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1 **Autonomous Sensory Meridian Response (ASMR): A flow-like mental state**

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18 **Abstract**

19 Autonomous Sensory Meridian Response (ASMR) is a previously unstudied sensory
20 phenomenon, in which individuals experience a tingling, static-like sensation across the scalp,
21 back of the neck and at times further areas in response to specific triggering audio and visual
22 stimuli. This sensation is widely reported to be accompanied by feelings of relaxation and
23 wellbeing. The current study identifies several common triggers used to achieve ASMR,
24 including whispering, personal attention, crisp sounds and slow movements. Data obtained
25 also illustrates temporary improvements in symptoms of depression and chronic pain in those
26 who engage in ASMR. A high prevalence of synaesthesia (5.9%) within the sample suggests
27 a possible link between ASMR and synaesthesia, similar to that of misophonia. Links
28 between number of effective triggers and heightened flow state suggest that flow may be
29 necessary to achieve sensations associated with ASMR.

30

31 **Introduction**

32 In recent years, there has been growing interest in a previously unknown sensory
33 phenomenon, named Autonomous Sensory Meridian Response (ASMR) by those capable of
34 experiencing it. Those who describe ASMR claim it to be an anomalous sensory experience
35 which has thus far escaped the eye of scientific research. There is a suggestion that ASMR
36 may be of use for providing temporary relief to individuals with depression, stress and
37 chronic pain. As ASMR has received some media attention in recent months, many have
38 taken to public forums to explain their ability to induce ASMR to ease symptoms of these
39 conditions in cases where other routes of treatment may have been lacking or ineffective
40 (Taylor, 2013; TheWaterwhispers, 2013), while others use ASMR exclusively as a relaxation
41 tool (Marsden, 2012). To date there has been no rigorous scientific exploration of ASMR, nor
42 of the conditions which trigger or end the ASMR state.

43 Media designed specifically to produce ASMR has amassed a community of thousands of
44 members. Capable individuals utilise a variety of visual and audio stimulation – most
45 typically through video sharing – to achieve a tingling, static-like sensation widely reported
46 to spread across the skull and down the back of the neck (Taylor, 2014). The advent of online
47 video communities has facilitated a gathering of those who experience ASMR, and as a result
48 hundreds of videos have been produced, viewed and shared with the goal of inducing this
49 sensation, which is said to be paired with a feeling of intense relaxation. A dedicated ASMR
50 subgroup on Reddit (<http://www.reddit.com/r/asmr/>) boasts 86,000 subscribers from around
51 the world, and some of the most popular ASMR content creators on video sharing site
52 Youtube (<http://youtube.com/>), for example GentleWhispering have upwards of 300,000
53 subscribers. Table 1 lists a number of these popular sources on Youtube. These figures show
54 that the culture surrounding ASMR is in no way insignificant. Several reputable international
55 media outlets have reported on the attention this phenomenon is receiving, and the lack of
56 scientific explanation. (Marsden, 2012; Tomchak, 2014).

57 Though stimuli used to induce ASMR are widely varied, and devotees report that individual
58 differences play a pivotal role in the effectiveness of each video, distinct themes appear to be
59 present in ASMR media. Exploration of the most viewed ASMR media on Youtube uncovers
60 what may be discrete categories of common triggers. For example, many of these videos
61 depict role play situations, in which the viewer is placed in a position of ‘close proximity’ to
62 another person in order to be cared for in some manner. Often this involves grooming (e.g.

63 MassageASMR; Fairy Char ASMR), or being given some type of medical examination (e.g.
64 WhisperTalkStudios). The tone of these types of ASMR media is usually one of having close
65 attention paid to you, the viewer, with videos shot in a point of view manner. Other videos
66 include acts which require a similar amount of focus, but directed towards objects, rather than
67 the viewer (e.g. Ephemeral Rift).

68

69

70 **Table 1 - Popular ASMR-related channels on YouTube. Counts correct at 10 December 2014**

Name	Channel URL	Total Views
WhisperTalkStudios	https://www.youtube.com/user/WhisperTalkStudios	218,900
GentleWhispering	https://www.youtube.com/user/GentleWhispering	88,311,107
MassageASMR	https://www.youtube.com/user/MassageASMR	46,575,761
Fairy Char ASMR	https://www.youtube.com/user/feirycharstaRs	9,008,828
Ephemeral Rift	https://www.youtube.com/user/EphemeralRift	27,053,163
ASMRRequests	https://www.youtube.com/user/ASMRrequests	648,590
TheUKASMR	https://www.youtube.com/user/TheUKASMR	7,734,238

71

72 ASMR videos also typically appear to include an emphasis on the use of sound to trigger the
73 static sensation of ASMR, which include the subjects of these videos cycling through a
74 variety of household items which make various noises when tapped upon or used (e.g.
75 MassageASMR). On the surface, this trigger resulting in sensation seems quite similar to the
76 experience of synaesthesia (Ramachandran & Hubbard, 2001), a phenomenon in which
77 specific external stimuli cause an internal experience in a second, unstimulated modality.
78 Though some of the concurrents (secondary sensations in the unstimulated modality; Cytowic,
79 2002) found in ASMR appear to be more tangible than those experienced in synaesthesia (ie.
80 tingling on the skin), the positive emotional response of calm said to be associated are within
81 the realm of being considered as a form of sound-emotion synaesthesia. Reports of ASMR
82 experiences also appear to share some features with the state of “flow”, which is the state of
83 intense focus and diminished awareness of the passage of time that is often associated with
84 optimal performance in several activities, including sport (Csiskemenhalyi, 1991; Swann et
85 al., 2014). Anecdotal reports of ASMR describe states of focus, of greater “presence” and of
86 relaxation which are consistent with the non-active aspects of flow.

87 The aim of the current study was to describe the sensations associated with ASMR, explore
88 the ways in which it is typically induced in capable individuals, and to provide further

89 thoughts on where this sensation may fit into current knowledge on atypical perceptual
90 experiences. This research also aims to explore the extent to which engagement with ASMR
91 may ease symptoms of depression and chronic pain.

92

93 **Materials and Methods**

94 Participants

95 The sample of the present study was comprised of 245 men, 222 women and 8 individuals of
96 non-binary gender (N=475). These participants presented themselves as volunteers via online
97 advertisement on specialised ASMR interest groups on Facebook and Reddit. The age of the
98 sample ranged from 18 to 54 years (mean = 24.6 years, st. dev. = 7 years). Volunteers were
99 located worldwide, with particular participation from the United States of America and
100 Western Europe. All individuals in the sample self-reported to have experienced ASMR and
101 regularly consume ASMR media.

102 Method

103 An online questionnaire (www.qualtrics.com, Version 36,892) was conducted in order to
104 gather information on the prevalence of particular features of ASMR, when and why
105 individuals engage in ASMR, and the relation of ASMR to other known phenomenon. Ethical
106 approval was granted by the Department of Psychology of Swansea University, and
107 continuation from the initial screen of this questionnaire, which contained a brief summary of
108 the research topic and all necessary ethical information, served as informed consent. The
109 structure of this questionnaire is described below, and a version of the text of the
110 questionnaire is included as supplementary material:

111 *Section 1 - Demographics*

112 Demographic information, including whether or not individuals suffered from any
113 chronic illness or took medications, was gathered at the beginning of the survey. In addition,
114 the Beck Depression Inventory (BDI-II; Beck et al., 1996) and Beck Anxiety Inventory (BAI;
115 Beck et al., 1988) were included to give insight on the daily mood of participants. As several
116 online sources indicate the existence of a subset of ASMR media users who engage in ASMR
117 to manage symptoms of depression, stress, or pain, this data would be used to explore
118 efficacy of ASMR in easing symptoms of these conditions. Participants were asked to verify
119 that they identified as able to experience ASMR and the tingling sensations commonly
120 associated with ASMR. No leading elaboration was given with regard to this sensation, as all
121 participants had been recruited via ASMR social network groups, and would therefore be
122 aware of how this aspect of the phenomenon is typically described. This was an attempt to
123 limit imposing researcher assumptions about ASMR. In this section, participants were also

124 given a definition of synaesthesia, alongside some examples of synaesthetic associations.
125 Participants were asked to report if they suspected they may experience any type of
126 synaesthesia. Those who responded in a positive or unsure manner were asked to specify
127 which type of synaesthesia they thought they may have, and were followed up approximately
128 four weeks later via e-mail to be assessed for consistency.

129 *Section 2 – Viewing Habits*

130 This section included questions pertaining to how often participants engaged in
131 ASMR media sessions, how many videos they consumed in a single session, and at what time
132 of day they typically viewed ASMR media. Questions regarding the optimal conditions to
133 experience ASMR were also included.

134 *Section 3 – Triggers*

135 Participants were asked to report whether or not they experienced any of the triggers
136 in a list of 9 given stimuli: Crisp sounds, whispering, personal attention, vacuum noise,
137 aeroplane noise, laughing, smiling, watching repetitive tasks, and slow movements. Of these
138 suggestions, five possible triggers were inspired by the typical content of ASMR videos (eg.
139 Close personal attention, crisp sounds) and four were unlikely triggers (vacuum noise,
140 aeroplane noise, laughing, smiling). These unlikely triggers are commonly present in ASMR
141 videos, but are not commonly identified in titles or online discussions, so were considered to
142 be unlikely to produce tingles in many participants. This section included a comment box in
143 which participants could specify what, if anything, abolished the tingling sensations.
144 Preference of receiving auditory triggers in one ear over another was also probed.

145 *Section 4 – Location*

146 In order to more clearly define the location and time course of the tingling sensation
147 associated with ASMR, participants were asked to report where on their body they typically
148 felt tingles originate, and whether or not the sensation always originated in that area.
149 Participants were also asked whether or not the tingling evolved or spread with intensity, and
150 if so, which other body areas the tingling sensation spread to.

151 *Section 5 – ‘Why do you watch ASMR videos?’*

152 This section presented several likert style statements to be rated from ‘strongly agree’
153 to ‘strongly disagree’ in terms of how well each represented individuals’ experiences of

154 ASMR and ASMR media. These included statements concerning mood and arousal control,
155 such as ‘I watch ASMR videos to relieve negative mood’, ‘... to deal with anxiety’, and ‘...
156 to relieve stress’. Further, more generalised statements, such as ‘I know what triggers my
157 ASMR’, ‘I watch ASMR videos for sexual stimulation’, and ‘ASMR videos help me focus’
158 were included to obtain a rounded view of why participants choose to engage with ASMR
159 media.

160 *Section 6 - Flow State Scale*

161 Since the reported ASMR experience shares some features with that of the ‘flow’
162 state (Csikszentmihalyi, 1991), we used a reduced version of the Flow State Scale (Jackson &
163 Marsh, 1996) to quantify this experience. We selected only the eight questions relating to the
164 passive experience of flow. Participants scored their agreement with statements such as
165 “Things seem to happen automatically” on a 5-point scale. These scores were initially
166 subjected to factor analysis to confirm that only a single factor had been captured in the
167 reduced questionnaire. Combined scores, composed of the sum of the scores of the
168 components, were then submitted to Pearson’s Correlation to investigate links between flow
169 state and trigger thresholds.

170 *Section 7 - Effect on mood and chronic pain*

171 Using an interactive sliding scale ranging from 0 to 100, participants were asked to rate their
172 experience of mood during a typical day, directly before, during, one hour after and 3 hours
173 after a successful ASMR media viewing session. 0 on this scale represented ‘terrible, the
174 worst I’ve ever felt’, whereas 100 represented ‘euphoric, the best I’ve ever felt’. Participants
175 who earlier indicated that they suffered from chronic pain were also asked to complete a
176 version of this task with the intensity of their pain symptoms in mind.

177 Data analysis

178 Where possible, analyses were conducted on the entire sample (N=475). However, due to
179 certain sections being inapplicable to some participants, some sections included data from a
180 subset of the entire sample. In these cases, N is reported alongside the results. All analyses
181 were carried out in SPSS and Microsoft Excel. A copy of the data from this experiment are
182 included as supplementary data.

183

184 **Results**

185 *Why engage in ASMR?*

186 Through Likert style questions, participants largely sought out ASMR as an opportunity for
187 relaxation, with 98% of individuals agreeing, or agreeing strongly with this statement. In a
188 similar vein, 82% agreed that they used ASMR to help them sleep, and 70% used ASMR to
189 deal with stress. A small number of individuals (5%) reported using ASMR media for sexual
190 stimulation, with the vast majority of participants (84%) disagreeing with this notion.

191 Many participants described additional details of seeking the effects of ASMR where other
192 interventions, medical or otherwise, had been unable to assist. This is perhaps best illustrated
193 by a correspondence from one participant whose anxiety and stress was causing significant
194 issues in his daily functioning. After noticing during a hairdressing appointment that he felt at
195 ease, he sought out ways to replicate this feeling daily in order to manage his symptoms, and
196 in the process discovered ASMR media. In his own words:

197 *“I was totally amazed, I can only describe what I started feeling as an extremely relaxed*
198 *trance like state, that I didn’t want to end, a little like how I have read perfect meditation*
199 *should be but I never ever achieved.”*

200 *Common triggers*

201 Analysis of responses found four prominent categories of triggers, each experienced by over
202 50% of participants. These triggers are whispering (75%), personal attention (69%), crisp
203 sounds (64%) and slow movements (53%). 34% of participants also reported that their
204 ASMR was triggered by watching repetitive tasks. Triggers less commonly associated with
205 ASMR media (smiling, vacuum cleaner noise, aeroplane noise, and laughing) were included
206 for comparison. Each of these non-triggers were in each case reported to be effective by less
207 than 3% of participants. Some individuals reported only being triggered by new viewing
208 material, in which they are unable to predict which trigger will be presented next.

209 The most common time for engagement with ASMR media was reported to be before going
210 to sleep at night, with 81% of participants reporting this as their preferred time. 4% of
211 participants engaged in ASMR upon waking, 2% participated during the morning to midday.
212 30% of participants also reported viewing ASMR media in their spare time, regardless of the
213 time of day.

214 **Table 2 - Percentage of participants that reported induction of tingling sensations from each trigger type**

Trigger type	Percentage of participants triggered
Whispering	75%
Personal attention	69%
Crisp sounds (metallic foil, tapping fingernails, etc.)	64%
Slow movements	53%
Repetitive movements	36%
Smiling	13%
Aeroplane noise	3%
Vacuum cleaner noise	2%
Laughing	2%

215

216 When asked if participants preferred any specific environmental conditions for viewing, 52%
 217 responded 'yes'. Submitted comments suggested that of these, individuals near universally
 218 preferred quiet, relaxed conditions in order to achieve ASMR from online media. Many also
 219 specified preference for binaural headphones, so as to experience depth of sound.

220 Most participants reported having their first experience of ASMR at age five (65 individuals),
 221 with the vast majority (241 individuals) reporting the first experience of ASMR between five
 222 and ten years of age. There were also several instances of ASMR being first experienced
 223 further into adulthood – 41 individuals reported their first ASMR experience as happening
 224 after age 18.

225

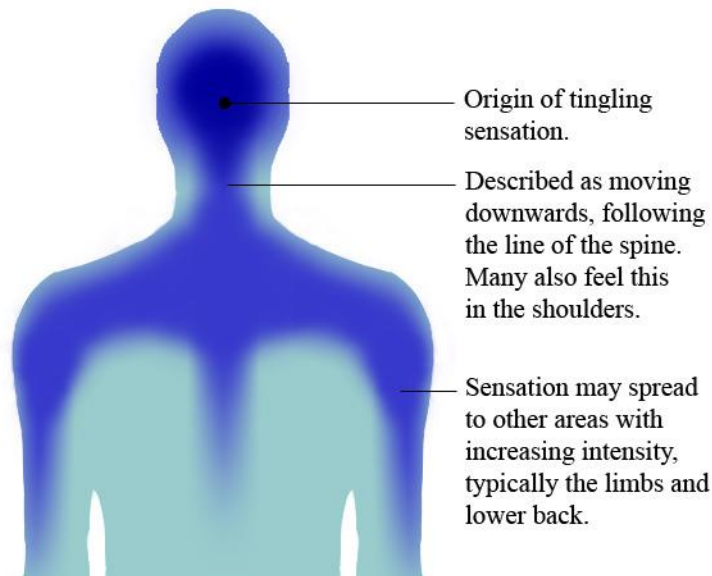
226 *Experience of ASMR*

227 Participants widely reported sensations similar to that found in general reporting of ASMR; a
 228 tingling sensation which originated typically towards the back of the scalp and progressed
 229 down the line of the spine and, in some cases, out towards the shoulders. Many participants
 230 also felt that their lower back, arms and legs experienced the sensation, though the amount of
 231 area the tingles covered seemed to be determined by the extent to which individuals had been
 232 triggered.

233 63% of participants reported the tingling sensation associated with ASMR to originate
 234 consistently in one part of their body, while 27% said this origin varied. Of those that
 235 reported a consistent origin, the static tingling sensation was reported to typically originate on
 236 the back of the head (41%) and shoulders (29%). When intense, this sensation is able to

237 extend down the line of the spine (50%), arms (25%) and legs (21%), though this does not
238 occur in every session, and every individual does not experience the same route.

239



240

241 **Figure 1: An illustration of the route of ASMR's tingling sensation. Image shows rear view of the head**
242 **and upper torso. Capable individuals typically experience the sensation as originating at the back of the**
243 **head, spreading across the scalp and down the back of the neck. Half of participants reported that this**
244 **sensation typically spreads to the shoulders and back with increasing intensity. Though this diagram**
245 **represents the most common areas involved in the tingling sensation, there is a huge amount of individual**
246 **variation in where tingles spread to with increased intensity, with legs and arms also commonly reported**
247 **as hotspots in some individuals.**

248

249 *Medications which affect ASMR*

250 Of the sample who reported taking medication, only three participants responded positively
251 when asked if they had noted effects of any of their medications on ASMR. One participant
252 noted that their antidepressant stifled sensations of ASMR, which later returned once they
253 stopped taking the medication, though they did not specify which. Another noted that
254 sleeping pills dulled their ASMR experience. A third reported that Clonazepam decreased the
255 sensations associated with ASMR. Six participants responded that their medication had no
256 effect on ASMR. 103 other participants who use medication were unsure as to the effect of
257 their medication on their experience of ASMR.

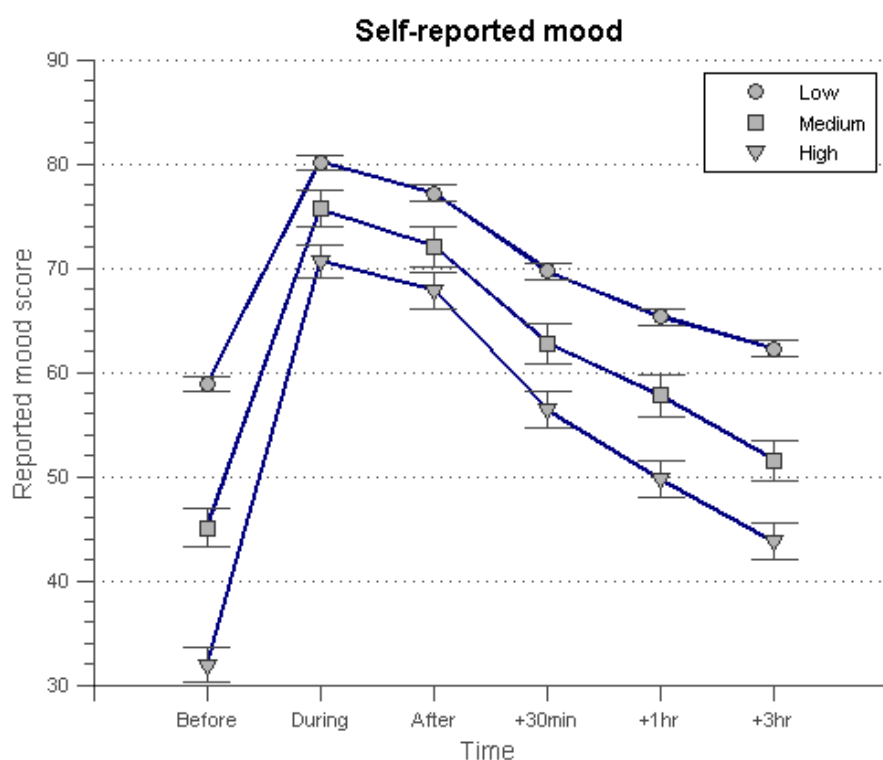
258

259 *Effect on mood*

260 80% of participants responded positively when asked if ASMR has an effect of their mood,
261 while 14% were unsure and 6% felt that ASMR did not alter their mood. When submitted to a

262 mixed ANOVA with factors for time (before, during, immediately following and 3 hours
 263 after ASMR) and for depression status (high, medium or low as defined by the BDI), we
 264 found a significant main effect of time on mood [$F(3.06, 1143.0)$, $p < 0.0005$]. Pairwise
 265 comparisons revealed significant differences between all timeframes ($p < 0.0005$ in all cases).
 266 Participants reportedly felt best while they are engaging with ASMR media, with reports on
 267 the 0 to 100 scale of positive mood averaging at 78 for this time period. The effect on mood
 268 steadily decreased over the course of several hours. Means for all time frames are reported in
 269 Figure 2. This effect is moderated by severity of depression, with people at higher risk of
 270 depression showing a more rapid decline in mood score over time [$F(10,2360)=20.217$, $p <$
 271 0.0005].

272



273

274 **Figure 2: The time course of mood before, during, immediately following, and several hours after**
 275 **engaging in ASMR. Data shown is the mean mood score given to each time frame by all participants (N =**
 276 **475), with participants grouped according to their Beck Depression Index. Mood scores could range from**
 277 **0 to 100, 0 representing the worst the individual had ever felt, 100 representing the best they have ever**
 278 **felt. Error bars represent +/- 1 standard error.**

279 50% of participants said their mood improved even in sessions when no tingling sensation
 280 was produced, while 30% said that achieving this sensation was vital to mood improvement.

281 69% of those who scored moderate to severe on the BDI reported using ASMR to ease their
282 symptoms of depression (N=70). Those scoring as depressed reported a mean improvement
283 in mood of 38.75 (STD = 18.85), in comparison to a mean improvement of 21.33 (STD =
284 13.58) in non-depressed participants.

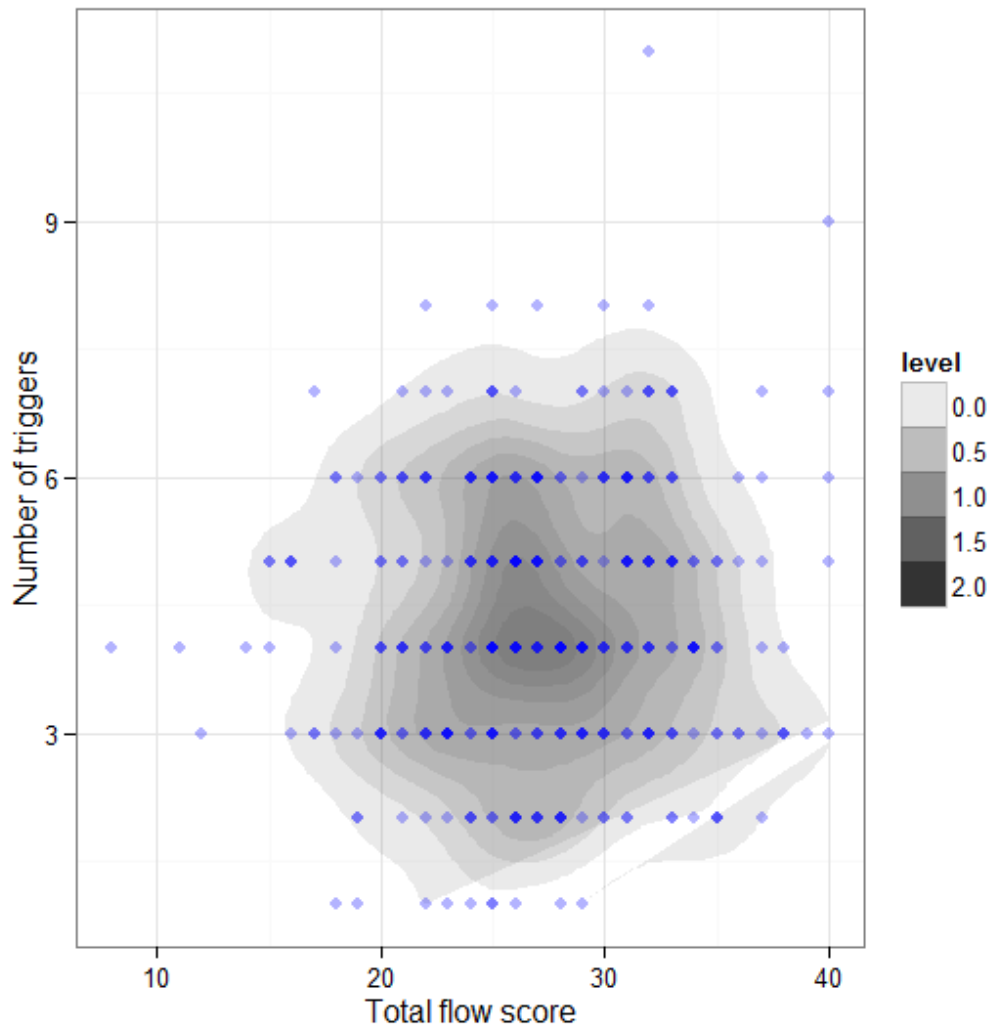
285 *Effect on chronic pain*

286 38 individuals with chronic pain reported that ASMR improved their symptoms. 13 were
287 unsure of ASMR's impact on their symptoms. 40 did not believe that ASMR had an impact
288 on their symptoms of chronic pain. Analyses were carried out on the responses of individuals
289 who responded positively and unsurely to this section. Six individuals who originally
290 reported issues with chronic pain were omitted due to incomplete data. Data analysis was
291 therefore carried out on 45 cases.

292 Self-report data for before, during, immediately after and 3 hours after ASMR were analysed
293 using a one way ANOVA, and were found to significantly differ [$F(3, 132) = 13.892, p <$
294 0.0005]. Pairwise comparisons revealed there to be a significant difference in chronic pain
295 symptoms before and during ASMR ($p < 0.0005$), a difference which was maintained three
296 hours following ASMR ($p = 0.014$). There was no significant difference between symptoms
297 of chronic pain during and immediately after ASMR ($p = 1.00$), nor was there a difference
298 between during and 3 hours after ASMR ($p = 0.21$).

299 *Flow state*

300 50 cases did not have complete data for the flow state questionnaire, so were removed from
301 analysis. We were interested in whether people who experience the flow state more readily
302 also experience the ASMR state more readily. To examine this we took the sum of each
303 participant's responses on the flow state questionnaire and correlated this with the total
304 number of ASMR triggers each person reported, from the list of commonly-reported triggers
305 (i.e. whispering, crisp sounds, personal attention, repetitive actions, slow movements, smiling,
306 water pouring). We used a non-parametric Spearman's test, as the trigger data tended to fall
307 into a small number of values. We found a highly significant relationship between flow
308 experience and number of triggers, with greater flow experience being associated with a
309 larger number of triggers [$\rho = 0.936, p < 0.01$]. This relationship is shown in Figure 3.



310

311 **Figure 3 – Relationship between participants’ susceptibility to the flow state (expressed as a sum of the**
 312 **scores on the modified Flow State Scale) and the number of triggers of the ASMR state. Note that many**
 313 **points are overplotted, so a density map is used here to show a concentration of responses.**

314 *Familial links*

315 When asked if they knew of any family members who experienced ASMR, 38 participants
 316 responded positively, 59 responded negatively, and the remaining 378 were unsure or had not
 317 inquired. The relations most often identified as experiencing ASMR were sisters (17
 318 individuals), mothers (11), brothers (7) and fathers (4). There were also reports of
 319 grandparents experiencing ASMR, though as relational distance increased fewer individuals
 320 were reported to be known as able to experience ASMR. It is likely that the perceived
 321 strangeness and stigma many individuals feel surrounds ASMR, has prevented many from
 322 asking if other individuals within their family experience something similar. The reports
 323 gathered through this research, however, do appear to indicate a familial aspect to the ability
 324 to experience ASMR.

325
326 *Synaesthesia*

327 Synaesthesia appeared to be particularly prevalent within the sample. 35 participants reported
328 experiencing various subtypes synaesthesia and, after exploration of the consistency of
329 concurrents through a follow up interview, 29 of these cases were assessed to be genuine.
330 This places the prevalence of synaesthesia within the sample at 5.9%, compared to a
331 prevalence in the general population of 4.4% (Simner at al. 2006). Participants reported
332 several subtypes, including grapheme-colour, grapheme-personality, time-space and pain-
333 gustatory synaesthesia.

334 Some comments submitted seem to resemble the inducer-concurrent relationship in
335 synaesthesia. One individual described the tingling sensation as changeable depending on the
336 gender of the voice in the ASMR video she was currently watching. She reported that a
337 female voice would cause the tingles to extend more strongly down one leg, whereas a male
338 voice would increase the sensation in the other leg. Several individuals responded similarly,
339 specifying that '*different triggers hit different parts*'. However, without more data it is
340 difficult to ascertain whether similar experiences are common amongst ASMR capable
341 individuals.

342

343 **Discussion**

344 ASMR can be defined as a combination of positive feelings, relaxation and a distinct, static-
345 like tingling sensation on the skin. This sensation typically originates on the scalp in response
346 to a trigger, travelling down the spine, and can spread to the back, arms and legs as intensity
347 increases. An increase in intensity can be achieved through experiencing further triggers.

348 Those who are able to can engage in ASMR through specialised media at any time, given that
349 the environment in which they attempt to do so is quiet and calm. Many report being
350 triggered by viewing others engaged in focused, precise tasks, by having close personal
351 attention paid to them, or by any number of audio stimuli, such as whispering, tapping or
352 other crisp sounds. Though the effectiveness of various triggers is subject to individual
353 differences, most who experience ASMR can be induced by the above categories of stimuli,
354 either through watching specially designed media, or by coming across triggers in daily life.
355 In capable individuals, ASMR is used mainly to achieve relaxation and for stress relief
356 purposes.

357 *Uplifting mood and pain relief*

358 The results of this study suggest that ASMR also provides temporary relief in mood for those
359 suffering from depression, with many individuals consciously using it for this purpose.
360 Individuals whose scores on the BDI suggested moderate to severe depression reported a
361 significantly more uplifting effect of engaging in ASMR than those without depression.
362 Those suffering from symptoms of chronic pain also benefitted from ASMR, seeing a
363 significant reduction in their discomfort for several hours following an ASMR session.

364 Many reported that even in the absence of tingling sensations, they felt that their mood and
365 symptoms of pain had been improved. It is possible that devoting specific time to engaging in
366 ASMR, watching relaxed scenes play out and sitting quietly could be considered a form of
367 mindfulness (Langer, 1989). Those who engage in ASMR take time to focus on positive
368 emotions triggered by these stimuli, focusing exclusively on this the task at hand. This
369 behaviour is very reminiscent of mindfulness practices, which have already been shown by
370 several studies to have positive effect on both conditions (Kabat-Zinn, Lipworth & Burney,
371 1985; Segal, Williams & Teasdale, 2012). This categorisation of ASMR as an exercise in
372 mindfulness meditation perhaps best explains the improvements in mood observed in both
373 depressed and non-depressed participants in this study.

374 *Obtaining Flow State*

375 Individuals who scored highly on flow measures reported regularly experiencing a higher
376 number of triggers. This suggests that those who are able to more readily experience flow
377 state during ASMR media consumption are susceptible to more frequent ASMR experiences
378 during their sessions.

379 Many ASMR videos show individuals in highly focused states (e.g. performing medical
380 exams) or engaged in repetitive tasks (e.g. folding towels). The behaviour of performers
381 during these types of videos often resembles that of someone in flow state – confidently and
382 accurately executing precise tasks. It may be that ASMR is brought about by obtaining a
383 flow-like state, which is in part facilitated by witnessing others in such a state. Similar
384 transference of state from performers to audience have been observed in studies probing the
385 role of mirror neurons (Rizolatti, Sinigaglia & Anderson, 2008). Higher levels of flow may
386 in turn facilitate triggers to be obtained, as could be indicated by results of this study.

387 *Links with synaesthesia*

388 The prevalence of synaesthesia of any type within the current study's sample was 5.9%,
389 which is considerably higher than the estimated prevalence of 4.4% in the general population
390 (Simner & Hubbard, 2013). This would suggest there may be a relationship between the two
391 phenomena. In emotional subtypes of synaesthesia, individuals feel moved to various
392 emotions by inducing stimuli which should, in theory, have no emotional effect on them (e.g.
393 tactile-emotion synaesthesia; Ramachandran & Brang, 2008). This sounds strikingly similar
394 to the experience of emotion in ASMR, where emotionally neutral sounds such as tapping
395 and paper tearing, or visual stimuli such as tasks requiring close concentration, bring about a
396 consistent relaxing, stress relieving, positive emotional response.

397 It is, however, also worth exploring whether or not the experience of ASMR ends with
398 automatic positive emotional reactions to neutral audio and visual stimuli. There may also be
399 merit in exploring automatic negative emotional reactions to external stimuli, and assessing
400 any relation of such an experience to ASMR. Within literature surrounding synaesthesia, a
401 related phenomenon that fits this description does exist, and is known as misophonia. Those
402 who experience misophonia (literally 'hatred of sound') have automatic negative emotional
403 reactions to particular sounds – the opposite of what can be observed in reactions to specific
404 audio stimuli in ASMR. For instance, sufferers report that noises made by humans, such as

405 'loud breathing or nose sounds' of any volume can produce feelings of disgust, anger, or
406 hatred in a manner which cannot be explained by previously learned associations. (Schröder,
407 Vulink & Denys, 2013) Though this condition has not yet been included in the Diagnostic
408 and Statistical Manual (DSM), there has been movement for misophonia to be recognised as
409 a psychiatric disorder in future revisions, and links between this phenomenon and other
410 perceptual atypicalities such as synaesthesia have been found (Edlstein, Brang &
411 Ramachandran, 2012).

412 There are distinct similarities between the experience of ASMR and Misophonia. In both
413 phenomena, triggering sounds originate from human movements and behaviours. Reactions
414 to these stimuli automatic in both cases, unexplained by previously learned associations, and
415 have some consistency (with the possible exception of some individuals becoming habituated
416 to triggers from ASMR media they have previously viewed). The present study suggests that
417 ASMR, similarly to misophonia, may have a relationship with synaesthesia. Indeed, both
418 experiences seem to follow somewhat synaesthetic patterns; particular inducers (external
419 stimuli, such as whispering, close attention, etc.) produce concurrents (internal
420 perceptual/sensational experiences - in the case of ASMR, tingling and relaxation) in a
421 somewhat predictable manner. It may be the case that ASMR and misophonia are two ends of
422 the same spectrum of synaesthesia-like emotional responses. Whether this hypothetical
423 spectrum, or indeed ASMR alone, can be classified as a type of sound-emotion synaesthesia
424 is however, debateable.

425 The main issue with relating ASMR to synaesthesia is that, from the data collected here, there
426 does appear to be a difference between the two in terms of tangibility of concurrents.
427 Whereas synaesthetic concurrents are described as 'having a knowledge or sensation of a
428 certain concurrent' (Simner & Hubbard, 2013), the tingling sensation associated with ASMR
429 is described in a very physical sense. If we were to consider the concurrent of ASMR as a
430 tingling sensation, as described by participants of the current study, we could with near
431 certainty say that ASMR is not a subtype of synaesthesia. However, this neglects the presence
432 of positive emotions which accompany the tingling sensation. It may be that ASMR is the
433 positive end of a spectrum of a sound/emotion synaesthesia, and that this tingling sensation is
434 a secondary phenomenon resulting from intensely positive feelings, rather than the primary
435 concurrent. The data collected seems to support this, as many participants reported feeling
436 relaxation and positive emotions even in the absence of a tingling sensation.

437 However, there is no mention in misophonia research of any negative counterpart to the
438 tingling sensation found in ASMR. If one were looking for a truly polar opposite sensation, it
439 may be expected to observe numbness in the skin or an irritating sensation present. It must be
440 considered, however, that perhaps the opposite of this tingling sensation is not irritation, but
441 actually the general level of sensation that might be expected in typical individuals. Rather
442 than this aspect lying on a continuum from irritation to typical sensation to pleasant tingling,
443 it is a smaller continuum between typical sensation and pleasant tingling, with many shades
444 of grey between the two.

445 *Future directions for research*

446 Though the age of the sample in the present study suggests engaging in ASMR is primarily
447 an endeavour of young adults - this is likely to be reflective of limitations in the sampling
448 method. Several individuals above age 40 provided input via this questionnaire, and some
449 participants spontaneously reported being aware that one of their parents and/or their children
450 also experienced what they believe to be the same the sensation. This would suggest that the
451 young age of the sample is more likely a product of user demographic of Facebook and
452 Reddit than an accurate representation of ASMR capable individuals' ages. In the current
453 study, synaesthesia was tested for consistency via e-mail interview. As the subtypes reported
454 by participants were so varied, some immeasurable by the standard Test of Genuineness
455 (TOG-R; Asher et al., 2006), interview was favoured over electronic tests of consistency such
456 as those found on synaesthete.org (Eagleman et al., 2007). We suggest that future studies
457 into ASMR include rigorous controls for synaesthetic experience.

458 While ASMR appears to be a genuine, relatively prevalent perceptual experience, the exact
459 nature of the phenomenon is still unknown. There is the possibility that the tingles associated
460 with ASMR result from a minor seizure, brought on by appropriate stimuli. This has been
461 hypothesised in the past (Novella, 2012), but as of yet remains uninvestigated. In this vein,
462 research utilising neuroimaging methods such as fMRI may further our understanding brain
463 regions involved in ASMR. fMRI investigations in particular, however, have potential to
464 prove problematic, as results of the current study show that individuals overwhelmingly
465 require specific, quiet and relaxed conditions to achieve the desired sensation. An alternative
466 avenue of research might be the use of so-called non-invasive brain stimulation (Davis & van
467 Koningsbruggen, 2013) to modulate brain activity during ASMR. Techniques such as
468 transcranial direct current or magnetic stimulation (tDCS, TMS) are known to induce

469 multisensory experiences, often as an unintended side-effect of stimulation (Davis, Gold,
470 Pascual-Leone, & Bracewell, 2013). Given the age demographic of ASMR consumers, we
471 note that brain stimulation techniques should be used sparingly in younger people (Davis,
472 2014).

473 Further exploration into ASMR's relationship with Misophonia may also yield interesting
474 results. Studies examining the co-occurrence of Misophonia and ASMR may shed more light
475 on the possibility that these two experiences are related, or potentially opposite poles of the
476 same spectrum. Similarly, the relationship with synaesthesia suggested by the results of this
477 research should be taken further, using more robust consistency measures to verify that the
478 high instance of synaesthesia in ASMR capable individuals. The suggestion that ASMR and
479 Misophonia may be related was based primarily on similarities in reaction to auditory stimuli.
480 Though sounds play a pivotal role in ASMR, it would also be advantageous to investigate the
481 role of visual stimuli alone in triggering viewers, as such stimuli involving precise
482 movements and focused tasks appear to be effective while being near silent.

483 *Conclusions*

484 We have provided the first investigation into the phenomenon of autonomic sensory meridian
485 response (ASMR). ASMR can be induced, in those who are susceptible, by a fairly consistent
486 set of triggers. Given the reported benefits of ASMR in improving mood and pain symptoms,
487 we suggest that ASMR warrants further investigation as a potential therapeutic measure
488 similar to that of meditation and mindfulness.

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