen sharing had been particularly helpful during the psychoeducation sessions. These observations were consistent with the impressions of her therapists, who found the therapy work feasible despite the intrinsic limitations of the online format.

Figure 1

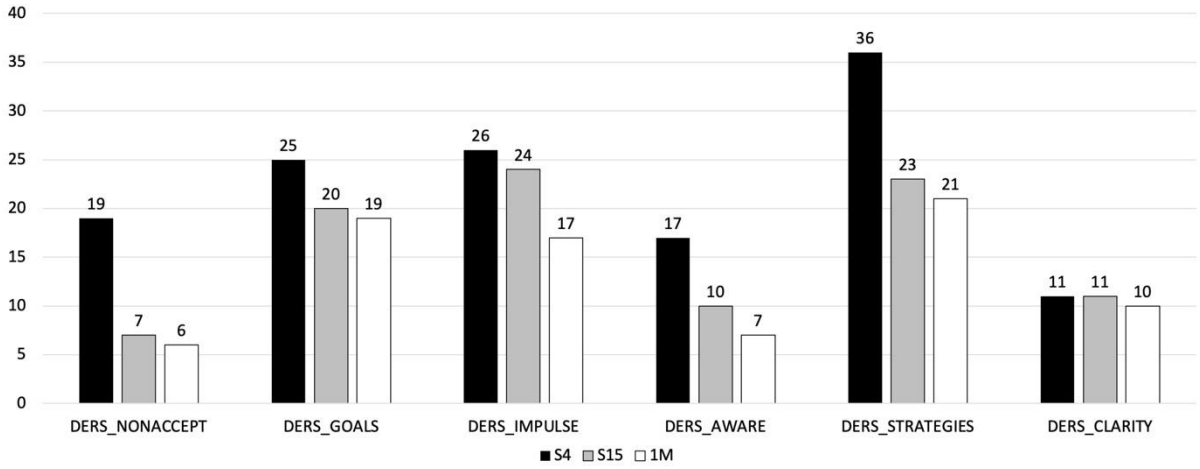
Overview of Sophie's Total Scores on the Main Outcome Measures.



Note. 1M = 1-month follow-up; A-MISO-S = Amsterdam Misophonia Scale; DERS_TOTAL = Difficulties in Emotion Regulation Scale Total Score; HADS = Hospital Anxiety and Depression Scale; HADS_A = Hospital Anxiety and Depression Scale Anxiety Score; HADS_D = Hospital Anxiety and Depression Scale Depression Score; IA = initial assessment; S = Session.

Figure 2

Overview of Sophie's DERS Subscale Scores at Baseline, Post-intervention, and Follow-Up.



Note. 1M = 1-month follow-up; DERS = Difficulties in Emotion Regulation Scale; DERS_AWARE = lack of emotional awareness; DERS_CLARITY = lack of emotional clarity; DERS_GOALS = difficulty engaging in goal-directed behaviour; DERS_IMPULSE = impulse control difficulties; DERS_NONACCEPT = nonacceptance of emotional responses; DERS_STRATEGIES = limited access to emotion regulation strategies. Pre = pre-intervention (S8); S = session.

Discussion

General Overview

The present case study reported the adoption of 15 weeks of tailored online emotion regulation for a female adolescent with misophonia ('Sophie'). The results showed that the intervention was feasible and acceptable, and effective at reliably reducing clinical levels of misophonic symptoms and emotion dysregulation while also helping to improve overall anxiety and depression. In particular, Sophie's misophonia level, presenting as 'severe' at the initial assessment, dropped to the borderline 'mild' range by the 1-month month follow-up. While no inference on causation can be drawn based on the current study, Sophie's especially positive results on measures of specific emotion regulation difficulties appear to suggest that the mechanism of change in her misophonic difficulties may have lied in improved acceptance and awareness of emotional responses, and increased access to emotion regulation strategies. This may in turn have been a product of increased knowledge about emotions and misophonia and, perhaps even more crucially, Sophie's particularly strong commitment to emotion regulation techniques based on awareness and acceptance (i.e., mindfulness, distress tolerance, and PMR).

Treatment Implications

The changes of Sophie's scores on the outcome measures translated into a number of daily life improvements in her psychological and social well-being. These included reduced anticipatory anxiety for potential triggers, increased confidence in being able to tolerate sounds and control her reactions, renewed hope for the future (*"Therapy can work!"*), and decreased avoidance of potentially triggering situations. Sophie's newly found awareness of her emotions and the treatability of misophonia also appeared to trigger in her feelings of validation for her condition, which she was able to share with her mother and younger sister, thus also feeling in a novel empowering and supporting position. In turn, this also appeared to lead to a new drive

to be open about misophonia with others, which decreased her feelings of being 'wrong', guilty, or misjudged, reduced the frequency of head knocking and skin pinching, reinforced her sense of self-efficacy, and ultimately seemed to improve Sophie's overall quality of life.

Limitations and Future Directions

The present study has a number of limitations. First, the nature of a single case design does not allow for any form of generalisation, and the online format, adopted due to COVID-19, carries significant restrictions in terms of therapeutic relationships. Secondly, a number of clinical circumstances at the time of treatment meant that no additional follow-up could be carried out with Sophie after one month. Thus, further more rigorous research – based on larger samples, more longitudinal designs, and in-person delivery – is warranted to confirm these results and explore the longer-term effectiveness of this approach to treat misophonia.

Implications for Clinical Practice

Some implications for clinical practice can be preliminarily drawn from the present findings. More specifically, Sophie's case confirms that an online intervention for misophonia can be feasible and acceptable, thus potentially expanding the formats of application of other therapeutic approaches for the condition. Similarly, emotion regulation strategies specifically based on awareness and acceptance of emotional responses, coupled with a strong psychoeducational component around emotions and misophonia itself, may be helpful in future tailored interventions, regardless of their underlying theoretical model. On a more practical level, some hidden advantages of online therapeutic work should also be considered. These include the aforementioned usefulness of live screen-sharing features for psychoeducation sessions, in particular for online video resources (e.g., YouTube, TED Talks) and interactive 3D applications, as well as improved flexibility around scheduling and time-keeping with people who may be busy during regular working hours – for instance, Sophie was able to never

miss a session despite still attending school online on a daily basis. More specifically linked to misophonia, online work also carries the advantage of allowing the therapist to be placed on mute when not speaking, thus preventing unintentional triggering situations which may be unavoidable during face-to-face therapy (e.g., the therapist sniffing due to a cold).

Conclusions

A tailored online psychological intervention based on the cognitive model and developed around emotion regulation principles and techniques was found to be effective in decreasing self-reported misophonia levels from severe to moderate/mild in a 16-year-old female. Improvements in emotion dysregulation as well as overall levels of anxiety and depression were also observed. As the theoretical and clinical research on misophonia continues to develop, more methodologically rigorous investigations are warranted to build on these results and explore potentially more effective approaches to treat this novel diagnosis.

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