

Poorer well-being in children with misophonia: evidence from the Sussex misophonia Scale for adolescents

Article (Accepted Version)

Rinaldi, Louisa J, Smees, Rebecca, Ward, Jamie and Simner, Julia (2022) Poorer well-being in children with misophonia: evidence from the Sussex misophonia Scale for adolescents. *Frontiers in Psychology*, 13. a808379 1-12. ISSN 1664-1078

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Poorer well-being in Children with Misophonia:
Evidence from the *Sussex Misophonia Scale for Adolescents*

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13

Abstract

14 **Objective**

15 Misophonia is an unusually strong aversion to a specific class of sounds -- most often human
16 bodily sounds such as chewing, crunching, or breathing. A number of studies have emerged in
17 the last 10 years examining misophonia in adults, but little is known about the impact of the
18 condition in children. Here we set out to investigate the well-being profile of children with
19 misophonia, while also presenting the first validated misophonia questionnaire for children.

20 **Methods**

21 We screened 142 children (10-14 years; Mean 11.72 SD 1.12; 65 female, 77 male) using our
22 novel diagnostic (the *Sussex Misophonia Scale for Adolescents; SMS-Adolescent*). This
23 allowed us to identify a group of children already manifesting misophonia at that age – the first
24 population-sampled cohort of child misophonics examined to date. Children and their parents
25 also completed measures of well-being (for convergent validation of our SMS-Adolescent) and
26 creative self-construct (for discriminant validation).

27 **Results**

28 Data show that children with misophonia have significantly elevated levels of anxiety and
29 obsessive compulsive traits. Additionally children with misophonia have significantly poorer
30 life-satisfaction, and health-related quality of life. As predicted, they show no differences in
31 creative self-construct.

32 **Conclusions**

33 Together our data suggest the first evidence in population sampling of poorer life outcomes for
34 children with misophonia, and provide preliminary convergent and discriminant validation for
35 our novel misophonia instrument. Our data suggest a need for greater recognition and
36 therapeutic outlets for adolescents with misophonia.

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38 *Keywords:* Misophonia, Sound-sensitivity, Sensory sensitivity, aversion, wellbeing

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Poorer Well-being in Children with Misophonia:

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Evidence from the *Sussex Misophonia Scale for Adolescents*

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46 Misophonia is a disorder of decreased tolerance to certain classes of sounds, which trigger
47 unusual negative emotions such as anger, disgust, or anxiety (Swedo et al., 2022). Typical
48 triggers include everyday sounds such as chewing, crunching, clicking or breathing. These
49 sounds are not particularly loud, and easily ignored by most other people, but can be highly
50 aversive to people with misophonia (for reviews see Potgieter et al., 2019; Williams et al.,
51 2021). The condition may be associated with subtle organisational differences in the brain that
52 likely arise during development, and lead to important variations in sound tolerance - which
53 can impact profoundly on daily life. People with misophonia show increased functional and
54 structural connectivity in regions related to threat, emotion, and salience (Kumar et al., 2017;
55 Schröder et al., 2019), suggesting that sounds are more prominent and emotionally distressing
56 than they might be for most other people. Here we consider the roots of this condition, by
57 seeking to better understand misophonia in children. Our study aims to identify how the
58 condition can be recognised in young cohorts (10-14 years) using a novel instrument, and
59 whether misophonia is associated with demonstrably poorer well-being across multiple
60 measures.

61 Several case-studies have described children and adolescents who have sought treatment for
62 misophonia in clinical environments (Dover & McGuire, 2021; Johnson et al., 2013; Kamody
63 & del Conte, 2017; Webber et al., 2014). However, the present study is the first to explore
64 misophonia in young samples who have *not* self-referred for study/treatment, and this can
65 provide vital information. Clearly, children who are studied at clinic have already shown
66 sufficient difficulties for their parents or caregivers to seek clinical support. Examining well-
67 being in such environments is therefore circular (i.e., since children with poorer well-being are
68 precisely those who seek treatment). Here we take a different approach by asking questions
69 about well-being in a sample of children with misophonia who have not already sought
70 treatment, and will almost certainly not even know that their misophonia is a recognised
71 condition. Specifically, we screened a large sample of children to identify those with
72 misophonia among them. As such, this is the first ever study of a population-sampled cohort
73 of child misophonics, and we give details below of how our participants were identified.

74 Some studies suggest as many as 20% of the population may have some degree of misophonia
75 (Wu et al., 2014; Zhou et al., 2017) with yet-higher rates in groups with elevated anxiety
76 (Naylor et al., 2020) but potentially lower rates cross-culturally (Kılıç et al., 2021; Zhou et al.,
77 2017). However, the exact prevalence may still be unknown since it is difficult to draw a line
78 between everyday disliking, and the type of disliking linked to misophonia (e.g., most people
79 dislike messy eating-sounds but only misophonics will feel the extreme emotions that make
80 tolerating these sounds almost impossible). It is therefore important to use a robust
81 methodology when identifying people with misophonia for research purposes. Although
82 several statistically-tested misophonia questionnaires exist for adults (Rinaldi et al., 2021;
83 Rosenthal et al., 2021; Vitoratou et al., 2021; Wu et al., 2014), there are no validated tests for

84 children. Our review found that child-completed (or indeed parent-completed) assessments of
85 any kind are rare in misophonia, and those that exist are typically ‘add-ons’ to adult diagnostics
86 (e.g., with instructions to substitute “my sound issues” for “my child’s sound issues”). This
87 sometimes create ambiguous items (e.g., *My [→ my child’s] sound issues currently make me*
88 *unhappy*; Who is unhappy: parent or child?) or require parents to comment on difficult-to-
89 distinguish internal mental states in their children (e.g., *My child feels helpless? Or isolated?*
90 *Or guilty?*). Therefore, a second aim of this study was to validate a novel diagnostic of
91 misophonia in children: our newly devised *Sussex Misophonia Scale for Adolescents* (SMS-
92 Adolescent). We describe this briefly below.

93 Our adolescent misophonia measure is based on an existing scale (Sussex Misophonia Scale;
94 Rinaldi et al., 2021) we recently produced for adults. Importantly, we created this original adult
95 questionnaire in such a way as to be ideally suited for adapting to adolescents, by using
96 psycholinguistic norming data to ensure its language was appropriate not just for adults but
97 also for children (see *Methods*). Additionally, the original adult questionnaire was devised to
98 be time-efficient (e.g., for when testing adults in large cohorts or within a battery of other tests)
99 but this also makes it suitable for the shorter attention spans of younger participants. Finally,
100 the adult questionnaire was specifically written in such a way that a parallel adolescent measure
101 could be created in the future with only the most minimal adaptation; specifically, it would
102 require only a single word change in just four items exchanging *work* for *school* (e.g., *I avoid*
103 *work* → *I avoid school*; see Appendix for full adolescent questionnaire). Hence, our original
104 adult questionnaire was ideally suited to be adapted into an adolescent version, which we have
105 done in the current study. We then administered this questionnaire to a sample of children 10-
106 14 years, to identify those with misophonia, whom we could simultaneously examine for well-
107 being.

108 Any research study -- and indeed any diagnostic -- of misophonia in adolescents would be
109 especially valuable for a number of reasons. Misophonia was named and recognized only
110 recently (Jastreboff & Jastreboff, 2001) and has not yet entered formal diagnostic manuals such
111 as the DSM-5 and ICD-11 (American Psychiatric Association, 2013; World Health
112 Organization, 2020). This lack of widespread recognition has partly contributed to the
113 relatively poorer life-outcomes reported by people with misophonia – especially those with
114 more profound aversions. Here we look at similar outcomes in children, testing constructs that
115 have been examined in the adult literature. In adults, misophonia has been linked with poorer
116 well-being, where quality of life declines with increasing misophonia symptoms (Jager et al.,
117 2020) while depressive symptoms increase (Eijsker et al., 2019), and where people with
118 misophonia show higher rates of anxiety and OCD/obsessive symptoms (Cusack et al., 2018).
119 However, far less is known about misophonia in children, even though the condition appears
120 to arise at some point during childhood or adolescence (Lewin et al., 2021; Rouw & Erfanian,
121 2018). Moreover, misophonia can potentially worsen with age if left unaddressed, and give rise
122 to coping strategies (e.g., wearing headphones) that could theoretically worsen sensitivity over
123 time (Palumbo et al., 2018). Importantly, young children often cannot advocate for themselves
124 to seek treatment. And even if they do so, a lack of clinical and research understanding means
125 that medical professionals are often unable to provide children with the support they need. Our
126 aim therefore is to demonstrate how to recognise the presentation of misophonia in children,
127 and to examine its impact on well-being.

128 To understand the focus of our research on well-being, we must understand that “well-being”
129 is a broad construct (Pollard & Lee, 2003), incorporating different concepts such as life

130 satisfaction (Diener, 2000), hedonic well-being (e.g. emotional stability, good mental health),
131 eudaemonic well-being (e.g., positive mental attitude, fulfillment; Ryff et al., 1995), bodily/
132 health-related well-being (e.g., Erhart et al., 2009), and the psychological/ physical/ social well-
133 being that contributes to health-related quality-of-life (Erhart et al., 2009; The Whoqol Group,
134 1998). As we might therefore expect, the literature on childhood well-being is also extremely
135 heterogeneous, focussing on both single well-being concepts, and multi-dimensional ones
136 (Ben-Arieh & Frønes, 2007; Casas, 2019; McLellan & Steward, 2015; Newland et al., 2019;
137 Pollard & Lee, 2003). Importantly however, differences in children’s well-being predict
138 inequalities in a number of different ways. For example, lower levels of well-being have been
139 linked to lower educational attainment (Lindeboom et al., 2010; Morrison Gutman & Vorhaus,
140 2012; Sammons et al., 2008), school exclusions (Parry-Langdon et al., 2008), poorer behaviour
141 (Sylva et al., 2008), and lowered life chances (Cornaglia et al., 2015). And well-being is known
142 to be particularly poor in children with sensory differences (e.g., higher rates of anxiety in
143 children with multi-sensory sensitivities and synaesthesia; Simner et al., 2021). It is therefore
144 important to understand the well-being profiles of children with misophonia, including areas
145 of anxiety and OCD/obsessive symptoms.

146 In summary, our research aims to understand the well-being of adolescents with misophonia,
147 with a primary focus on anxiety and OCD/obsessive symptoms, given that these have shown
148 misophonia-linked associations in adults (Cusack et al., 2018; Naylor et al., 2020; Schröder et
149 al., 2013; Wu et al., 2014). A secondary focus is on the well-being elements of health-related
150 quality of life, and satisfaction with life, both predicted to decline in misophonia as they do in
151 a range of other conditions (e.g., schizophrenia; Chang et al., 2011; Fervaha et al., 2016). A
152 final aim of our paper is to validate a novel diagnostic measure for adolescent misophonia (our
153 SMS-Adolescent). If our misophonia scale successfully identifies a group of children who go
154 on to show significant differences from their peers *in other ways* (i.e., in well-being), we
155 suggest this goes some way towards validating the measure itself. To be clear, an ideal
156 approach to validation might include other procedures such as examining the Receiver
157 Operator Characteristics (ROC) of our instrument (see Mehdi & Ahmadi, 2011); doing this in
158 our adult questionnaire has allowed us to show that the adult measure is an “excellent” tool for
159 separating a large group of pre-identified misophonics from a large group of pre-identified
160 controls (Rinaldi et al., 2021). In children however, we do not have a “large group of pre-
161 identified misophonics” – for precisely the reasons we are conducting this research. In other
162 words, we have a problem of circularity: the lack of diagnostics and poor recognition for
163 childhood misophonia means there are few or no large cohorts of child misophonics we could
164 use to validate any diagnostic with ROC analyses. Therefore, we instead seek *convergent*
165 validity, showing that children identified as having misophonia by the SMS-Adolescent are
166 also those showing broader well-being deficits, compared to their peers. We will therefore
167 screen a cohort of children for misophonia using our adolescent misophonia measure (SMS-
168 Adolescent) and then explore the well-being of those identified as having misophonia (see
169 *Methods*).

170 Finally, we also aim to validate our questionnaire via *discriminant* validity, by demonstrating
171 that our construct of interest (misophonia, as identified by our novel questionnaire) does not
172 correlate with unrelated constructs where we would not expect it to. For this we selected a
173 measure of creative self-concept, in which we asked our child-participants to evaluate how well
174 they felt they performed in creative subjects at school. Creative self-concept is a robust
175 construct of creativity that has been well studied (McKay et al., 2017; Snyder et al., 2020) and
176 correlates with direct measurements of creative activities and achievements. We hypothesise

177 that children with misophonia should score no differently to controls in creative self-concept.
 178 This would provide some evidence of discriminant validity for our misophonia questionnaire
 179 (the SMS-Adolescent), in addition to convergent validity from our well-being measures.

180 **Methods**

181 **Participants**

182 We tested 275 participants, comprising 142 children and adolescents aged 10-14 years (Mean
 183 11.72 SD 1.12; 65 female, 77 male), along with 133 of their parents (113 female, 19 male, 1
 184 prefer not to say) whose children had a mean age 11.73 (SD 1.14; 64 female, 69 male; There
 185 were nine more children than adults since nine families ended testing after the child-measures
 186 but before the adult-measures. We therefore included these families in our analyses of child-
 187 measure only.)

188 Our participants were drawn from the MULTISENSE project, a large-scale random screening
 189 study focussing on multiple aspects of childhood development (e.g., multisensory processing,
 190 creativity, attainment; e.g., Simner et al., 2021). The inclusion criteria for the MULTISENSE
 191 project was to be in Years 2-5 within 22 Infant and Primary schools across Sussex in the south
 192 of England in 2016, where uptake for the study was 99% and the sample comprised over three
 193 thousand children in the initial recruitment wave. As an indicator of affluence/poverty (Taylor,
 194 2018) the mean school-level *Free School Meal* percentage for this cohort was 13.44 %, where
 195 the national average from the same year is 14.5%, and our schools ranged in FSM status from
 196 0.7% to 38.1%. The 142 children in our current study were those whose parents had agreed to
 197 stay in touch for future screening¹, and they were tested for the current study four years after
 198 initial recruitment. (Parent) participants were entered into a £100 prize draw. This study was
 199 approved by the Sussex University Science and Technology Ethics Committee (reference
 200 number ER/LR290/3).

201 **Materials & Procedure**

202 Testing took place between November 2020-March 2021. Participants completed our study
 203 from home, using our in-house web application, which houses tests and advice on misophonia
 204 (www.misophonia-hub.org). Parent participants were sent a URL via email to take part, and
 205 this led them directly into our testing page without any access to the broader framework. The
 206 study began with a request for demographic information on age, gender etc. Participants then

¹ Our sample of 142 children was no different to the remainder in terms of a range of well-being metrics taken at earlier recruitment; i.e., not significantly different in positive affect ($t(141.95) = 0.70, p = .49$), negative affect ($t(141.86) = 1.70, p = .09$; for measure see Laurent et al., 1999), pro-social behaviour, emotional symptoms, conduct, hyperactivity or peer problems (i.e., no effect of group ($F(1, 534) = 0.79, p = .374$), nor interaction ($F(3.21, 1712.16) = 0.53, p = .673$; for measure see Goodman, 2001). Our sample were significantly higher than the remainder in spelling ($t(149.21) = -6.04, p < .001$) and math ($t(113.88) = -7.16, p < .001$) and this is perhaps to be expected from the children of parents who sign up for continued research (given the heritability of conscientiousness and intelligence; Devlin et al., 1997; Luciano et al., 2006). The important point, however, is that our entire sample for the current study were recruited in exactly the same way, and we now look *within* this subset, based on a screening for misophonia. In other words, our sampling is likely to be unrelated to our findings on misophonia.

207 completed our six measures shown below; the first measure below was completed by parents
208 and the subsequent five were completed by children.

209 **The Screen for Childhood Anxiety Related Disorders (SCARED;** Birmaher et al., 1997;
210 Birmaher, Khetarpal, et al., 1999). The SCARED is a parent-completed 41-item questionnaire
211 which screens for anxiety symptoms. Scores measure overall anxiety, with additional sub-
212 scales of *Panic Disorder, General Anxiety, Separation Anxiety, Social anxiety and School*
213 *Avoidance*. Questions are presented as statements, which parents rate based on their child over
214 the past three months. For example, Item 7 relates to generalised anxiety and states *My child is*
215 *nervous*. Parents respond on a 3-point Likert scale: *Not true or hardly ever true/ Somewhat true*
216 *or sometimes true/ Very true or often true*. This widely used measure is reliable in a number of
217 ways, including in terms of internal consistency ($\alpha = .93$), test–retest reliability, and parent–
218 child agreement (Birmaher, Brent, et al., 1999; Birmaher et al., 1997; Birmaher, Khetarpal, et
219 al., 1999). In our own sample we found excellent internal consistency ($\alpha = .95$). This
220 questionnaire took approximately 5 minutes to complete.

221 **SMS-Adolescent: Sussex Misophonia Scale for Adolescents.** This novel self-report
222 questionnaire presents 48 known misophonia triggers in Part 1 (see Table 1), and then 39
223 Likert-type statements in Part 2. In Part 1, participants were told that the questionnaire
224 concerned things they hear and see, and they were asked: *Have you always hated these things?*
225 *Or don't you mind them?* Using check boxes, participants respond Yes/No to eight broad
226 categories (e.g., *I hate... the sound of people eating*; see Table 1). If all eight responses were
227 *No*, participants proceeded to Part 2. But for any *Yes* response, this revealed a full list of triggers
228 within that category. For example, if participants responded *Yes* to *I hate the sound of people*
229 *eating*, this revealed check boxes for eight types of eating-sound (*crunchy foods (e.g., apples);*
230 *crispy snacks; chewing; lip smacking; swallowing; slurping (a drink); wet mouth sounds (e.g.,*
231 *yoghurt); other eating sound*; see Table 1). Across our eight categories, we presented a total of
232 48 trigger items, although our conditional logic allowed us to ask this in a time-efficient way.
233 These 48 items were drawn from a detailed literature search, representing triggers identified
234 for misophonia at the time of testing (see Rinaldi et al., 2021).

235 [Table 1]

236

237 In Part 2, participants were shown 39 statements, with the question: *How often do these things*
238 *happen to you?* Responses were given on a 5-point scale (*Never, Rarely, Sometimes, Often,*
239 *Always*). Examples include: *Hatred of some sounds make me feel lonely* (Item 18); *I don't do*
240 *well at school because of distractions from sounds* (Item 12); *I want to get pay-back on people*
241 *who make certain sounds* (Item 37); *I cover my ears to block out certain sounds* (Item 28); and
242 *Sounds often cause me physical pain* (Item 9)². We point out that questions related to pain
243 might be suggestive of conditions such as hyperacusis (i.e., pain, discomfort, or a sense of
244 'fullness' in the ears, especially from loud sounds). However, hyperacusis is co-morbid with

² In the adult version of this questionnaire, a factor analyses by Rinaldi et al. (2021) revealed 5 factors, seen respectively in the five examples shown here, and these factors were: Feelings and Isolation (Items 2, 3, 4, 5, 10, 11, 16, 17, 18, 23, 24, 26, 27, 30, 32, 38); Life Consequences (i.e., impact on work and friendships; Items 12, 13, 14, 21, 22, 31); Intersocial Reactivity (Items 8, 15, 35, 36, 37); Avoidance and Repulsion (Items 1, 7, 20, 28, 29, 33, 34, 39); and Pain (suggestive of hyperacusis; Items 6, 9, 19, 25). This factor analysis had reduced an original set of 53 items down to the 39 used here in the final version. Internal reliability of all factors was very high with Cronbach's alpha estimates of .98, .94, .91, .92 and .95 for factors 1-5 respectively. However, we did not explore factor structure in adolescents because our sample size does not support this approach.

245 misophonia (Jastreboff & Jastreboff, 2014), and these questions correlate highly with all others
246 (Rinaldi et al., 2021). They are included here because they will alert clinicians to pain
247 symptomology and the possible need for screening of other pain-related conditions.

248 This questionnaire was adapted from an almost identical version for adults (Rinaldi et al.,
249 2021), with only a single-word difference, changing *work* to *school* in four items (Q12, Q14,
250 Q22, Q31; see Appendix). This was possible since the original adult version had been created
251 in such a way as to be ideally suited to adapting for adolescents. Specifically, we had used
252 psycholinguistic norming data to ensure its language was appropriate not just for adults but
253 also for children. We conducted a linguistic analysis of its vocabulary using age-of-acquisition
254 norms (Bird et al., 2001; Gilhooly & Logie, 1980) retrieved via the N-Watch psycholinguistics
255 tool (Davis, 2005). This analysis showed that the vocabulary within this test makes it
256 appropriate for adolescents in our study, having a mean age-of-acquisition of 3 years 9 months,
257 with an upper age of 8 years 2 months (based on 122 of its 173 words, which were retrievable
258 from N-Watch).

259 In total, Parts 1 and 2 contained 109 items, with 48 items revealed conditionally, meaning our
260 questionnaire took only 5-10 minutes to complete. In part 2, our measure showed an excellent
261 overall internal consistency of $\alpha = .97$. Receiver Operator Characteristic additionally show this
262 questionnaire to be an “excellent measure” for identifying misophonia in adults (see Rinaldi et
263 al., 2021) and the current study will add validation for the adolescent version.

264 **Very Short Wellbeing Questionnaire for Children (VSWQ-C; Smees et al., 2020).** The
265 VSWQ-C questionnaire captures health-related quality-of-life in a measure for children aged
266 6+ years. Its four positively-worded questions are *Have you got on well in class? Have you got*
267 *on well at home? Have you got on well with friends?* and *Has your body felt well?* Children
268 completed the questionnaire by rating statements on a 5-point Likert scale: *Never, Hardly ever,*
269 *Sometimes, Mostly, or Always.* The VSWQ-C was developed from a consideration of the
270 Health-Related Quality-of-life literature (e.g., Ravens-Sieberer & Kidscreen Group Europe,
271 2006; Solans et al., 2008) and designed for fast administration, while covering key levels of
272 well-being (*home life, school life, friends and health*). A recent validation on more than 1500
273 children (Smees et al., 2020) shows the VSWQ-C to have excellent concurrent validity ($r > .7$)
274 with longer measures such as the KIDSCREEN-10 (Ravens-Sieberer & Kidscreen Group
275 Europe, 2006), suggesting it successfully taps into global well-being. The VSWQ-C was
276 previously shown to have an internal consistency of $\alpha = .66$ in children aged 9-10 years old,
277 and in our sample had an internal consistency of $\alpha = .80$.

278 **Satisfaction with Life Scale-Child (SWLS-C; Gadermann et al., 2010, 2011).** The SWLS-C
279 is a 5-item measure for children and adolescents to self-report their life satisfaction. It is an
280 adaptation of the adult *Satisfaction with Life Scale* (Diener et al., 1985), and children responded
281 using a 5-point Likert scale (from *Disagree a lot* to *Agree a lot*). Its five items are: *In most*
282 *ways my life is close to the way I would want it to be; The things in my life are excellent; I am*
283 *happy with my life; So far I have gotten the important things I want in life; and If I could live*
284 *my life over, I would have it the same way.* Gadermann et al. (2010, 2011) have successfully
285 demonstrated the measure’s construct validity, and convergent and discriminant validity. They
286 additionally reported an internal consistency of $\alpha = .86$, and in our own sample we found an
287 internal consistency of $\alpha = .90$.

288 **The Obsessive Compulsive Inventory - Child Version (OCI-CV;** Foa et al., 2010). The OCI-
 289 CV is a 21-item child-report measure assessing obsessive compulsive symptoms in children
 290 and adolescents aged 7+ years. Children responded on a 3-point scale from *Never* to *Always*,
 291 describing events from the preceding month. The scale was adapted from an adult version
 292 (Opakunle et al., 2017) and shows robust test-retest reliability, concurrent validity with
 293 clinician-rated OCD symptom, as well as discriminant validity with anxiety symptoms (Foa et
 294 al., 2010). Foa et al. (2010) found total OCI-CV had an internal consistency of $\alpha = .85$, and in
 295 our own sample we found an internal consistency of $\alpha = .93$.

296 **Creative Self-Concept.** This measure was designed for this study to elicit children's evaluation
 297 of their own creative ability. Creative self-concept is a robust indicator of creativity and
 298 correlates with direct measurements of creative activities and achievements in adults (McKay
 299 et al., 2017; Snyder et al., 2020). Since there are no similar scales for children (though ample
 300 literature showing self-concept *itself* is a reliable construct for children; e.g., in academic areas;
 301 Gao & Eccles, 2020) we created one for our purposes here. For this, we adapted an adult scale
 302 for creative self-concept (e.g., McKay et al., 2017) by shortening it to a two-item set for
 303 children, using language from child scales (of academic self-concept; e.g., Gao & Eccles,
 304 2020). In the present study, children were therefore asked *How good are you at these subjects:*
 305 *Art/Music?* These items are key indicators of artistic creative concept (McKay et al., 2017;
 306 Snyder et al., 2020), and children were required to rate each one using a 7-point Likert scale,
 307 running from *1=Not good at all* to *7=Very good* (with the mid-point 4 marked as *Average*).
 308 We will average across items in our results, and note that they have an acceptable internal
 309 consistency (interitem correlation $r = .25$; $p = .005$).

310

Results

311 Identifying children with misophonia.

312 In the adult questionnaire related to the scale used here (Rinaldi et al., 2021), scoring involves
 313 summing the 39 Likert-scale responses in Part 2³ (coded 0-4; giving a score out of 156), and
 314 comparing to the adult threshold for misophonia. The adult test has been used by several
 315 thousand misophonics to date, and Receiver Operator Characteristic show it to be an
 316 "excellent" measure for identifying misophonia in adults (Rinaldi et al., 2021). In children
 317 however, the threshold for misophonia is unknown. We therefore take a conservative approach
 318 by considering the prevalence of misophonia in adults (20%; Wu et al., 2014; see also Zhou et
 319 al., 2017) and conservatively applying half this prevalence to children, to set the child threshold
 320 at the 90th percentile of total SMS-Adolescent scores. This threshold captured all children with
 321 a test-score of 49 or higher, and we point out that this threshold is approximating the adult
 322 threshold on this scale (50.5; Rinaldi et al., 2021). Our conservative approach will allow us to
 323 be confident that we are identifying genuine child misophonics. (i.e., it aims to reduce false
 324 positives over false negatives).

³ The comparable adult measure does not provide a score for Part 1 (triggers). Instead, it allows users to compare their own triggers against an ordered ranking. This ranking shows triggers listed from most to least common, according to a norming sample of ≈ 150 misophonic adults (Rinaldi et al., 2021). However, since this ordered ranking is not known for children, we omit this here. We therefore look to future studies where the nature of triggers for childhood misophonia can be better understood, and present our questionnaire in full here, for such purposes.

325 Using this threshold score, we classified 15 children with misophonia. This group comprised 9
 326 girls (Mean age 11.67, SD 1.32) and 6 boys (Mean age 11.00, SD 0.89). The remaining 127
 327 children were designated controls, and comprised 56 girls (Mean age 11.67, SD 1.22) and 71
 328 boys (Mean age 11.83, SD 1.03). This relatively small sample has great value in being the first
 329 identified by screening of a population, rather than self-presenting at clinic. As such, they may
 330 represent an estimate of the children with misophonia in the population at large.

331 **Do children with misophonia show poorer well-being (in anxiety, OCD traits, health**
 332 **related quality of life, and satisfaction with life)?**

333 In our analyses, we first ran assumptions checks, which confirmed significant skews in our data
 334 across all measures. These skews are expected with well-being data, and reflect the fact that
 335 the majority of participants have no problems in their well-being, so their scores are at one end
 336 of the scale (e.g., within the Obsessive Compulsive Inventory, most participants will not have
 337 any obsessive compulsive symptoms and therefore score 0). To address this skew, we ran
 338 robust models where possible (following Field et al., 2012). As part of our assumptions checks
 339 we also screened for, and removed outliers by looking for z-scores above/below 3/-3. Instances
 340 where outliers were found are indicated below. We next ensured no violation of homogeneity
 341 of variance using Levene's test, and we also include a variance ratio (where scores below 1.5
 342 indicate no issues with homogeneity of variance; see Blanca et al., 2018). These tests are
 343 included below. We ran our group-wise analyses in R using "WRS2" for robust t-tests, and
 344 robust effect sizes using trimmed means. Given unequal sample sizes, a Hedges *g* correction
 345 may be applied. However our need for robust models combined with the fact that the robust
 346 effect sizes reported throughout are more conservative across the board, we report instead an
 347 explanatory measure of effect size ξ which holds the same interpretation as Cohen's *d* (e.g.,
 348 Values of $\xi = 0.10, 0.30, \text{ and } 0.50$ correspond to small, medium, and large effect sizes
 349 respectively; Mair & Wilcox, 2020). We additionally used the R packages "afex" for ANOVA,
 350 "emmeans" for post-hoc estimated means tests, and "tidyverse" for general data wrangling.

351 We first considered our parent-report questionnaire, for anxiety (the SCARED) where the
 352 maximum possible score is 82, and scores ≥ 25 may indicate the presence of an anxiety disorder
 353 (Birmaher et al., 1997; Birmaher, Khetarpal, et al., 1999). The overall mean for children with
 354 misophonia was 31.50 (SD 13.46) compared to 13.74 (SD 14.22) for controls. We found no
 355 problems with Levene's test of homogeneity of variance ($F(1,113) = 0.003, p = .955$; variance
 356 ratio 1.05) We explored the SCARED in a 2x5 mixed ANOVA crossing group (misophonics
 357 vs. controls) with subscale (*Panic Disorder, General Anxiety, Separation Anxiety, Social*
 358 *Anxiety and School Avoidance*; see Figure 2) We found a statistically significant main effect of
 359 group ($f(1, 113) = 14.35, p < .001$), and a significant but less interesting main effect of sub-
 360 scale ($f(3.32, 374.74) = 20.59, p < .001$, since scores are generally higher for some sub-scales
 361 over others). We also found a significant interaction ($f(3.32, 374.74) = 3.29, p = .020$). We ran
 362 post-hoc estimated marginal means tests to explore this interaction and found that misophonics
 363 were significantly higher across all SCARED subscales except for *School Avoidance* (where
 364 the numerical difference failed to reach significance; see Figure 1).

365 [Figure 1]

366

367 We next considered our child-report measures, beginning with the OCI-CV for obsessive-
 368 compulsive traits (Foa et al., 2010). Mean scores for children with misophonia were 24.36 (SD
 369 6.44) compared to controls who scored 7.63 (SD 6.59). We again found no problems with

370 Levene's ($F(1,122) = 0.64$, $p = .426$; variance ratio 1.02) so we proceeded to explore the
 371 Obsessive Compulsive Inventory using a 2x6 mixed ANOVA crossing group (misophonics vs.
 372 controls) with subscale (*Washing, Checking and Doubting, Hoarding, Ordering, Obsessing,*
 373 *and Neutralizing*; see Figure 2). We found a statistically significant main effect of group ($F(1,$
 374 $123) = 64.95$, $p < .001$), a significant but less interesting main effect of sub-scale ($F(4.13,$
 375 $508.53) = 48.52$, $p < .001$; since some sub-scales are higher than others), and a significant
 376 interaction ($F(4.13, 508.53) = 13.19$, $p < .001$). We ran post-hoc estimated marginal means
 377 tests to explore this interaction and found misophonics had significantly higher obsessive
 378 compulsive traits across each subscale of the OCI (see Figure 2) but where differences are
 379 especially notable for *Neutralising* ($\xi = 0.88$, 95% CI 0.80-0.97), *Ordering* ($\xi = 0.88$, 95% CI
 380 0.79-0.99) and *Obsessing* ($\xi = 0.86$, 95% CI 0.80-0.98).

381 [Figure 2]

382

383 We next considered health-related quality-of-life, and satisfaction with life, where scores are
 384 summed across items, and low scores correspond to poorer well-being. Within the *Very Short*
 385 *Well-being Questionnaire for Children* (VSWQ-C; Smees et al., 2020) we first ran our
 386 assumptions checks where we identified and removed three outliers, and confirmed that we
 387 had no problem with homogeneity of variance using Levene's test ($F(1,137) = 0.06$, $p = .799$;
 388 variance ratio 1.16). We compared the mean score for children with misophonia 15.00 (SD
 389 2.34) with controls 17.51 (SD 2.00). This difference was significant in a robust t-test ($t(7.65)$
 390 $= 3.17$, $p = .001$) with a large effect size ($\xi = 0.69$, 95% CI 0.55-0.83). We next looked at
 391 overall life satisfaction, (SWLS-C; Gadermann et al., 2010, 2011) where children with
 392 misophonia scored 13.77 (SD 4.28) compared to controls who scored 20.01 (SD 4.45). We
 393 again found no problems with Levene's ($F(1,135) = 0.05$, $p = .821$; variance ratio 1.03) Again,
 394 the difference between misophonics and controls was significant ($t(9.43) = 5.09$, $p < .001$)
 395 with a large effect size ($\xi = 0.78$, CI 0.73-0.91)⁴.

396 Table 2 shows that misophonia positively significantly correlated with obsessive-compulsive
 397 traits (OCI-CV; Foa et al., 2010) in Total and subscale scores, with all correlations surviving
 398 Bonferroni correction. Effects ranged from medium for the subscale *Hoarding* ($r = .45$, $p < .001$)
 399 to large for the Total score ($r = .69$, $p < .001$). We also found significant positive correlations
 400 between misophonia scores and anxiety (SCARED; Birmaher, Khetarpal, et al., 1999), in both
 401 total and subscale scores. These effects were moderate, ranging from $r = .29$ ($p < .001$) for *Social*
 402 *Anxiety*, to $r = .43$ ($p < .001$) for Total score. Finally, there was a significant and moderate
 403 negative correlation ($r = -.48$, $p < .001$) between misophonia scores and health-related quality
 404 of life (VSWB-C; Smees et al., 2020). We also found a strong negative correlation between
 405 misophonia scores and satisfaction with life (SWLS-C; Gadermann et al., 2010, 2011; $r = -.56$,
 406 $p < .001$). See Table 2 for a full list of these correlations, including with the subscales for anxiety
 407 and obsessive-compulsive traits.

408 [Table 2]

⁴ We considered a possible objection to our placing the threshold for misophonia at the 90th percentile (49 or higher; see above). We suggest this is an appropriate threshold because it is not only conservative (i.e., underestimating prevalence) but closely equivalent to the adult threshold (50.5; shown statistically to be an "excellent" threshold; see (Rinaldi et al., 2021). However, we also took a precautionary secondary approach, to consider the misophonia scale as a continuum and thereby re-analyse our measures using a correlational approach. To anticipate our results, we again found significance in all measures administered, mirroring our group-wise results above.

409

410 **Do children with misophonia show differences in creative self-concept?**

411 Discriminant validity was assessed by considering scores in creative self-concept. As predicted,
412 children with misophonia showed no differences in this area. Averaging across our two
413 questions of creative self-construct (art, music), our assumptions checks showed non-
414 normality. We therefore ran a robust t-test, however we found no problems with homogeneity
415 of variance (Levene's $F(1,127) = 0.04, p = .830$; variance ratio 1.06). As predicted, there were
416 no significant differences between misophonics (Mean 4.29, SD 1.34) and controls (Mean 4.48,
417 SD 1.26; $t(8.41) = 0.17, p = .867$) with a small effect size ($\xi = 0.14, 95\% \text{ CI } 0.00-0.24$). We
418 explored our null result by producing a Bayes Factor to determine if there is enough evidence
419 to accept the null hypothesis (Dienes, 2014). We found a JZS Bayes Factor of 0.329, where
420 scores such as this (i.e., less than 1) provide evidence for the null hypothesis. Our Bayes passed
421 the 0.33 threshold for moderate evidence. Similarly, a correlational approach shows an almost
422 entirely non-existent relationship between misophonia scores and creative self-concept, with
423 an r value of .01 (see Table 2).

424

425

Discussion

426 In this study we examined - general population cohort of children with misophonia. These
427 children showed significant differences compared to peers without misophonia. Primarily, they
428 had higher traits associated with both anxiety disorder (SCARED; Birmaher, Khetarpal, et al.,
429 1999) and obsessive-compulsive disorder (Foa et al., 2010). They also showed poorer health-
430 related quality-of-life (in the VSWQ-C; Smees et al., 2020) and poorer satisfaction with life
431 (Gadernann et al., 2010). Importantly, our screening for misophonia was child-completed,
432 while at least one of our other measures was parent-completed (i.e., SCARED), meaning our
433 results cannot be dismissed as a response bias (e.g., an acquiescence bias) since our data come
434 from different individuals rating the same child.

435 Several previous studies have linked misophonia with anxiety/ obsessive-compulsive traits
436 (Cusack et al., 2018; Naylor et al., 2020; Schröder et al., 2013; Wu et al., 2014) and with poorer
437 quality-of-life (Jager et al., 2020) -- but importantly, only in adults. The current study extends
438 this finding into children for the first time, and importantly, children in the population at large
439 rather than those who have self-referred to treatment clinics. (Our screening approach means
440 we are almost certainly observing cases of misophonia that are likely to be as-yet unrecognised
441 formally.) Prior to our study, there have been no validated measures to identify childhood
442 misophonia. Here we have introduced our adolescent instrument the SMS-Adolescent, adapted
443 from a related adults scale (Rinaldi et al., 2021). Our measure can be found in full in our
444 appendix, as well as online at our website www.misophonia-hub.org/test where we provide an
445 online interface and automated scoring. Our findings offer preliminary convergent validity for
446 this scale, by showing it correlates with the related (but different) constructs of anxiety,
447 obsessive-compulsive traits, life-satisfaction and health related well-being. This convergent
448 validity has been particularly important in validating our measure given the lack of existing
449 adolescent misophonia measures available for comparison (i.e., to offer concurrent validity;
450 see Godwin et al., 2013 and Smees et al., 2020 for discussions on differences between
451 convergent and concurrent validity). The strength of these convergent relationships ranged
452 from moderate (for anxiety) to strong (for all the remainder), as we might expect from previous
453 misophonia studies looking at similar characteristics in adults (e.g., Zhou et al., 2017). We also

454 provided preliminary evidence of discriminant validation, by demonstrating that our measure
455 of misophonia does not correlate with the unrelated construct of creative self-concept. We have
456 necessarily applied our scale conservatively, identifying children in the 90th percentile and
457 above. But future studies might validate our measure more widely on larger samples of
458 adolescent misophonics to refine its threshold. A related goal is to also explore whether our
459 measure has a factor structure, as it does in adults (see Footnote 2).

460 The pattern of poor well-being we have identified in children with misophonia requires close
461 attention. Adults studies (e.g., Wu et al., 2014) have suggested that misophonia is self-evidently
462 related to anxiety and obsessive-compulsive disorders simply given its symptomatology (e.g.,
463 negative reactions triggered by sounds, associated anxiety and distress, and corresponding
464 avoidance/ compulsion). Here we tentatively suggest that obsessive-compulsive traits and
465 misophonia may also be mediated by the factor of disgust. Disgust is a key emotional outcome
466 of misophonia, but also shows important differences in OCD. Stein, Shapira and colleagues
467 have linked OCD to a disruption in disgust processing, with more inappropriate disgust
468 compared to controls, and with disruptions mediated by the insula in both functional magnetic
469 resonance imaging (fMRI; Shapira et al., 2003) and positron emission tomography (PET; Stein
470 et al., 2006). This overlap between misophonia and OCD in both phenomenology and neural
471 features may implicate disgust in their shared aetiology. We therefore suggest that future
472 studies of misophonia may explore further the finding of elevated OCD-traits, shown both here
473 in children, and elsewhere in adults.

474 These findings of poorer well-being in children with misophonia (e.g., heightened anxiety)
475 raise the question of causality. We have assumed that misophonia may be responsible for our
476 target children's poorer well-being scores, although it is equally possible that children with
477 poorer well-being (e.g., higher anxiety) may be more pre-disposed to developing misophonia.
478 Of course these ideas are not mutually exclusive -- and development will also be mediated by
479 environment and genetics. One genetic marker for misophonia has been identified in a report
480 by the organisation 23andMe (Fayzullina et al., 2015). They examined 80,607 participants who
481 were asked "Does the sound of other people chewing fill you with rage?" (Yes/No/Not Sure).
482 After removing responses of 'Not Sure' and applying their criteria for genome-wide association
483 significance (see https://permalinks.23andme.com/pdf/23-08_genetic_associations_with_traits.pdf)
484 Fayzullina et al. found a significant genetic locus associated with misophonia -- at least as far
485 as they had phenotyped it with their single question. This locus, rs2937573 (chromosomal
486 region 5q34), resides near the TENM2 gene, which encodes for the teneurin-2 protein,
487 implicated in regulating synaptic connections during brain development (Tews et al., 2017;
488 Vysokov et al., 2016). This finding supports evidence elsewhere of enhanced functional
489 connectivity in misophonia (Kumar et al., 2017; Schröder et al., 2019). However, the four
490 teneurin proteins also contain peptide sequences (teneurin C-terminal associated peptides;
491 TCAP-1–4) which have been associated with anxiety behaviours in rats (Tan et al., 2009), and
492 linked to structures implicated in other mood disorders (Woelfle et al., 2016). Future genetic
493 studies may therefore hold the key for greater insight into the co-morbid relationship between
494 misophonia and broader anxiety disorders.

495 We recognise that one limitation of our study is our small sample size, where our screening of
496 142 children identified 15 with misophonia. Hence, although our study presents promising data
497 in support of the validity of our measure, this validation remains preliminary until future studies
498 can replicate and extend our findings on larger samples. We also point out that our cohort of
499 142 children were a sub-set from a much larger randomly-sampled cohort (MULTISENSE) but

500 were not strictly randomly-sampled themselves. (They were children whose parents had signed
501 on for further study, comprising around 5% of the initial wave.) However, there were no well-
502 being differences between our subset and the larger wave (using seven different well-being
503 indicators, see footnote 1). This suggests our sample were indeed a meaningful reflection of
504 the well-being of the entire random sample at large, and – furthermore – our misophonics and
505 non-misophonics for the current study were recruited in exactly the same way (i.e., we look
506 *within* this subset, based on a screening for misophonia). Nonetheless, future studies may wish
507 to use our scales on larger random samples. Finally, our preliminary findings regarding
508 divergent validity would benefit from replication using validated measures of creativity, and/or
509 additional traits (so long as these traits are such that we would expect no convergence).

510 Our results begin to address a vacuum of knowledge concerning childhood misophonia, and
511 highlight a need for further attention. We suggest that current and future research should
512 promote actions to widen the public’s understanding of misophonia. Our data on well-being
513 also suggest that professionals might engage in an active screening for anxiety disorder and
514 obsessive-compulsions in any child where misophonia is suspected. At the same time,
515 researchers and clinicians might push for a wider understanding of the condition in schools.
516 One way to achieve this is to open dialogues between parents and teachers, where information
517 about misophonia can be shared. To achieve this, we have created an online information hub
518 (www.misophonia-hub.org) as a one-stop resource containing advice and support for adults,
519 children, parents, researchers, clinicians and educators. The site also contains information
520 factsheets about misophonia in both children and adults (e.g., our child factsheet is designed
521 for parents to print, individualise, and share with their teacher). Feedback suggests our
522 factsheets often provide well-needed validation for the “genuineness” of the child’s reports,
523 because children with misophonia are often dismissed or disbelieved. Thus, impact has been at
524 the heart of our research, and we propose a similar approach for future researchers. In summary,
525 our study shows that misophonia can be identified in children aged 10-14 years, with negative
526 implications for elevated anxiety and obsessive-traits, as well as poorer life satisfaction, and
527 health-related quality of life.

528 Conflict of Interest

529 The authors declare that the research was conducted in the absence of any commercial or
530 financial relationships that could be construed as a potential conflict of interest.

531 Funding

532 Authors received funding from the REAM foundation, Misophonia Research Fund initiative
533 awarded to authors JS and JW.

534 Acknowledgements

535 We are grateful to Dr James Alvarez for his programming assistance.

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Appendix: The Sussex Misophonia Scale for Adolescents (SMS-Adolescent)

This test is available online with automatic scoring at www.misophonia-hub.org/test

Part 1

We're going to ask you about things you see and hear every day. Have you always hated these things? Or don't you mind them? I hate... (*categories 1-8 are shown on screen; with sub-scale items revealed in the event of a positive response to the category*)

- 1 the sound of people eating yes/no
Which do you hate hearing? Tick all that apply.
crunchy foods (e.g. apples); crispy snacks; chewing; lip smacking; swallowing; slurping (a drink); wet mouth sounds (e.g., yoghurt); other
- 2 the sound of repetitive tapping yes/no
Which do you hate hearing? Tick all that apply.
pen clicking; foot tapping/ foot on floor; repetitive barking; tapping pen/ pencil; tapping finger; typing on a computer; other
- 3 the sound of rustling yes/no
Which do you hate hearing? Tick all that apply.
rustling paper; rustling plastic; other
- 4 throat sounds yes/no
Which do you hate hearing? Tick all that apply.
throat clearing; hiccups; humming; other
- 5 sounds people make through their mouth and nose yes/no
Which do you hate hearing? Tick all that apply.
breathing; snorting (e.g., when people laugh); nose sniffing; coughing; snoring; whistling; sneezing; burping; other
- 6 some voice sounds yes/no
Which do you hate hearing? Tick all that apply.
certain accents; some people's voices; certain letter sounds; certain vowels; certain consonants; other
- 7 repetitive visual movements yes/no
Which do you hate seeing? Tick all that apply.
repetitive leg rocking; foot shuffling; people rocking back and forth on their chair; other
- 8 some background sounds (e.g., fridge humming) yes/no
Which do you hate hearing? Tick all that apply.
clock ticking; car engines; refrigerator humming; dishwasher; washing machine/ dryer; fan; other

Part 2

How often do these things happen to you? (Likert responses: Never, Hardly ever, Sometimes, Often, Always).

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795 1. Certain sounds make me feel disgusted, even if those sounds don't disgust other people.

796 2. I have a problem because hearing certain sounds makes me unhappy.

797 3. I feel no one really understands that I have a problem with sounds.

798 4. I feel scared hearing sounds I don't like.

799 5. Other people make fun of me for hating sounds.

800 6. It hurts when I hear certain sounds, even if it doesn't hurt other people.

801 7. Sometimes I leave the room, to avoid telling people off for making bad sounds.

802 8. There are some sounds I hate so much, I shout at people.

803 9. Sounds often cause me physical pain.

804 10. I feel guilty because of my reaction to sounds.

805 11. I worry nobody can help with my sound problems.

806 12. I don't do well at school because of distractions from sounds.

807 13. I try to avoid going to people's houses if those people make sounds I hate.

808 14. I try to avoid going to school because of difficulties with sounds.

809 15. I hate people who make sounds I don't like.

810 16. I feel embarrassed about hating certain sounds.

811 17. Nobody believes my problem with sounds.

812 18. Hatred of some sounds make me feel lonely.

813 19. I feel physical pain if unable to avoid a sound.

814 20. The sound made by some people makes me feel the need to avoid them.

815 21. Problems with sounds has meant I don't have many friends.

816 22. My hatred of some sounds creates problems in school.

817 23. I'm worried about always having problems from hearing certain sounds.

818 24. I try not to let people know I hate certain sounds.

819 25. I feel pain on my body when I hear certain sounds.

820 26. My life is worse because of sound problems.

821 27. People think I'm crazy because of my reaction to sounds.

822 28. I cover my ears to block out certain sounds.

823 29. I've told some people they must not make certain noises around me.

824 30. Some sounds make me want to scream or cry.

825 31. I don't like school because there are lots of sounds I hate.

826 32. I suspect my friends think I'm weird, because of my reaction to sounds.

827 33. I react more strongly to some sounds if I'm having a bad day.

828 34. I say things aloud in order to avoid listening to bad sounds.

829 35. I want to hurt people who make sounds I hate.

830 36. I feel like people make sounds on purpose just to upset me.

831 37. I want to get pay-back on people who make certain sounds.

832 38. I think my problems with sounds are getting worse with age.

833 39. I put on headphones to block out certain sounds.

834

835 **Scoring**

836 Part 1. This section does not form part of the misophonia diagnosis, but researchers may wish

837 to use this section for descriptive statistics (e.g., describing the number of triggers reported by

838 their participant) or related analyses.

839 Part 2. Likert responses are scored 0-4 (0-never; 1-hardly ever; 2-sometimes; 3-often; 4-
840 always) and are then summed to give scores running from 0-156, where the passing threshold
841 to indicate misophonia from this study was 49 or higher.

842 Tables

843 Table 1. *Triggers for misophonia, and their superordinate category.*

| No. | We're going to ask you about things you see and hear every day. Have you always hated these things? Or don't you mind them? I hate... | Which do you hate hearing (or seeing, for category 7)? Tick all that apply. |
|-----|---|--|
| 1 | the sound of people eating | crunchy foods (e.g. apples); crispy snacks; chewing; lip smacking; swallowing; slurping (a drink); wet mouth sounds (e.g., yoghurt); other |
| 2 | the sound of repetitive tapping | pen clicking; foot tapping/ foot on floor; repetitive barking; tapping pen/ pencil; tapping finger; typing on a computer; other |
| 3 | the sound of rustling | rustling paper; rustling plastic; other |
| 4 | throat sounds | throat clearing; hiccups; humming; other |
| 5 | sounds people make through their mouth and nose | breathing; snorting (e.g., when people laugh); nose sniffing; coughing; snoring; whistling; sneezing; burping; other |
| 6 | some voice sounds | certain accents; some people's voices; certain letter sounds; certain vowels; certain consonants; other |
| 7 | repetitive visual movements | repetitive leg rocking; foot shuffling; people rocking back and forth on their chair; other |
| 8 | some background sounds (e.g., fridge humming) | clock ticking; car engines; refrigerator humming; dishwasher; washing machine/ dryer; fan; other |

844 Categories are shown first; sub-set items are revealed in the event of a positive response. Note
845 that seven out of eight trigger-categories are for sounds, while one category is non-auditory
846 because people with misophonia can also be triggered by repetitive visual movements such as
847 leg-swaying.

848

849 Table 2 Spearman Correlations between misophonia scores and our remaining measures (r and
 850 p values) with 95% confidence intervals.
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| | Subscale | Correlation with SMS-A (misophonia) | | 95% CI |
|--------------------------------------|-----------------------------------|-------------------------------------|----------------|--------------|
| | | <i>r</i> value | <i>p</i> value | |
| SCARED (anxiety) | Total | 0.43 | <.001 | 0.27-0.57 |
| | General anxiety | 0.38 | <.001 | 0.21-0.52 |
| | Panic disorder | 0.41 | <.001 | 0.24-0.55 |
| | School avoidance | 0.42 | <.001 | 0.26-0.55 |
| | Separation anxiety | 0.37 | <.001 | 0.20-0.51 |
| | Social anxiety | 0.29 | <.001 | 0.12-0.45 |
| OCI-CV (obsessive- compulsive) | Total | 0.69 | <.001 | 0.47-0.69 |
| | Washing | 0.47 | <.001 | 0.30-0.58 |
| | Checking /doubting | 0.59 | <.001 | 0.51-0.72 |
| | Hoarding | 0.45 | <.001 | 0.50-0.72 |
| | Neutralizing | 0.62 | <.001 | 0.43-0.67 |
| | Obsessing | 0.62 | <.001 | 0.58-0.77 |
| | Ordering | 0.56 | <.001 | 0.33-0.60 |
| VSWB | Total | -0.48 | <.001 | -0.60- -0.35 |
| SWLS | Total | -0.56 | <.001 | -0.67- -0.44 |
| Creative self- concept | Average creative self- concept | 0.04 | .686 | -0.16 - 0.21 |
| | Art | 0.07 | .406 | -0.10 - 0.24 |
| | Music | 0.01 | .889 | -0.16 - 0.19 |

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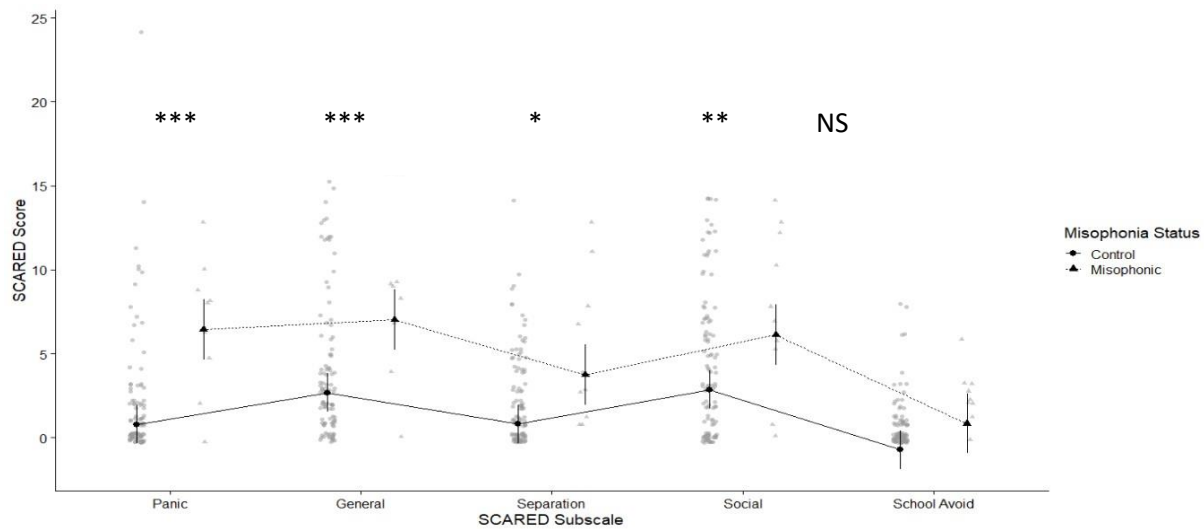
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857 **Figures**
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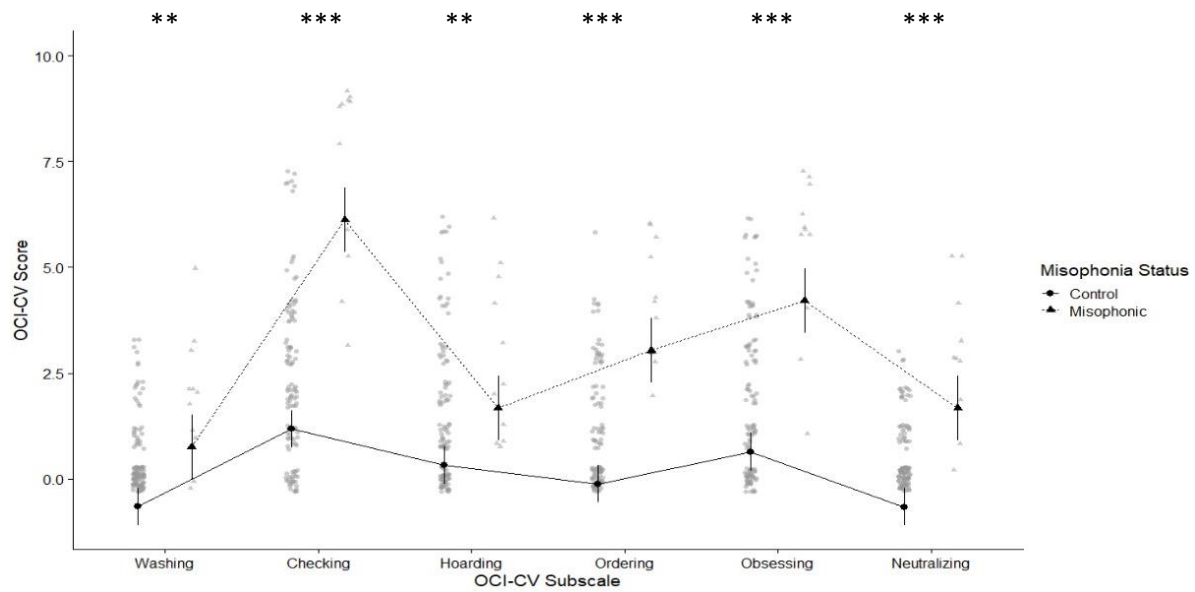


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860 Figure 1.

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864 Figure 2.

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866 **Figure Captions**

867 Figure 1. Means plot showing differences between misophonics (shown in triangle) and
 868 controls (shown in circles) in each of the SCARED subscales (from left to right: *Panic*
 869 *Disorder, General Anxiety, Separation Anxiety, Social Anxiety and School Avoidance*).

870 Figure 2. Means plot showing greater scores for misophonics (shown in triangle) and controls
 871 (shown in circles) in each of the OCI subscales (from left to right: *Washing, Checking and*
 872 *Doubting, Hoarding, Ordering, Obsessing, and Neutralizing*). Here and in all similar figures,
 873 means are shown with black circles/triangles, while grey points represent the raw data, with
 874 overlapping points appearing darker. Here and throughout, error bars show 95% confidence
 875 intervals, and the asterisks represent significant p values as follows: * <.05, ** <.01, *** <.001.

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