Autonomous Sensory Meridian Response: Induction, Personality, and Consciousness Correlates

Natalie Roberts

BA (Psychology), MRes (Psychology)

Submitted in fulfilment of the requirements of a degree of Doctor of Philosophy (PhD)

Department of Psychology

Macquarie University

Submitted on 28th of February 2019

Table of Contents

Statement of Authorship 4

Acknowledgements 5

Abstract 6

Chapter 1: Introduction 7

Chapter 2: ASMR: Scale Development and Personality Correlates 28

Chapter 3: ASMR: Sensitivity and Personality Correlates 73

Chapter 4: ASMR: Induction and Frisson 114

Appendix A: ASMR Stimulus Videos 157

Appendix B: Pilot Study Results 160

Appendix C: Frisson Stimulus Videos 162

Chapter 5: ASMR: Altered States and Consciousness Correlates 163

Appendix D: ASMR-15 and Subscale Scores 206

Appendix E: ASMR Trigger Preferences Results 208

Chapter 6: General Discussion 213

Appendix F: Ethics Approval for Study 3 in Chapter 2 238

Appendix G: Ethics Approval for Chapter 3 240

Appendix H: Ethics Approval for Chapter 4 242

Appendix I: Ethics Approval for Amendment for Chapter 4 243

Appendix J: Ethics Approval for Chapter 5 244

Appendix K: Ethics Approval for Amendment for Chapter 5 245

Statement of Authorship

This work has not been previously submitted for a degree in any university, except where declared. To the best of my knowledge and awareness, this thesis contains no material previously published or written by someone else, except where explicitly referenced in the thesis itself.

Natalie Roberts

13/01/2019

Acknowledgments

I'd like to express my sincerest gratitude to my supervisor Simon Boag, for his endless support, patience and wisdom in guiding the progress of this work. Thank you for taking a chance on me in researching such a risky and unusual topic, and for going above and beyond to make sure it paid off. Many thanks as well to my associate supervisor Alissa Beath. Your guidance has been both supportive and reassuring, and I'm endlessly thankful for the time and effort you have put in to help untangle this puzzle.

To my partner Mitch, thank you for always believing in me, and for being my biggest cheerleader. I truly couldn't have finished this without you, and I'll be forever grateful for your love and support during this time. I'd also like to thank my family and friends who have been consistently supportive, caring, and encouraging, including Mason, Fannie, Rix, Nick and Robyn. Of course, I couldn't have finished this without the support from my parents, Julie and Craig. Thank you for everything.

A final, sincere thank you goes out to the ASMR internet community, particularly the wonderful people of Reddit. I wouldn't have been able to do any of this without your generosity and interest in furthering the research community's understanding of ASMR. Thank you for your time, and I hope this thesis answers some of your questions.

Abstract

Altered states of consciousness (ASC) refer to qualitative shifts in an individual's pattern of mental functioning. One such experience, autonomous sensory meridian response (ASMR), has been relatively unexplored, despite garnering significant attention online and in the media. ASMR is a pleasurable, head-orientated tingling sensation, triggered by specific audio-visual stimuli, producing feelings of relaxation, comfort and euphoria. Common triggers include whispering, soft speaking and tapping sounds. The aim of this thesis was to explore the parameters of ASMR experiences, with respect to phenomenology, prevalence, induction and relationship to personality and consciousness correlates. This was achieved through a mixed-methods approach in 4 parts. Study 1 outlined the refinement of the newly developed ASMR-15 scale, and explored the relationship of ASMR to anxiety, misophonia and absorption. Study 2 assessed the associations between Big Five personality factors and dispositional sensitivity with ASMR propensity, and the prevalence of ASMR experiences in an undergraduate student population. Study 3 outlined the successful induction of ASMR experiences in a laboratory setting, and divergence from induced frisson. Finally, Study 4 examined consciousness correlates and the possibility of ASMR existing as an anomalous experience. Taken together, the findings of these studies suggest that ASMR propensity can be measured across generalised and niche populations, and that ASMR is a relatively common, unusual experience unaccounted for by existing constructs. In addition, ASMR appears to be associated with a number of personality traits and individual differences. Lastly, the ASMR-15 appears to be a reliable and valid measure of ASMR.

Chapter 1: Introduction

Throughout history and across cultures, humans have reported a wide variety of altered states of consciousness and anomalous experiences (Cardeña, Lynn, & Krippner, 2017; Tart, 1980). Existing on a broad continuum, altered states of consciousness (ASCs) refer to qualitative and quantitative shifts in subjective experience and mental functioning, characterised by a distinct, temporary deviation from ordinary waking consciousness (Dietrich, 2018; Ludwig, 1966; Tart, 1969; Tart, 1972). From dreaming, sleep states and alcohol intoxication, to psychedelic and narcotic-induced states, trance possession and hypnosis, ASCs represent a realm of potential experiences beyond the "thin veneer" of ordinary consciousness (Ludwig, 1966, p. 225; Tart, 1972). While 'unusual', ASCs appear to be an almost universal human experience, with almost 90% of societies participating in institutionalised, culturally-mediated procedures to alter consciousness (Bourguignon, 1973; Cardeña et al., 2017; Price-Williams & Hughes, 1994). Examples of such culturally-mediated procedures include shamanic ceremonies, sweat lodges, and the ingestion of psychoactive substances (Polito, Langdon, & Brown, 2010). Moreover, due to the ubiquitousness of such practices (Cardeña et al., 2017; Polito et al., 2010), it has even been postulated that the drive towards experiencing ASCs may constitute a basic human motive (McPeake, Kennedy, & Gordon, 1991; Csikszentmihalyi & Nakamura, 2018).

Altered States and Alterations of Consciousness

Despite this, the parameters, organisation, and range of altered states remain relatively unclear, an issue owing in large part, to the subjective, individualistic, and ephemeral nature of such experiences (Dietrich, 2018). As a contentious area, there have been numerous attempts at classifying and mapping altered states onto a hierarchy or continuum, including by method of induction, phenomenology, and antecedents (Dietrich, 2018; Ludwig, 1966; Silverman, 1968; Vaitl et al., 2005). Through the examination and distillation of the features of a wide variety of experiences, Ludwig (1966) advocated for the existence of ten general

characteristics across most ASCs, including: disturbed time sense, alterations in thinking, change in emotional expression, loss of control, body image change, change in meaning or significance, perceptual distortions, a sense of the ineffable, hypersuggestibility, and feelings of rejuvenation. By contrast, when classified with respect to antecedents, three broad categories across ASCs emerge. Specifically, Silverman (1968) identified three conditions responsible for the stimulation of ASCs: sensory overload or underload (e.g. healing trance experiences, sensory and social deprivation), hyperattentiveness to a narrow range of stimuli and hypoattentiveness to the environment (e.g. praying, absorption, flow states), and changes in body chemistry (e.g. thyroid disorders, consumption of psychedelics). Finally, in acknowledging the difficulties encountered when attempting to operationalise and structure consciousness and its alterations, Pekala (1991) identified twelve major dimensions of ASCs, including: Altered experience, positive affect, negative affect, imagery, altered state, volitional control, arousal, self-awareness, rationality, internal dialogue, memory, and attention (Beischel, Rock, & Krippner, 2011). Nevertheless, while substantial progress has been made across the numerous classification systems and models of consciousness, the categories, boundaries, and terminology surrounding ASCs remain hotly debated (Dietrich, 2018; Rock & Krippner, 2007). For instance, there have even been assertions that the conceptualization of SoCs and ASCs rest on a logical fallacy, whereby supposed ‘states’ of consciousness may be readily conflated with the content of consciousness (i.e. object of awareness), itself (Rock & Krippner, 2007).

Representing a broader continuum, alterations of consciousness (AoCs) refer to somewhat more amorphous, or less discrete deviations in consciousness (Barušs, 2003). In an effort to synthesise and categorise the myriad phenomena within the AoC umbrella, Vaitl et al. (2005) created a classification system structured around methods of induction. Five origin domains were identified, positing that ASCs and AoCs may be: spontaneously occurring (e.g.

daydreaming, near death experiences), psychologically-induced (e.g. sensory deprivation or overload, meditation, hypnosis), physically or physiologically-induced (e.g. starvation, sexual activity), disease-induced (e.g. psychotic illness, coma) or pharmacologically-induced (e.g. narcotics, psychedelics). Additionally, there exists substantial variance within, and similarity across, induction categories, specifically with respect to arousal and relaxation, awareness span, self-awareness, and sensitivity (Vaitl et al., 2005). Despite this variability, ASCs and AoCs both function as transcendent states of existence, bypassing the limitations of ordinary waking consciousness (Cardeña et al., 2017).

As alterations and altered states of consciousness have perceptual and experiential qualities distinct from ordinary waking consciousness, ASCs and AoCs offer potentials and experiences otherwise inaccessible in the ordinary waking state (Tart, 1980). Described as a "paramount reality" (p. 103), Csikszentmihalyi and Nakamura (2018) argue that a dissatisfaction with the ordinary waking state underpins the desire to participate in transient, alternative realities, such that altered states offer temporary relief from an otherwise harsh, underwhelming existence. As a result, ASCs and AoCs may sometimes manifest as maladaptive forms of human expression, such as forms of escapism (e.g. psychedelic use), self-destruction (e.g. narcotic use), or defence in the face of external threat (e.g. dissociation; Ludwig, 1966). Nevertheless, ASCs and AoCs may also represent a desirable state of consciousness. Such desirable states may be evident through the improved functionality of existing traits, or presence of state-specific abilities, including the regulation and healing of physical ailments (e.g. healing in shamanic rituals, body temperature regulation in extreme climates through meditation), creating new knowledge and experiences (e.g. mystical and transcendental experiences, absorption in art and music), and in various social functions (e.g. group spirit possession practices; Ludwig, 1966; Cardeña et al., 2017).

Peak Experiences, Frisson and ASMR

In seeking to understand such desirable states of functioning, there have been efforts to operationalise and assess transpersonal, positive experiential phenomena, including peak experiences, peak performance, and flow (Mouton & Montijo, 2017; Privette, 1983). Maslow (1962) described peak experiences as moments of intense happiness, awe and ecstasy, in the absence of self-consciousness. Peak experiences may occur during profound moments of love, insight, and creativity, fulfilling one's previously "vague, unsatisfied yearnings" (Maslow, 1962, p. 9). Similarly, episodes of peak performance pertain to moments of superior, high level functioning, characteristic of actualised human potential (Privette, 1983). For example, peak performance may be witnessed as increased physical strength in a crisis situation, artistic expression, and enhanced athletic performance (Privette, 1983). While initially thought to be mystical, or reserved for only those who had achieved self-actualisation, moments of peak functioning appear to be an almost universal experience (Mouton & Montijo, 2017; Panzarella, 1980). By contrast, flow refers to a distinctively enjoyable state of intense absorption in an activity of interest within a narrow stimulus field, characterised by a match in skill level of the experiencer to the difficulty of the activity of interest (Csikszentmihalyi, 1990; Csikszentmihalyi & Nakamura, 2018). Notably, unlike a number of certain escapes from reality (e.g. alcohol consumption, psychedelics), Csikszentmihalyi and Nakamura (2018) argue that flow experiences represent an intrinsically rewarding optimization of ordinary consciousness, rather than a deviation or escape from normal functioning.

While peak experiences may occur in response to practically any stimuli (i.e. people, learning, work, etc.; Mouton & Montijo, 2017), aesthetic peak experiences pertain to moments of intense joy upon exposure to music and visual art, producing feelings of optimism, self-transformation, and a loss of self (Panzarella, 1980). A well-explored indicator

of aesthetic pleasure – chills – involves the experience of tingles or shivers along the spine, often accompanied by heightened emotions, tears, and goosebumps (Harrison & Loui, 2014; Sloboda, 1991). Frisson, or musically-induced chills, refer to moments of profound resonance with musical stimuli, producing distinct shifts in emotion, goosebumps, and piloerection (Harrison & Loui, 2014). In a study by Sloboda (1991), frisson was most reliably induced through descending chord progressions, and a violation of expectations, including unusual harmonies and melodies.

However, music and art are not the only stimuli utilised in the pursuit of pleasurable, sensory experiences. For instance, there has been substantial recent interest in inducing "tingles" from viewing and listening to non-musical stimuli, including whispering, crinkling and crisp sounds (Barratt & Davis, 2015). The phenomenon, known as Autonomous Sensory Meridian Response (ASMR), appears to share numerous features with other anomalous, and aesthetic peak experiences, such as synaesthesia (i.e. cross-modal sensory stimulation) and flow states, and may have potential therapeutic applications (Barratt & Davis, 2015).

What is ASMR?

Autonomous Sensory Meridian Response (ASMR) is a pleasurable, head-oriented tingling sensation typically induced by exposure to specific audiovisual triggers, producing feelings of comfort, relaxation and euphoria (Andersen, 2014; Colizoli, Murre, & Rouw, 2013; Poerio, Blakey, Hostler, & Veltri, 2018; Roberts, 2015). Initially coined by Jennifer Allen in 2010 (Morris, 2018), the term 'ASMR' refers to an autonomous, sensory meridian experience, elicited in response to a variety of triggers. 'Autonomous' here, refers to the phenomenon's apparent spontaneous development, whereas 'sensory meridian' pertains to the sensory character of the experience (i.e. a peak, point, or moment of highest development or prosperity; Richard, 2016). Commonly cited triggers include whispering, tapping and crisp sounds, slow movements, close personal attention, and the observation of others completing

skilful tasks (Ahuja, 2013; Barratt & Davis, 2015). However, preferences with respect to the style and delivery of triggers appear to be fairly idiosyncratic, spanning a variety of genres including, but not limited to: makeup tutorials, poetry readings, and roleplays (Gallagher, 2018; Poerio et al., 2018). Additionally, these videos frequently feature whispering and tapping sounds, and share similarities with other prominent YouTube trends, including slime and pimple popping videos, such that ASMR may exist as a form of satisfying content (Alexander, 2017; Swannell, 2016). Together, these videos seemingly represent a genre of audiovisual stimuli for the purpose of inducing vicarious aesthetic satisfaction (Swannell, 2016; Goins, 2016).

While ASMR has been labelled a "relatively rare" phenomenon (Morris, 2018, p. 52), there is increasing evidence that ASMR may be a common experience. For instance, while research into ASMR is still in its infancy, mounting interest in discussing and inducing ASMR experiences has seen the emergence of a growing "whispering community" (Garro, 2017, p. 1) across social media platforms such as YouTube, Reddit and Facebook. For instance, the Facebook page *ASMR* (https://www.facebook.com/ASMRofficial) as of February 2019, has earned over 59 000 likes, and the ASMR-dedicated subReddit *ASMR: Sounds That Feel Good* has accrued over 175 000 members since its inception in 2011. However, the largest ASMR community appears to exist on YouTube, where, as of January 2019[1], 18 million ASMR videos have been uploaded, with some earning over 46 million views (TubeBuddy, 2019).

Awareness of ASMR reached a new peak in early February 2019, with the airing of an ASMR-style beer commercial from Michelob Ultra during the Super Bowl (Schaefer, 2019). The ad, which has since accrued over 14 million views on YouTube, features actress

[1] Note: As of February 2019, the number of videos on YouTube that match the term "ASMR" has exceeded 50 million. However, it is unclear whether all these search results pertain to ASMR stimulus videos specifically, or refer to commentary on ASMR as a whole.

Zoë Kravitz tapping her nails on the side of a glass bottle, whispering, and holding a glass of beer up to a sensitive microphone to capture gentle fizzing sounds. Despite intending to induce relaxation and pleasure, the response from viewers was not all positive, with 54% of tweets about the commercial criticising the use of ASMR techniques (Johnson, 2019). One tweet read "what made me the most uncomfortable was the Michelob commercial…. ASMR gets under my skin, and not in a good way… I can't stand to listen to it" (Johnson, 2019). As a seemingly divisive phenomenon, ASMR has even been labelled a "vast consensual hallucination" (Connor, 2013) by skeptics, dismissing the experience as mere internet novelty.

Despite some negative responses, interest in ASMR continues to increase, and may be partially attributable to the self-reported benefits associated with ASMR induction. Most notably, ASMR has been cited as both a non-pharmaceutical sleep aid and an effective tool for relaxation, although these claims have not yet been meaningfully substantiated (Taylor, 2013). Nevertheless, ASMR media appear to be widely accessed for wellbeing purposes. For example, in assessing the most common motives underlying deliberate ASMR engagement, Barratt and Davis (2015) surveyed 475 self-identified ASMR experiencers from Reddit and Facebook. Participants most frequently cited (98%) relaxation-seeking as a primary motive, followed by sleep (82%), and stress management (70%). Additionally, 80% of participants retrospectively identified an improvement in their mood following ASMR experiences. While these findings are preliminary, the endorsement of ASMR as an alternative to mindfulness and relaxation exercises suggests that ASMR may be a promising adjunct to existing therapeutic interventions for stress, anxiety, and mood disorders (Barratt & Davis, 2015). However, the existence of a valid and reliable measure of ASMR propensity is needed in order to further understand, assess, and discern the legitimacy of ASMR experiences.

Assessing ASMR Experiences

There have been recent attempts to both qualify and quantify ASMR in a way that allows for the systematic observations and exploration of the correlates and possible antecedents of the experience. In an early study, Barratt et al. (2015) assessed self-reported ASMR experiences as a form of passive flow among 475 self-identified ASMR experiencers recruited from Reddit and Facebook. Participants completed an 8-item modified version of the Flow State Scale (Jackson & Marsh, 1996), alongside 35-items assessing the self-reported effects of ASMR induction on mood and chronic pain symptomatology. ASMR (as captured by items assessing reported effects on mood and pain), was associated with a short-term self-reported decrease in discomfort from chronic pain, and an improvement in mood following induction. However, it is important to note that these results were derived from recalled experiences, and did not involve real-time ASMR induction. In addition, the findings only pertained to ASMR experiences from the perspective of flow and so the specific features that constitute ASMR were not directly addressed. Thus, while ASMR may share features with flow, such as relaxation and absorption in a stimulus of interest (Barratt et al., 2015), flow itself does not appear to adequately account for the various sensory and affective components of ASMR (e.g. tingling, and feelings of comfort and euphoria; Poerio et al., 2018; Andersen, 2014; Colizoli et al., 2013; Roberts, 2015).

In acknowledging the need for a specific measure of ASMR propensity, Fredborg, Clark, and Smith (2017) created a 14-item ASMR Checklist modelled around common triggers and accompanying sensory experience (i.e. tingles intensity). To identify the role of personality traits in ASMR experiences, Fredborg et al. (2017) administered the BFI (John, Donahue & Kentle, 1991) to 290 self-identified ASMR experiencers from Reddit, and an additional 290 age- and sex-matched controls. ASMR participants also completed the ASMR Checklist, retrospectively rating the effectiveness of a number of common triggers in

inducing ASMR, including "watching someone draw" and "whispering" on a 7-point scale from 0, *no tingles*, to 6, *the most intense ASMR experience*. Consistent with the findings of McErlean and Banissy (2017), self-identified ASMR participants scored significantly higher on Openness to Experience, Neuroticism and lower on Conscientiousness than controls, suggesting a particular personality profile associated with self-identified ASMR propensity. Further, intensity scores on the ASMR Checklist correlated weakly, yet positively with Openness and Neuroticism. However, these findings were significantly limited by the assessment of ASMR as a solely sensory experience (i.e. only comprising tingles intensity), despite evidence that ASMR is multifaceted, with affective changes and relaxation components (Barratt et al., 2015). As a result, while self-selecting ASMR participants may report significantly different levels of Big Five traits than non-ASMR participants, the exact nature of ASMR remains unaddressed, and it is unclear how personality relates to ASMR experiences beyond sensory components.

ASMR as a Multidimensional Construct

While previous work has tended towards conceptualising, and thus assessing, ASMR propensity as a unidimensional construct, ASMR appears to be a multidimensional experience. In a previous mixed methods study, Roberts (2015) sought to create a self-report measure of ASMR propensity that captured the phenomenology of ASMR experiences[2]. Through content analysis of 303 online archival accounts of ASMR, distinct affective (i.e. bliss, pleasure, euphoria), sensory (i.e. tingles, goosebumps), and altered consciousness (i.e. time distortions, trance-like state) components emerged. Distinct from previous work, the adoption of an exploratory approach allowed for the inclusion of more diverse facets of ASMR, beyond sensation as seen in previous research (e.g. Fredborg et al., 2017).

[2] Note: the Roberts (2015) study forms part of a 2018 publication that is included in Chapter 2 of this thesis. Declaration of the relation of these earlier data to the PhD is provided on page 29.

Informed by this content analysis, Roberts (2015) created the preliminary 31-item self-report measure (ASMR-31) of ASMR propensity. Following the statement "when I experience ASMR", participants were asked to indicate their level of agreement with each item, including "I feel euphoric" on a Likert scale from 1, *completely untrue for me,* to 5, *completely true for me*. To assess the relationships between ASMR and similar constructs, the ASMR-31 was administered to 453 participants from an online ASMR interest group (r/ASMR), alongside measures of ASMR-flow (FSS-2; Jackson & Marsh, 1996; Jackson & Eklund, 2002; Barratt & Davis, 2015), frisson (AES; Silvia & Nusbaum, 2011), and alexithymia ('no words for emotions'; TAS-20; Bagby, Taylor, & Parker, 1994). The measure was refined to eventually produce a 20-item ASMR scale, with five meaningful subscales: Affect (i.e. emotional component of the experience), Altered Consciousness (i.e. deviation from ordinary waking state as a result of ASMR induction), Sensation (i.e. the sensory components of the experience, such as tingling or goosebumps), Relaxation (i.e. experience of calmness and relaxation), and Movement (i.e. spread of sensation throughout the head and/or body). Correlational analyses revealed some convergence between ASMR, frisson, and flow, as well as divergence between ASMR and alexithymia.

However, in order to assess these relationships further, the scale required additional refinement. Firstly, whilst the overall scale appeared to be reliable, the Relaxation and Sensation dimensions failed to demonstrate adequate internal consistency. Moreover, the predictive validity of the measure was yet to be determined (e.g., concordance between scores on the self-report measure and experiences following exposure to ASMR stimuli), and as yet, the ASMR-20 had not been administered outside of a specialised sample. The establishment of reliability and validity was a critical next step then in quantifying ASMR experiences. As a result, additional administration and refinement of the new measure was

required to allow for the reliable and valid assessment of multidimensional ASMR experiences in a variety of samples.

Summary and Overview of Thesis

In summary, attempts to quantify and assess ASMR experiences to date have been mostly limited in a number of ways, most notably though the conceptualisation of ASMR as a unidimensional experience, and premature classification of ASMR as a flow state (e.g. Barratt & Davis, 2015). Roberts (2015) instead reported that ASMR appears to be a multidimensional experience unexplained by existing constructs and measures (i.e. frisson, alexithymia, aesthetic experiences, and flow). Nevertheless, it remains unclear to what extent various individual differences such as personality, sensitivity, and tendency towards experiencing ASCs can explain levels of ASMR propensity. An understanding of individual differences associated with ASMR experiences may help explain why some people experience ASMR, while others do not. Additionally, it is currently unknown whether ASMR exists as an AoC within the umbrella of peak experiences, an unusual experience triggered by particular stimuli, or whether ASMR is another manifestation of synaesthesia (i.e. the experience of cross-modal sensory stimulation, where a stimulus elicits a response in one modality (e.g. sound), as well as a secondary response in another modality (e.g. perception of colour); Cardeña et al., 2017). Moreover, there is currently no sound psychometric tool that allows for the assessment of ASMR experiences in participants unfamiliar with ASMR terminology, creating a reliance on online communities who may not best represent all levels of ASMR experiences.

Given the limitations described above, to substantially advance research in this area necessitates the creation and refinement of a reliable and valid, multidimensional measure of ASMR propensity. In previous work, the ASMR-20 demonstrated promise as a sound tool for ASMR exploration (Roberts, 2015), even if requiring further refinement. In addition to this,

the ASMR-20 needed further validation on non-specialised samples in order to assess ASMR experiences outside of self-selecting interest groups. Such refinement would allow for a much more extensive exploration of possible antecedents and personality traits underlying ASMR propensity, as well as the relative prevalence of ASMR experiences more broadly.

Aims of This Thesis

The broad aim of this thesis was to assess the phenomenology of ASMR, and examine the extent to which ASMR relates to individual differences. However, given so little is currently known about ASMR, it was appropriate to ask multiple questions about the phenomenon. As a result, Chapter 2 outlines the continued refinement of the ASMR-20, utilising exploratory and confirmatory factor analyses to produce a novel reliable and valid measure of ASMR propensity. To achieve this, the refined ASMR scale was administered to a large, online ASMR community, alongside measures of anxiety (BIS; Carver & White, 1994), absorption (CES; Goldberg, 1999), and misophonia (i.e. hatred of specific sounds; MAQ; Johnson, 2014). In doing so, we explored how strongly experiences of ASMR were associated with similar, known phenomena, including dissociative absorption and other strong physio-affective responses to sounds, as seen in misophonia.

Chapter 3 then discusses the distribution of ASMR experiences amongst undergraduate psychology students, and the individual differences in personality and dispositional sensitivity associated with an increased propensity towards experiencing ASMR. The main aim of this work was to assess the prevalence of ASMR experiences within an undergraduate sample, utilising a modified (i.e. adapted to suit participants without prior awareness of ASMR) version of the ASMR measure. An additional aim was to assess the reliability of the validated ASMR measure among non-specialised participants. To achieve these aims, the ASMR measure was administered to undergraduate students alongside measures of sensory-processing sensitivity (Aron & Aron, 1997) and Big Five personality

traits (BFI; John et al., 1991). In order to explain ASMR without priming participant responses, the existing ASMR-15 was modified to include a contextual overview of synaesthetic experiences, independent of ASMR terminology.

In order to assess the accessibility of ASMR experiences in a controlled environment, Chapter 4 presents work that explored the possibility of inducing ASMR and frisson in a laboratory setting amongst undergraduate students. The primary aim of the study was to assess the predictive validity of the ASMR measure, and to assess whether higher ASMR scores were associated with more frequent reports of ASMR experiences in the laboratory. A secondary aim was to provide further evidence of divergence between ASMR and frisson experiences, through a mixed-methods analysis of responses to ASMR and frisson stimuli. To achieve this, undergraduate psychology students completed the ASMR scale and a measure of frisson, before viewing selected ASMR and frisson stimuli under controlled conditions. In doing so, we examined whether higher ASMR scores were associated with qualitative descriptions consistent with ASMR experiences, and if frisson scores were positively correlated with accounts of frisson experiences. Additionally, we explored the relationships between accounts of ASMR and frisson experiences to further disentangle the phenomena.

In Chapter 5, ASMR was explored with respect to altered states of consciousness and unusual experiences, to understand the extent to which ASMR propensity may reflect permeable mental boundaries and a tendency towards unusual experiences. Specifically, the study assessed whether ASMR is associated with greater transliminality, or the tendency for psychological material to transcend the threshold of conscious awareness (Lange, Thalbourne, Houran, & Storm, 2000). A secondary aim was to assess the reliability and validity of the contextualised ASMR measure (utilised in Chapter 3) among specialised ASMR participants. To achieve this, the ASMR scale was administered to online ASMR

samples from Facebook and Reddit. Additionally, participants completed measures of mindfulness, unusual experiences, transliminality, and body consciousness, to explore the relationships between individual differences in personality and consciousness, and ASMR propensity.

A final discussion chapter (Chapter 6) then outlines the main findings and unique contributions of this thesis. Novel findings are critically evaluated and synthesised to highlight the major themes that emerged across studies, including the prevalence of ASMR experiences in specialised and non-specialised samples. In addition, the strengths, limitations, and overall implications of the work is examined. This discussion further includes recommendations for further scale refinement and promising future avenues for research, as well as potential therapeutic and clinical applications of the ASMR measure.

References

Ahuja, N. K. (2013). It feels good to be measured: Clinical role-play, Walker Percy, and the tingles. *Perspectives in Biology and Medicine, 56,* 442-451.

Alexander, L. (2017, May 31). *The slimy, technicolor world of satisfying YouTube videos.* Retrieved from https://medium.com/s/i-o/the-slimy-technicolor-world-of-satisfying-youtube-videos-63c3793b2738

Andersen, J. (2014). Now you've got the shiveries: Affect, intimacy, and the ASMR whisper community. *Television & New Media, 1*, 1-18.

Aron, E. N., & Aron, A. (1997). Sensory-processing sensitivity and its relation to introversion and emotionality. *Journal of Personality and Social Psychology, 73*, 345-368.

Bagby, R. M., Taylor, G. J., & Parker, J. D. (1994). The twenty-item Toronto Alexithymia Scale. II. Convergent, discriminant and concurrent validity. *Journal of Psychosomatic Research, 38*, 33–40.

Barratt, E. L. & Davis, N. J. (2015). Autonomous sensory meridian response (ASMR): A flow-like mental state. *PeerJ, 3*, 1-17.

Barušs, I. (2003). *Alterations in consciousness: An empirical analysis for social scientists*. Washington, DC: American Psychological Association.

Beischel, J., Rock, A. J., & Krippner, S. (2011). Reconceptualizing the field of altered consciousness: A 50-year retrospective. *Altering Consciousness: Multidisciplinary Perspectives*, *1*, 113-135.

Bourguignon, E. (1973). *Religion, altered states of consciousness, and social change*. Columbus: The Ohio State University Press.

Cardeña, E., Lynn, S. J., & Krippner, S. (2017). The psychology of anomalous experiences: A rediscovery. *Psychology of Consciousness: Theory, Research, and Practice, 4,* 4-22.

Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS Scales. *Journal of Personality and Social Psychology*, *67,* 319-333.

Colizoli, O., Murre, J. M. J., & Rouw, R. (2013). A taste for words and sounds: A case of lexical-gustatory and sound-gustatory synaesthesia. *Frontiers in Psychology, 4*, 1-16.

Colver, M. C., & El-Alayli, A. (2016). Getting aesthetic chills from music: The connection between openness to experience and frisson. *Psychology of Music, 44,* 413-427.

Connor, M. (2013, May 8). *Notes on ASMR, Massumi and the joy of digital painting.* Retrieved from http://rhizome.org/editorial/2013/may/08/notes-asmr-massumi-and-joy-digital-painting/

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper & Row.

Csikszentmihalyi, M., & Nakamura, J. (2018). Flow, altered states of consciousness, and human evolution. *Journal of Consciousness Studies, 25,* 102-114.

Dietrich, A. (2018). Editorial introduction: Altered states of consciousness. *Journal of Consciousness Studies, 25,* 9-12.

Fredborg, B., Clark, J., & Smith, S. D. (2017). An examination of personality traits associated with autonomous sensory meridian response (ASMR). *Frontiers in Psychology*, *8*, 1-9.

Gallagher, R. (2016). Eliciting euphoria online: The aesthetics of 'ASMR' video culture. *Film Criticism*, *40,* 1-12.

Garro, D. (2017). Autonomous meridian sensory response – from internet subculture to audiovisual therapy. In *Proceedings of the Electronic Visualisation and the Art Conference*. BCS, The Chartered Institute for IT. 1-8.

Goins, L. (2016, June 11). Why are we so obsessed with pimple popping? Retrieved from https://www.refinery29.com/en-us/2016/06/112919/pimple-popping-psychology

Goldberg, L. R. (1999). The Curious Experiences Survey, a revised version of the Dissociative Experiences Scale: Factor structure, reliability, and relations to demographic and personality variables. *Psychological Assessment*, *11,* 134-145.

Harrison, L., & Loui, P. (2014). Thrills, chills, frissons, and skin orgasms: Toward an integrative model of transcendent psychophysiological experiences in music. *Frontiers in Psychology, 5,* 1-6.

Jackson, S. A., & Eklund, R. C. (2002). Assessing flow in physical activity: The Flow State Scale-2 and Dispositional Flow Scale-2. *Journal of Sport and Exercise Psychology, 24,* 133-150.

Jackson, S. A. & Marsh, H. W. (1996). Development and validation of a scale to measure optimal experience: The flow state scale. *Journal of Sport and Exercise Psychology, 18,* 17-35.

John, O. P., Donahue, E. M., & Kentle, R. L. (1991). The Big Five Inventory--Versions 4a and 54. Berkeley, CA: University of California, Berkeley, Institute of Personality and Social Research.

Johnson, L. (2019, February 4). *Millions of Americans just learned what ASMR is from Michelob Ultra's Super Bowl commercial – but they aren't loving it.* Retrieved from https://www.businessinsider.com.au/michelob-ultras-asmr-super-bowl-commercial019-2-2019-2

Johnson, M. (2014, February). *50 cases of misophonia using the MMP*. Paper presented at the

misophonia conference of the Tinnitus Practitioners Association, Atlanta, GA.

Lange, R., Thalbourne, M. A., Houran, J., & Storm, L. (2000). The Revised Transliminality Scale: Reliability and validity data from a Rasch top-down purification procedure. *Consciousness and Cognition, 9*, 591-617.

Ludwig, A. M. (1966). Altered states of consciousness. *Archives of General Psychiatry, 15*, 225-234.

Maslow, A. H. (1962). Lessons from peak experiences. *Journal of Humanistic Psychology, 2,* 9–18.

McErlean, A. B. J., & Banissy, M. J. (2017). Assessing individual variation in personality and empathy traits in self-reported autonomous sensory meridian response. *Multisensory Research*, *30*, 601-613.

McPeake, J. D., Kennedy, B. P., & Gordon, S. M. (1991). Altered states of consciousness therapy. *Journal of Substance Abuse Treatment, 8,* 75-82.

Morris, M. (2018). A simply marvellous reaction: Autonomous sensory meridian response and the desk tutorial. *Architectural Design*, *88*, 50-57.

Mouton, A. R., & Montijo, M. N. (2017). Love, passion, and peak experience: A qualitative study on six continents. *The Journal of Positive Psychology, 12,* 263-280.

Panzarella, R. (1980). The phenomenology of aesthetic peak experiences. *Journal of Humanistic Psychology, 20,* 69-85.

Pekala, R. J. (1991). The phenomenology of consciousness inventory. In *Quantifying consciousness*. Springer, Boston, MA.

Poerio, G. L., Blakey, E. Hostler, T. J., & Veltri, T. (2018). More than a feeling: Autonomous sensory meridian response (ASMR) is characterized by reliable changes in affect and physiology. *Plos One,* 13, 1-18.

Polito, V., Langdon, R., & Brown, J. (2010). The experience of altered states of consciousness in shamanic ritual: The role of pre-existing beliefs and affective factors. *Consciousness and Cognition, 19,* 918-925.

Price-Williams, D., & Hughes, D. J. (1994). Shamanism and altered states of consciousness. *Anthropology of Consciousness, 5,* 1-15.

Privette, G. (1983). Peak experience, peak performance, and flow: A comparative analysis of positive human emotions. *Journal of Personality and Social Psychology, 45,* 1361-1368.

Richard, C. (2016). Interview with Jennifer Allen, the woman who coined the term, "Autonomous Sensory Meridian Response' (ASMR). Retrieved from https://asmruniversity.com/2016/05/17/jennifer-allen-interview-coined-asmr/

Roberts, N. M. (2015). *Towards the development of an integrative measure of autonomous cephalocaudal paresthesia* (Unpublished master's thesis). Macquarie University, Sydney, Australia.

Rock, A. J., & Krippner, S. (2007). Does the concept of "altered states of consciousness" rest on a mistake? *International Journal of Transpersonal Studies, 26*, 33–40.

Schaefer, M. A. (2019, February 7). *Did a Superbowl beer commercial get you tingling? It's called ASMR.* Retrieved from https://www.philly.com/news/asmr-michelob-commercial-super-bowl-autonomous-sensory-meridian-response-20190207.html

Silverman, J. (1968). A paradigm for the study of altered states of consciousness. *British Journal of Psychiatry, 114,* 1201-1218.

Silvia, P. J., & Nusbaum, E. C. (2011). On personality and piloerection: Individual differences in aesthetic chills and other unusual aesthetic experiences. *Psychology of Aesthetics, Creativity, and the Arts*, *5,* 208-214.

Sloboda, J. A. (1991). Music structure and emotional response: Some empirical findings.

Psychology of Music, 19, 110-120.

Swannell, C. (2016). Pop, as in popular. *The Medical Journal of Australia*, *204,* 1-2.

Tart, C. T. (1969). Introduction. In C. T. Tart (Ed.), *Altered states of consciousness*. New York: Wiley.

Tart, C. T. (1971). Scientific foundations for the study of altered states of consciousness. *Journal of Transpersonal Psychology, 3*, 93-124.

Tart, C. T. (1972). States of consciousness and state-specific sciences. *Science*, *176*, 1203–1210.

Tart, C. T. (1980). A Systems Approach to Altered States of Consciousness. In: Davidson J.M., Davidson R.J. (eds) The Psychobiology of Consciousness. Springer, Boston, MA.

Taylor, S. (2013). 'Head orgasms', meditation and near-death experiences. The Guardian. Available at https://www.theguardian.com/science/brain-flapping/2013/oct/09/head-orgasms-meditation-near-death-experiences.

TubeBuddy. (2019). TubeBuddy | The Premier YouTube Channel Management and Optimization Toolkit. Retrieved from https://www.tubebuddy.com.

Vaitl, D., Birbaumer, N., Gruzelier, J., Jamieson, G. A., Kotchoubey, B., Kübler, A., Lehmann, D., Miltner, W. H. R., Ott, U., Putz, P., Sammer, G., Strauch, I., Strehl, U., Wakermann, J., & Weiss, T. (2005). Psychobiology of altered states of consciousness. *Psychological Bulletin*, *131,* 1, 98–127.

Introduction to Chapter 2

The broad aim of this thesis was to explore the phenomenology of ASMR experiences, the extent to which they relate to other existing individual differences, and whether propensity to experience ASMR is a unique construct not covered by existing individual difference constructs. As discussed in Chapter 1, given the difficulty in defining and assessing altered states and alterations of consciousness, we wanted to operationalise ASMR experiences in a rigorous manner, and adequately represent the diverse qualities of the phenomenon. As a result, the rationale for this study concerned the refinement of a measure of ASMR propensity (ASMR-20), in order to allow for an examination of ASMR experiences, and how they relate to existing constructs. Building upon previous work (Roberts, 2015 – included as part of Chapter 2 as part of published research), Chapter 2 outlines the continued refinement of the Autonomous Sensory Meridian Response Scale, through exploratory and confirmatory factor analyses. In addition, we assessed the relationships between the refined ASMR measure and existing measures, including self-reported anxiety, absorption, and misophonia.

Chapter 2

Autonomous Sensory Meridian Response: Scale Development and Personality Correlates

Published as: Roberts, N., Beath, A., & Boag, S. (2018, September 17). Autonomous Sensory Meridian Response: Scale Development and Personality Correlates. *Psychology of Consciousness: Theory, Research, and Practice*. Advance online publication. http://dx.doi.org/10.1037/cns0000168

Author Contribution: Natalie Roberts was responsible for the concept and design of the project, data analysis and write-up. Associate Professor Simon Boag provided supervision and gave input on the research question, study design, data analysis and manuscript preparation. Dr. Alissa Beath provided supervision and guidance on data analysis and manuscript revisions.

Declaration for Chapter 2

This paper is a published composite of three studies: Roberts, N., Beath, A., & Boag, S. (2018, September 17). Autonomous Sensory Meridian Response: Scale Development and Personality Correlates. *Psychology of Consciousness: Theory, Research, and Practice*. Advance online publication. http://dx.doi.org/10.1037/cns0000168. Studies 1 and 2 reported here were undertaken as part of previous Masters of Research, and do not form a part of the examinable material in this thesis. Study 3 was completed within the PhD program, making reference to Studies 1 and 2 as a pilot. As a result, Studies 1 and 2 have been included as they form part of the published paper, and provide context for the methodology and findings of Study 3, but do not count as work towards this thesis.

Abstract

Altered states of consciousness refer to qualitative shifts in an individual's overall pattern of mental functioning. This article presents the 3-part development and validation of a multidimensional self-report measure of autonomous sensory meridian response (ASMR). ASMR is an intensely pleasurable, head-orientated tingling sensation that typically occurs in response to specific, audio-visual triggers, producing feelings of comfort, relaxation and euphoria. A mixed methods approach was adopted, conducting a content analysis on 303 accounts of ASMR, to derive a comprehensive self-report measure. Exploratory (n = 453; n = 448) and confirmatory analyses (n = 448) were utilised to determine the underlying factor structure of the ASMR measure and replicability of findings across assessment applications. Convergent and divergent validity were assessed through comparisons with other, established alterations of consciousness, including frisson, absorption, alexithymia, flow, misophonia and anxiety. The resultant ASMR-15 demonstrated sufficient internal consistency (α = .78) and validity as a measure of ASMR propensity, and may be useful to researchers interested in further exploring and disentangling ASMR from other alterations of consciousness.

Keywords: ASMR; Autonomous Sensory Meridian Response; Scale Development; Altered States; Frisson

Deviations from ordinary, waking consciousness have been well documented throughout history and across cultures (Polito, Langdon & Brown, 2010; James, 1902; Maslow, 1964). Recently, the exploration of altered states and other anomalous experiences has seen a shift towards investigating more specific, unusual sensory experiences and transient adaptive states, particularly those implicated in moments of peak performance, euphoria, and emotional identification with external stimuli (Schäfer, Fachner & Smukalla, 2013; Harrison & Loui, 2014). According to Andersen (2014), autonomous sensory meridian response (ASMR) has unique specific sensory component features that differ from other deliberately facilitated altered states of consciousness (ASCs). To date, however, little research has been specifically devoted to the topic of ASMR. As such, it is difficult to know whether ASMR is a unique ASC, or inter-related with other ASCs such as meditation and absorption. It is difficult to address this issue without a reliable way of evaluating the phenomenology of ASMR experiences, and currently there exists no reliable, comprehensive ASMR measurement tool. One aim of this study is to develop a novel tool for assessing the broad phenomenology of ASMR experiences, in order to determine whether ASMR in fact represents a unique experience.

ASMR is an intensely pleasurable tingling sensation that typically begins at the back of the head and travels down the central nervous system in response to specific, individualised audio-visual triggers and real world stimuli, resulting in feelings of comfort, relaxation and euphoria (Andersen, 2014; Colizoli, Murre & Rouw, 2013). The cluster of reported shifts in mood and sensory perception appear to be distinct from other sensory-induced peak experiences, including frisson (musically-induced aesthetic chills), as well as absorption (a state of total attention) and flow states (masterful, effortless and decisive functioning; Barušs, 2003).

Presently, significant online interest in describing, discussing and inducing ASMR has

seen the emergence of large and diverse online communities, suggesting that ASMR is an identifiable, common experience across individuals. Currently, the ASMR dedicated community on popular forum website Reddit, *ASMR: Sounds That Feel Good*, has attracted over 150 000 active members since its inception in 2011. Some individuals who report such experiences claim to regularly encounter the sensation incidentally, while many also consciously seek it out through online 'trigger videos' (Andersen, 2014). There are currently over 11 million ASMR videos hosted on YouTube, with some recording over 20 million views. Common triggers identified, and recreated through online audiovisual stimuli include simulated close personal attention, whispering, crisp sounds, slow movements, smiling, and the observation of others completing masterful tasks (Ahuja, 2013; Barratt & Davis, 2015).

In an attempt to measure ASMR experiences, Barratt and Davis (2015) utilised a modified version of the short Flow State Scale (S FSS-2; Jackson & Marsh, 1996) in the assessment of ASMR media viewing practices. The study focused on the demographics, viewing habits and specific triggers of 475 individuals who both report ASMR experiences and actively seek out online trigger videos, as well as subjective accounts of pain and mood management after viewing ASMR media. It was found that 98% of participants who described experiencing ASMR, and reported regular engagement with ASMR stimuli, mentioned seeking relaxation as a primary motivator. Further, of this sample, 82% utilised ASMR media for the purpose of sleep, while 70% endorsed stress-reduction motives. Significant improvements in mood during and immediately following ASMR stimulus exposure were further reported by the majority of the sample (80%), with a similarly significant reported reduction in chronic pain symptomatology. Nevertheless, while not definitive, the strong assertion that ASMR induction has practical benefit in promoting relaxation warrants further exploration.

ASMR also appears to share many characteristics with the Eastern concept of kundalini. Kundalini describes the dormant cosmic energy, situated at the base of the spine, that can be awakened or activated under particular conditions, including yoga, meditation and near-death experiences (Modestino, 2016; Valanciute & Thampy, 2011; Greyson, 1993). When aroused, the kundalini may travel upwards through the central nervous system, to the top of the head, producing feelings of bliss, awakening and enlightenment (Valanciute & Thampy, 2011; Greyson, 1993). A facet of this experience, known as the physio-kundalini syndrome, focuses on the physical symptoms of kundalini awakening. In a study by Greyson (1993), a 19-item physio-kundalini syndrome index was administered to 321 participants, including those who survived near-death experiences. A significant proportion (54%) of the sample reported feeling tingling or tickling sensations on the skin or inside the body, and a further 63% of participants described experiencing spontaneous bliss, ecstasy and positive emotions. While similar, ASMR appears to be distinct from kundalini for a number of reasons. Most notably, the direction of sensation in the body appears to begin most commonly in the head and travel downwards in ASMR experiences, contrasting the established upwards direction of kundalini. Further, a substantial proportion of participants in Greyson's (1993) study reported experiencing intense negative affect (43%), audiovisual symptoms (32%) and spontaneous, involuntary bodily movements (40%), which appear to be unique to kundalini phenomena.

As yet, however, ASMR has not been systematically investigated, for the purposes of developing a measurement instrument. One reason for this is that there has been little attempt to assess the parameters of the experience. The findings of Barratt and Davis (2015) suggest evidence for a significant association between the presence of flow state experiences when watching ASMR videos, and reported number of identified ASMR triggers. This finding suggests that ASMR triggers function in a similar fashion to the environmental and

interpersonal factors associated with flow state induction. However, the modified ASMR short Flow State Scale (Barratt & Davis, 2015; Jackson & Marsh, 1996) pertains particularly to the passive experience of watching online videos from the perspective of flow, as opposed to the experience of ASMR itself. As such, the measure does not allow for systematic comparison between ASMR sensations as a whole, and other constructs of interest, such as absorption, anxiety and frisson.

The aim of this study was to create a reliable and valid self-report ASMR measure, to assess the key characteristics, internal structure and relationships to similar phenomena. In order to do this, we systematically defined and operationalized ASMR through a broad and comprehensive content analysis of archival accounts of ASMR experiences. These data were used to determine the core characteristics and parameters of ASMR, which informed the content for development of an assessment tool.

In order to test the validity of the assessment tool, we also aimed to investigate the relationship between ASMR and other known alterations of consciousness. Most notably, ASMR has drawn comparison to frisson (Barratt & Davis, 2015). Frisson describes the incidence of moments of profound musical resonance, resulting in a marked shift in emotionality in the listener and an accompanying physical response (Harrison & Loui, 2014). Similar to Maslow's peak experiences (1964), transcendental musical experiences are distinctive, poignant, physical or quasi-physical sensations, manifested in physical markers of affect, including tears, chills and goosebumps (Harrison & Loui, 2014). Specific alterations in the construction of music, including loudness, key changes and chord progressions have been demonstrated as key predictors in eliciting frisson responses (Sloboda, 1991).

However, while similar, ASMR appears to be distinct from frisson in terms of the comprehensiveness of its cognitive, affective and sensory components, as well as the

specificity of its sensational locality and direction of movement through the body. Furthermore, frisson is typically induced via musical triggers whereas ASMR is typically generated by non-musical stimuli. Additionally, frisson is generally experienced as an excitatory process (Grewe et al., 2010), whereas ASMR appears to be a distinctly relaxing phenomenon (Barratt & Davis, 2015). These distinctions suggest that ASMR and frisson are distinct constructs. We thus expected responses on our developed ASMR assessment tool to diverge from frisson with respect to reported arousal, quality of sensation and method of induction.

Both ASMR and frisson involve cross-modal sensory stimulation, also known as synaesthesia (Colizoli et al., 2013). In some individuals, synaesthesia involves the experiencing of tastes, smells and colours in response to stimulation of another sensory domain (Colizoli et al., 2013). Barratt and Davis (2015) assessed the relative prevalence of synaesthetic experiences within an online ASMR interest group sample. They found that a higher proportion of synaesthetic experiences were found within the ASMR sample (5.9%) compared to the general population (4.4%), although this difference was not significant. Similarly, in a case study conducted by Colizoli et al. (2013), one participant demonstrated unidirectional synaesthesia, as well as ASMR experiences upon hearing soft, crackling sounds. It is possible, therefore, that ASMR exists as a form of synaesthesia, or that individuals who report synaesthetic sensations may have a higher propensity towards experiencing ASMR.

A related synaesthetic experience, misophonia, which is a condition associated with decreased sound tolerance, is estimated to affect between 1-6% of the general population (Wu, Lewin, Murphy & Storch, 2014). Individuals with misophonia report negative emotions and extreme sensitivity to particular sounds, resulting in anger, avoidance and anxiety (Wu et

al., 2014). Unlike hyperacusis (a reduced tolerance for all sounds), individuals with misophonia find specific, known sounds unpleasant and annoying (Møller, 2011). Misophonia and ASMR share a number of common features, particularly the incitement of pleasure or displeasure through individualised trigger stimuli. As such, a common synaesthetic pattern of responding to stimuli has been hypothesised as a key factor across both conditions (Colizoli, Murre & Rouw, 2013; Barratt & Davis, 2015). However, a careful disambiguation of the role of synaesthesia in both misophonia and ASMR, as well as the relationship between ASMR and misophonia has yet to be determined. We expected that ASMR would demonstrate a negative correlation with misophonia in the present work, particularly with respect to affect, relaxation and sensory experience.

The study also examined the relationship between ASMR and absorption. As a dissociative phenomenon, absorption has been defined as a disposition for experiencing periods of 'total' attention that completely engage one's representational resources (Tellegen & Atkinson, 1974). Temporary alterations of self have been associated with absorption when the focus of attention, or attentional object, is someone else (Tellegen & Atkinson, 1974). For example, Tellegen and Atkinson (1974) reported passive, sympathetic kinaesthetic engagement resulted from absorption between an individual and another, comparable to the establishment of a roleplaying interaction. Numerous online ASMR videos utilise roleplaying techniques (Ahuja, 2013), and ASMR stimuli possibly produces trancelike effects through the simulation of a roleplaying relationship that engages latent absorption tendencies in viewers, producing a temporary alteration of self. Ludwig (1966) acknowledged the power of simulated roleplaying in the production of altered states of consciousness. This suggests that ASMR videos may interact with latent absorption tendencies, utilising roleplaying as a means of establishing a pleasurable, kinaesthetically engaged ASC. In the present study, we expected that ASMR propensity will be positively related to absorption

tendencies in respondents.

This study also assessed the relationship between ASMR and alexithymia. Individuals with high levels of alexithymia experience difficulty discerning and identifying emotions within themselves, as well as difficulties with expressing emotion and with introspection (Mason, Tyson, Jones & Potts, 2005). Further, alexithymia has also been associated with an inability to disambiguate sensations within the self (Bagby, Taylor & Parker, 1994). It is possible that ASMR may exist as the manifestation of an ambiguous physical or emotional response to external stimuli. Further, Mason et al. (2005) examined the relationship between dissociation, dissociative absorption and scores on the 20-item Toronto Alexithymia Scale (TAS-20; Bagby, Parker & Taylor, 1994). Individuals who reported higher absorption propensity also demonstrated higher levels of alexithymia symptomatology. Due to this cluster of common phenomena, and the correlation between absorption and the experience of unusual physical symptomatology, we expected alexithymia to be correlated with greater ASMR propensity.

In summary, we set out to create the first psychometrically reliable and valid measure of ASMR, developed from experiential descriptions. We expected that scores on our newly created ASMR measure will converge with measures of absorption, flow, alexithymia and anxiety, and produce a divergent pattern of relationships to frisson and misophonia.

Study 1

Methods and Materials

Content Analysis

Data utilised in the content analysis were sourced from de-identified comments hosted in the public domain. Data were gathered through examination of online news articles, blogs and forums discussing ASMR, as well as user comments found on these webpages. A total of

39 pages were downloaded into the qualitative analysis program Atlas.ti for analysis, with 24 (61.5%) sourced from the popular sub Reddit forum *ASMR: Sounds That Feel Good*. Criterion sampling was undertaken to filter the sample of comments (Rudestam & Newton, 2007), and inclusionary criteria specified that the comments explicitly described the experiential qualities of ASMR, as opposed to accounts independent of specific phenomenological descriptors. All accounts of ASMR experiences were initially assessed to gain a broad understanding of the phenomenon, before isolating and highlighting words and phrases indicating new concepts (Hsieh & Shannon, 2005). With further analysis, larger and more abstract categories emerged that accounted for more specific key phrases and ideas, forming conceptual nodes that organised codes into meaningful clusters (Hsieh & Shannon, 2005). Schematic networks and codebooks were generated throughout collection, with data interpreted based on a rolling increase of new categories and sub categories (Corbin & Strauss, 1990). A hierarchical structure was established within the coding framework through the generation of network diagrams. This data set was collected in 2014 and 2015 and has not been presented previously.

Results

Qualitative Analysis

In assessing 303 experiential descriptions of ASMR, a diverse range of codes, categories and themes emerged. Codes and categories were mutually exclusive within themes, however a high degree of interconnectedness was observed between and within themes. A total of 174 categories were utilised 1140 times, where frequency of code use ranged from 1 to 108. Through the development of broad categories, three large thematic nodes emerged: Altered Consciousness, Affect and Sensation. Significant overlap between themes was observed, producing large, schematic outputs. See Table 1 for the frequency of prominent codes within nodes.

Table 1.

Frequency of Prominent Codes Within Major Themes

Theme	Codes	Frequency	Total Theme (*f*)
Affect	Pleasurable	51	
	Appraisal	43	
	Positive	32	
	Strange	13	
	Euphoric	10	
		Total = 149	228 (20.0%)
Altered Consciousness	Relaxation	38	
	Trance-like	27	
	Recreational Drug High	22	
	Mental State	21	
	Orgastic	11	
		Total = 119	282 (24.7%)
Sensation	Location	92	
	Tingle	73	
	Head	59	
	Intensity	38	
	Movement	29	
		Total = 291	630 (55.3%)
		Total = 1140	

Note. $N = 303$. Total Theme reflects the total frequency of all codes within each theme. The percentage refers to the proportion of total frequencies ($n = 1140$) accounted for by each theme.

Affect: A divide emerged in accounts of ASMR as being either predominately pleasant, or overstimulating and unpleasant. Accounts of ASMR were most frequently ($n = 51$) coded as pleasurable. Less frequently, ASMR was also described as unpleasant within the sample ($n = 10$). One case stated "my ASMR can feel unpleasant, and it sometimes starts in my

arms...sometimes you need to "put your mind into it" to make it feel pleasant" (C291). A significant portion of cases recalled feeling euphoric during ASMR experiences (*n* = 10). Commenter 23 asserted that ASMR felt like "tingles down my neck" and a "euphoric head feeling".

Akin to the divide over the positivity or pleasantness of ASMR, 13 cases described ASMR as strange and differentially linked to both the pleasurable and unpleasant coding categories. For example, one commenter states that ASMR was strange and unpleasant, reporting a "strange sensation on the right side of my back which is as if someone is tickling me there, and it's actually a tiny bit unpleasant" (C286). Conversely, commenter 263 described the experience as both strange and pleasant, "I find myself staring off into space while I feel my head filling with warmth. Sometimes, I shiver. It's a whole weird thing that I don't understand, but I love it."

Altered Consciousness: A large proportion of cases described ASMR as being similar to a wide range of conventional and unusual practices and experiences (*n* = 50). Comparisons between ASMR and meditation featured prominently in the data set (*n* = 10). Another descriptor seen across cases were comparisons to orgastic experiences (*n* = 11). For example, one commenter described ASMR as a "widespread tingly orgasmic feeling" (C107), while another used the term "brain orgasm" (C125).

ASMR was frequently compared to illicit drug effects, or recreational drug experiences (*n* = 22). Commonly mentioned drugs included MDMA (*n* = 6), LSD (*n* = 2), opiates (*n* = 2) and DMT (*n* = 3). One commenter compared ASMR to a "head rush from MDMA" (C302), while another stated that ASMR experiences mirror those of MDMA, where the substance "makes everything on Earth produce this effect" (C16). Similarly, the experience of ASMR was associated with the consumption of opiates, with one commenter

stating that ASMR simulates what they "imagine heroin must feel like" (C166).

The second most prominent concept that emerged within the altered consciousness node were descriptions of ASMR as relaxing (*n* = 38). Commenters frequently recalled ASMR experiences as "incredibly relaxing" (C181), producing an "intense feeling of relaxation" (C187). Some commenters recalled time distortions while experiencing ASMR (*n* = 6), and of these cases, 3 comments mentioned "going into a trance" (C266). Of the 6 cases that mentioned time distortions, all comments were associated with a slowing of time.

Sensation: Specific descriptions of the sensational component of ASMR experiences varied widely across cases. In total, 8 comments posited ASMR as electric, involving a spread of energy (*n* = 8) and producing a sensation akin to static (*n* = 1) or fuzz (*n* = 5). For example, one case stated "Its like, fuzz. Electric fuzz. Comes from the back of my head, to the sides past my ears and then to my shoulders. And my eyes get heavy and I feel the best type of dizziness" (C250).

Sites of ASMR sensations demonstrated wide variability across cases. 31 cases described experiencing ASMR primarily within the central nervous system (CNS), including the brain (*n* = 14) and spine (*n* = 17). A further 74 accounts cited ASMR sensations within the head (*n* = 59), including the ears (*n* = 3), chin (*n* =1), face (*n* = 1), scalp (*n* = 9) and skull (*n* = 1). Four cases mentioned effects within the digestive system, specifically the stomach (*n* = 3) and throat (*n* = 1). Regions encapsulated by the broader peripheral nervous system (PNS) were also strongly endorsed (*n* = 43).

Within the "head" category, the specific location of the origin of the experience varied, with 9 cases attributing the sensation to activity on the scalp, and 4 comments positing ASMR as occurring inside the head. For example, one commenter stated that they feel ASMR "in my scalp" (C300), while another described the sensation as "scalp tingles"

(C142). Conversely, some cases placed the origin of sensation "in the head" (C55).

Study 2

Methods and Materials

Developing the ASMR-31

Data collected from the content analysis were used to create the 31-item Autonomous Sensory Meridian Response Scale (ASMR-31). Items were constructed based on hierarchical prevalence of coding categories. Consistent with the approach outlined by Loevinger (1957), themes accounting for greater proportions of coding frequency were accorded more items. Five reversed items were included to highlight acquiescent response styles. Items and scale instructions were developed to be interpretable to participants who had previously experienced ASMR. Participants were encouraged to answer honestly, and indicate the truthfulness of each item, in response to the statement "when I experience ASMR" on a scale from 1, *completely untrue for me,* to 5, *completely true for me.* Total scores were calculated as the sum of item scores.

Administering the ASMR-31

Data were gathered on 453 (320 male) English speaking adults from 34 countries, via a link hosted on ASMR sub-Reddit *ASMR: Sounds That Feel Good*. Participants ranged in age between 18 and 60 years (M = 24.64 years; SD = 6.51). Respondents completed the ASMR-31 and demographics items prior to completing the 8-item modified Short Flow State Scale (FSS-2; Jackson & Marsh, 1996; Jackson & Eklund, 2002; Barratt & Davis, 2015), modified 10-item Aesthetic Experiences Scale (AES; Silvia & Nusbaum, 2011), with 3-item frisson subscale (i.e. AES-FR), and 20-item Toronto Alexithymia Scale (TAS-20; Bagby, Taylor & Parker, 1994). This resulted in 394 (278 male, M = 24.82; SD = 6.54) completed cases for the remaining measures. Prior to completion, participants were instructed that the purpose of the study was to increase understanding of ASMR through the development and validation of a

measure of ASMR propensity. Approval for the studies were granted by the human research ethics committee at Macquarie University. Participants were informed that the study would take approximately 15 minutes to complete. This data set was collected in 2015 and has not been presented previously. See Table 2 for reliability statistics.

Table 2

Study and Literature Reliability (Cronbach's Alpha) of Measures

Instrument and Subscale	Literature α (items)	Study α (items)
S FSS-2	0.77 - 0.78 (8)	0.61 (8)
AES	0.87 (10)	0.87 (10)
AES-FR (Frisson)	0.85 (3)	0.87 (3)
TAS-20	0.81 – 0.87 (20)	0.72 (20)
DIF	0.78 – 0.81 (7)	0.83 (7)
DDF	0.75 (5)	0.79 (5)
EOT	0.64 – 0.66 (8)	0.57 (8)

Note. N = 394. TAS-20 = Toronto Alexithymia Scale; DIF = Difficulty Identifying Feelings; DDF = Difficulty Describing Feelings; EOT = Externally Oriented Thinking; AES = Aesthetic Experiences Scale; AES-FR = Frisson; S FSS-2 = Short Flow State Scale. *Reliability statistics were not provided for the modified 8-item S FSS-2, so published alphas for the original 9-item S FSS-2 were included as a guide.

Results

ASMR-31

The ASMR-31 received 453 completed responses, while 394 participants completed the total battery of instruments. Outliers were examined following Hoaglin and Iglewicz's (1987) outlier labelling rule, where outliers are identified relative to the interquartile range. These parameters are established by multiplying the interquartile range of a variable by the

constant, *g*, and adding the value to the upper quartile, and subtracting the value from the lower quartile. Using this method, cases were considered exceptional on the ASMR-31 if they exceeded the parameters of 78 and 154, calculated by adding and subtracting the product of the interquartile range (14) and constant *g* (2.2), to the upper and lower quartile values. For this study, the more conservative standard of *g* was adopted, at 2.2 (Banerjee & Iglewicz, 2007), resulting in the removal of two cases from the dataset.

A parallel analysis was undertaken on the ASMR-31 to inform the ideal number of factors for further analysis. The results suggested 12 factors for extraction, with numerous single item factors and items with cross-loadings. Further, factors 5 through 12 produced eigenvalues less than 1. Through examination of variance and the produced scree plot, six factors were suggested for extraction. As a result, the proposed parallel analysis solution was rejected, and a progressive exploratory factor analysis was undertaken.

Exploratory Factor Analysis. EFA was conducted using principal axis factoring with a direct oblimin rotation, and produced a factor matrix after 16 iterations. A scree plot was produced to guide analysis, which identified 6 factors as ideal for extraction. Factor loadings were considered in line with criteria outlined by Worthington and Whittaker (2006), where items with factor loadings that failed to reach a minimum of .32 were removed progressively, as they were deemed to be weakly associated with a common theoretical grouping. Items that loaded onto more than one factor above .3 were also removed. In total, 11 items were removed (including all items from one of the original six factors), producing a final 20-item, 5-factor ASMR scale which will be referred to throughout the remainder of the analyses and discussion as the ASMR-20. See Table 3 for factor loadings.

Table 3

Final Item Matrix of the ASMR-20

ASMR-20 Item	ASMR-20 Factors				
	(M)	(AC)	(A)	(R)	(S)
M1	**.749**	.051	-.104	-.095	-.062
M2	**.546**	-.073	-.016	.103	.283
M4	**.456**	.027	.087	-.030	.137
M3	**.455**	.118	-.080	.018	-.119
M5	**.450**	-.020	-.039	.065	.159
AC1	-.027	**.784**	-.116	-.101	.084
AC2	-.025	**.739**	-.058	.013	.072
AC3	.035	**.573**	-.129	.075	.065
AC4	.080	**.512**	.143	.046	-.038
AC5	.058	**.432**	.012	.125	-.063
A1	.169	-.006	**-.789**	.043	-.123
A3	.021	-.042	**-.690**	.051	.085
A2	.083	.251	**-.575**	-.098	.031
A5	-.092	-.044	**-.446**	.194	.103
R1	-.031	-.018	-.173	**.753**	-.049
R2	.000	.175	.034	**.701**	-.012
S1	-.006	.040	-.172	-.105	**.611**
S2	.212	-.195	-.019	.155	**.527**
S3	.050	.214	.034	-.016	**.458**
S4	.295	-.158	.018	.070	**.375**
% of Variance	19.79	9.80	7.31	4.36	2.52
Cumulative % of Variance	19.79	29.59	36.90	41.26	43.79

Note. $N = 451$. 5 factors extracted, 16 iterations required.

The 20-items loaded strongly onto five theoretically meaningful factors, Affect, Sensation, Altered Consciousness, Relaxation and Movement. Factor labels were informed by the conceptual and thematic groupings within factors. Factor 1, labelled 'Movement', comprised items related to the spread of sensation throughout the body (e.g. *"The sensation feels like a wave of energy"*). Factor 2, 'Altered Consciousness' contained items associated with shifts in perception and awareness, particularly items related to established altered states of consciousness and deviations from general functioning, independent of emotional or physical input (e.g. "*It feels like an altered state of consciousness*"). Factor 3 described items related to 'Affect' or emotional experience and appraisal (e.g. "*The experience is blissful*"). Items loaded onto Factor 4, 'Relaxation', represented a distinct physical and emotional shift in arousal and appraisal (e.g. "*I find the experience calming*"). The final factor, Factor 5 or 'Sensation', captured descriptors of location and physical sensation (e.g. "*The sensation feels "tingly""*).

Reliability Analyses

Cronbach's alpha reliability coefficients were calculated for the total score scale and subscales, utilising the George and Mallery (2003) guidelines of acceptability, where values greater than .7 are sufficient. The total score ASMR-20 measure (α = .81) and Movement (α = .71), Affect (α = .73) and Altered Consciousness (α = .76) subscales met requirements. However, the Relaxation and Sensation subscales produced alphas of .69 and .63 respectively, which are considered less acceptable (George & Mallery, 2003). As a result, these findings will be interpreted with caution.

Frisson, Alexithymia and Flow

The ASMR-20 total score was correlated with the existing TAS-20, AES-FR and S FSS-2 measures to assess construct validity. Correlations have been considered at the .001

level, to account for multiple correlations. The Pearson's correlation coefficient between participant scores on the ASMR-20 and the TAS-20 was non-significant (r = .07, p = .197), suggesting that the ASMR-20 and TAS-20 assess different constructs. As hypothesised, the AES-FR and FSS-2 recorded weak, and moderate correlations with the ASMR-20, at r = .25 (p <.001) and r = .44 (p <.001) respectively. Pearson correlation coefficients were also generated to assess the relationship between the existing total score measures. The TAS-20 failed to correlate strongly with the AES-FR (r = .13, p = .011) or the S FSS-2 (r = .01, p = .890). Lastly, while significant, the AES-FR and S FSS-2 measures did not correlate strongly (r = .21, p <.001)

Of the ASMR-20 identified subscales, Affect correlated significantly with the FSS-2 (r = .23, p <.001). Similarly, Movement demonstrated positive, significant correlations with frisson (r = .20, p <.001) and flow (r = .28, p <.001). Finally, Altered Consciousness demonstrated significant, positive correlations with frisson (r = .21, p = .001). Of the ASMR-20 subscales, Altered Consciousness produced the largest correlation with flow (r = .48, p <.001). See Table 4 for correlations between ASMR-20 subscales and other measures.

Demographic Factors

The ASMR-20 (n = 451) was further explored with respect to gender, age, level of education and country of residence, to assess the relationship between demographic factors and ASMR propensity. There was no significant correlation found between scores on the ASMR-20 and age (r = -.001, p = .981). Similarly, males (M = 74.31, SD = 10.56) and females (M = 76.21, SD = 8.50) did not differ significantly with respect to ASMR, t (438) = -1.78, p = .076. The main effect of educational attainment on ASMR-20 scores was not significant, F (4, 446) = 1.16, p = .326, nor was there a significant difference in ASMR propensity across geographical location F(5, 445) = 1.890, p = .095). See Table 5 for

frequencies and means.

Table 4

Correlations Between the ASMR-20, Subscales and Total Score Measures

Measure	M	S	A	R	AC	TAS-20	DIF	DDF	EOT	AES	AES-FR	S FSS-2
ASMR-20	.773**	.614**	.622**	.367**	.657**	.065	.188**	.117	.233**	.322**	.245**	.436**
M		.498**	.304**	.130*	.241**	.026	.112	.121	.168*	.243**	.196**	.283**
S			.236**	.082	.072	.017	.027	.032	.067	.095	.113	.109
A				.290**	.301**	-.026	.095	.022	.222**	.171*	.110	.232**
R					.220**	-.003	.026	.019	.167*	.101	.084	.138*
AC						.131*	.244**	.112	.151*	.311**	.209**	.480**
TAS-20							.805**	.735**	.126	.141*	.128	.007
DIF								.540**	.143*	.312**	.220**	.110
DDF									.155*	.204**	.194**	.018
EOT										.166*	.162*	.177**
AES											.783**	.242**
AES-FR												.206**

Note. N = 394. ASMR-20 = Autonomous Sensory Meridian Response Scale; M = Movement; S = Sensation; A = Affect; R = Relaxation; AC = Altered Consciousness; TAS-20 = Toronto Alexithymia Scale; DIF = Difficulty Identifying Feelings; DDF = Difficulty Describing Feelings; EOT = Externally Oriented Thinking; AES = Aesthetic Experiences Scale; AES-FR = Frisson subscale; S FSS-2 = Short Flow State Scale. **p <.001 (2 tailed), *p <.01.

Table 5

Means and Frequencies of Demographic Variables for the ASMR-20

Variable	Frequency	ASMR-20 Mean (*M*)
Gender		
Male	276	74.47
Female	109	76.05
Level of Education		
High School or Equivalent	191	74.84
Bachelor's Degree	141	75.15
Master's Degree	30	72.17
Doctoral Degree	9	74.33
Other	23	78.09
Country of Residency		
Australia and New Zealand	29	73.69
Canada	44	75.14
Europe	54	72.83
United Kingdom	46	75.52
United States	207	75.66
Other	14	72.07

Note. $N = 394$.

Prior to re-testing, the ASMR-20 was refined with the intent of increasing the number of items related to Relaxation (>2), in line with the recommendations of Raubenheimer (2004). Item generation was informed by categories identified in the previous content analysis. The item "I feel sleepy and relaxed" was separated into "I feel sleepy" and "I

feel relaxed" to improve interpretability. A reverse scored item "I feel anxious" was also included, increasing the number of anticipated Relaxation specific items to four, and producing a 22-item ASMR scale.

Study 3

Methods and Materials

Data were gathered on 897 English speaking adults from 44 countries, via a link hosted on *ASMR: Sounds That Feel Good*, in order to assess the convergent and divergent validity of the ASMR scale by assessing the relationships between ASMR and anxiety, absorption and misophonia. All respondents completed the ASMR-22 and demographics items prior to the remaining measures, resulting in 820 (male = 580) completed cases for the entire questionnaire. Other variables of interest were measured using the 10-item modified Behavioural Inhibition Scale (BIS; Carver & White, 1994) assessing anxiety proneness, the 8-item absorption subscale of Goldberg's (1999) Curious Experiences Scale (CES), measuring propensity towards dissociative absorption, and a 21-item modified Misophonia Assessment Questionnaire (MAQ; Johnson, 2014; Dozier, 2015), assessing the frequency of misophonic experiences. It was anticipated that scores on the ASMR-22 would converge with scores on the CES and BIS, and demonstrate divergence from the MAQ. The questionnaire consisted of 62 items, and respondents were instructed that the study would take approximately 10 to 12 minutes to complete. This data set was collected in 2016 and has not been presented previously. See Table 6 for scale reliabilities.

Data gathered (n = 897) were randomly divided into two samples for factor analyses. EFA was undertaken utilising principle axis factoring with a direct oblimin rotation on the first sample (n = 448), consisting of 320 males and 123 females, ranging between 18 and 56 years (M = 24.66, SD = 6.31). A confirmatory factor analysis (CFA) was run on the second sample through Amos (Version 25.0), consisting of 323 males and 120 females, ranging

between 18 and 58 years (M = 24.85, SD = 6.41). Model fit was assessed through an examination of CFI, TLI, AIC, BIC and RMSEA fit indices.

Table 6

Study and Literature Reliability (Cronbach's Alpha) of Measures

Instrument	Literature α (items)	Study α (items)
BIS (Anxiety)	0.84 (10)	0.89 (10)
CES (Absorption)	0.75 (8)	0.70 (8)
MAQ (Misophonia)	*	0.95 (21)

Note. N = 820. BIS = Behavioural Inhibition Scale; CES = Curious Experiences Scale; MAQ = Misophonia Assessment Questionnaire. *Reliability statistics were not available for the modified Misophonia Assessment Questionnaire.

Results

Scale Refinement.

Solution 1 (ASMR-20).

Exploratory Factor Analysis. In line with the recommendations of Worthington and Whittaker (2006), and consistent with the approach employed in the generation and assessment of the ASMR-31, exploratory factor analysis was undertaken on Sample 1 (n = 448) via principle axis factoring with a direct oblimin rotation, producing a five factor matrix after 13 iterations. The 22-items produced a similar factor structure as in the previous study. However, R4 (*"I feel anxious"*) failed to load onto any factor at the .32 level (Worthington & Whittaker, 2006), and was removed, producing a 21-item scale.

Confirmatory Factor Analysis. A confirmatory factor analysis was performed on Sample 2 (n = 448) to assess the factor structure of the ASMR-21. Modification indices between residuals were evaluated, and included only for items within the same factor, that

explained interpretable variance unaccounted for by the identified factor. In total, 4 covariances were added to the model, with 2 between Altered Consciousness items, and 2 within the Affect factor. See Table 7 for a summary of included covariances.

Table 7

Included Covariances Between Residuals in the ASMR-21

Covariance	M.I.	Items	Common Element
Rc12 – Rc13	13.67	"It feels as though I have slipped into a hypnotic, trance-like state" and "I experience time distortions"	Hypnotic and trance state experience
Rc13 – Rc14	13.08	"I experience time distortions" and "The experience is similar to meditation"	Meditative experience
Ra16 – Ra18	11.95	"I feel euphoric" and "It feels like a positive occurrence"	Positive feelings
Ra15 – Ra16	10.24	"The experience is blissful" and "I feel euphoric"	Pleasure

Note. $N = 448$.

In examining the regression weights, AC5 ("*the experience is similar to meditation"*) produced a weak path coefficient (<.400), with high error variance, and was subsequently removed. The overall 20-item model demonstrated modest fit with respect to RMSEA (.06), CFI (.92) and TLI (.90), suggesting further refinement of the model.

Solution 2 (ASMR-15).

Exploratory Factor Analysis. Due to the modest model fit of the proposed ASMR-20, EFA was undertaken on the ASMR-22 via principal axis factoring with a direct oblimin rotation, specifying 4 factors for extraction. The factor matrix converged after 12 iterations, where the Sensation and Movement factors combined to create an 8-item Sensation factor. Through refinement, 4 items were removed progressively. Three items failed to load

above .32 on any factor (R4 *"I feel anxious"*; S3 "*I feel a strange sensation inside my skull"; M3 "The sensation feels warm"*), and one item produced high cross loadings onto 2 factors (A5 *"It feels like a positive occurrence"*). These items were removed, producing an 18-item scale.

Confirmatory Factor Analysis. A confirmatory factor analysis (CFA) was undertaken on Sample 2 (n = 448) to assess the factor structure of the ASMR-18. Modification indices between residuals were assessed, and included judiciously to improve model fit. In total, 8 covariances were added, with 7 added between Sensation items, and 1 between Altered Consciousness items. For a summary of included covariances, see Table 8.

In examining the regression weights, M4 ("*It feels as though there is a build-up followed by a release"*) and AC5 ("*The experience is similar to meditation"*) produced weak path coefficients (<.400), with high error variances, and numerous unjustified covariances between residuals. It was determined that the items were not critical to the description of ASMR, and removal would not eliminate core features of the construct. M5 ("*the sensation begins in my head and moves downwards through my body*") also demonstrated numerous covariances, and was removed. Through progressive removal of underperforming items, the overall fit of the model improved, producing a final, 15-item ASMR scale. See Table 9 for ASMR-15 factor structure, and Table 10 for final ASMR-15 items.

Chi-square value for the overall fit of the model was significant x^2 (82) = 188.09, p < .001, suggesting a lack of fit between the data and the hypothesised model. However, given the large sample size (n = 448), other measures of fit were assessed. The ASMR-15 demonstrated good fit with respect to CFI (.96), TLI (.94) and RMSEA (.05; Hu & Bentler, 1999). Further, in comparing AIC and BIC fit indices, the ASMR-15 produced a lower AIC (264.09) and BIC (420.07), than the ASMR-20 (AIC = 518.18; BIC = 735.73), suggesting a superior model in the ASMR-15 (Schreiber, Nora, Stage, Barlow & King, 2006). See

Diagram 1 for model.

Table 8

Included Covariances Between Residuals in the ASMR-18

Covariance	M.I.	Items	Common Element
Rm5 – Rm6	44.04	"The sensation feels like a wave of energy" and "The sensation spreads like a wave"	Wave
Rm5 – Rm8	15.33	"The sensation feels like a wave of energy" and "It feels as though there is a build-up followed by a release"	Energy
Rc12 – Rc13	14.22	"It feels as though I have slipped into a hypnotic, trance-like state" and "I experience time distortions"	Hypnotic and trance state experience
Rm6 – Rm9	11.90	"The sensation spreads like a wave" and "The sensation begins in my head and travels downwards through the rest of my body"	Movement
Rm6 – Rm8	10.79	"The sensation spreads like a wave" and "It feels as though there is a build-up followed by a release"	Movement
Rm8 – Rm9	8.47	"It feels as though there is a build-up followed by a release" and "The sensation begins in my head and travels downwards through the rest of my body"	Movement
Rs2 – Rm8	4.33	"The sensation feels "tingly"" and "It feels as though there is a build-up followed by a release"	Blood rush
Rs4 – Rm8	4.57	"It feels like goosebumps on the back of my head" and "It feels as though there is a build-up followed by a release"	Build up and arousal

Note. $N = 448$.

Table 9

Final Item Matrix of the ASMR-15

ASMR-15 Item	ASMR-15 Factors			
	(AC)	(S)	(R)	(A)
AC1	**.871**	-.038	-.038	-.038
AC2	**.820**	-.055	.019	-.019
AC3	**.634**	.107	.137	-.057
AC4	**.552**	.019	-.023	-.025
M2	.066	**.766**	.003	.097
M1	.176	**.616**	.008	.025
S2	-.128	**.522**	-.029	-.162
S4	-.041	**.520**	.003	.022
S1	-.072	**.517**	.010	-.158
R3	-.038	.055	**.937**	.054
R1	-.068	.000	**.638**	-.100
R2	.133	-.043	**.536**	.029
A1	-.013	-.084	.125	**-.718**
A2	.147	.029	-.075	**-.706**
A3	.031	.194	-.006	**-.536**
% of Variance	21.48	13.42	9.08	4.73
Cumulative % of Variance	21.48	34.90	43.98	48.71

Note. $N = 448$. Rotation converged in 6 iterations. S = Sensation; A = Affect; R = Relaxation; AC = Altered Consciousness.

Table 10

Final Items and Subscales of the Four-Factor ASMR-15

Factor	Item	Question
AC	AC1	It feels like an altered state of consciousness.
	AC2	It feels like a different state of mind.
	AC3	It feels as though I have slipped into a hypnotic, trance-like state.
	AC4	I experience time distortions.
S	S1	I experience an unusual sensation in my head and body.
	S2	The sensation feels "tingly".
	S4	It feels like goosebumps on the back of my head.
	M1	The sensation feels like a "wave of energy".
	M2	The sensation spreads like a wave.
R	R1	I find the experience calming.
	R2	I feel sleepy.
	R3	I feel relaxed.
A	A1	The experience is blissful.
	A2	I feel euphoric.
	A3	I find the sensation intensely pleasurable.

Note. $N = 448$. AC = Altered Consciousness; S = Sensation; R = Relaxation; A = Affect.

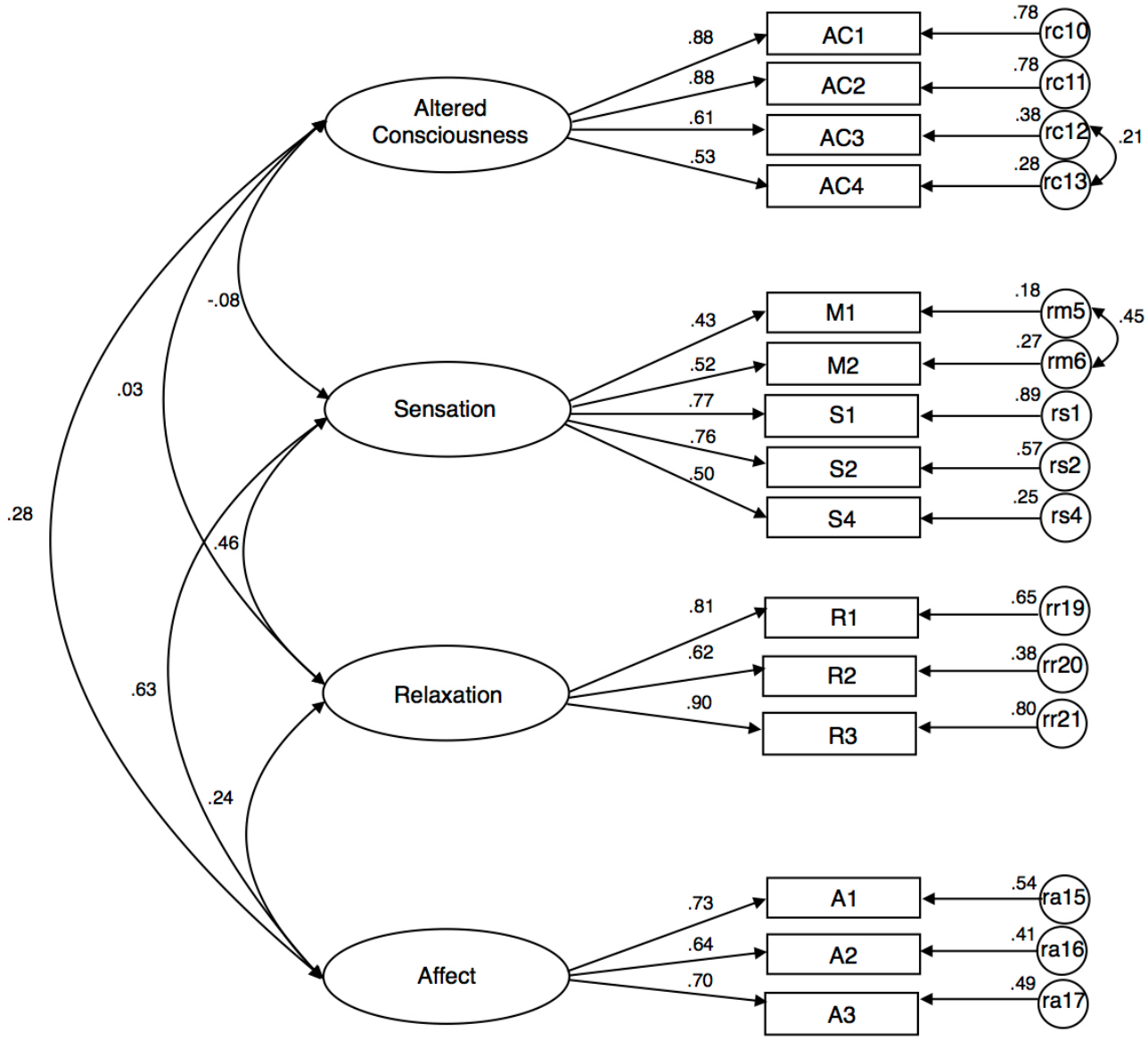
Reliability Analyses

Cronbach's alpha reliability coefficients were calculated on the combined sample (n = 896) for the total score scale and subscales, in line with the George and Mallery (2003) guidelines of acceptability. The total score ASMR-15 measure ($\alpha = .78$) met requirements. The Sensation ($\alpha = .72$), Affect ($\alpha = .74$) and Altered Consciousness ($\alpha = .82$) subscales demonstrated sufficient reliability, consistent with previous findings. However, the

Relaxation (α = .74) subscale demonstrated considerably improved reliability. See Table 11 for reliability comparisons between the ASMR-20 and ASMR-15.

Diagram 1.

ASMR-15 Confirmatory Factor Analysis Model



Note. $N = 448$.

Table 11

Reliability (Cronbach's Alpha) of Measures

Instrument and Subscale	Study 2 α (items)	Study 3 α (items)
ASMR	0.81 (20)	0.78 (15)
Altered Consciousness	0.76 (5)	0.82 (4)
Sensation	0.63 (4)	0.72 (5)
Relaxation	0.69 (2)	0.74 (3)
Affect	0.73 (4)	0.74 (3)
Movement	0.71 (5)	-

Note. Study 2 n = 451; Study 3 n = 896. ASMR = Autonomous Sensory Meridian Response. Movement data not available for Study 3, items combined with Sensation subscale.

Demographic Factors

The ASMR-15 (n = 896) was further explored with respect to demographic factors. Scores on the ASMR-15 did not correlate with age (r = .027, p = .425), or demonstrate a significant difference across genders, t (881) = -.872, p = .384. There did not appear to be an effect of level of education on ASMR scores, F (7, 888) = 1.424, p = .192. However, a significant difference was found between scores on the ASMR-15, when examined alongside location, F (5, 890) = 2.863, p = .014. Location was categorised into 6 regions, based on frequency, including Europe, Australia and New Zealand, the United States, United Kingdom and Canada. For countries represented infrequently, an "Other" category was created, comprising 14 countries, including Brazil, Costa Rica, India, Israel, Mexico, Pakistan, the Philippines, Singapore, Sint Maarten, South Africa, South Korea, Thailand, Venezuela and Zimbabwe. Bonferroni post-hoc contrasts revealed a significant main effect of location on ASMR scores F (5, 890) = 2.600, p = .019, with participants residing in the United States (M = 56.47, SD = 7.52) recording significantly higher scores on the ASMR-15 than those from

Europe (M = 53.87, SD = 8.20). The largest mean difference was found between participants from the United States and countries grouped under 'Other' (M = 53.29, SD = 9.34), F (5, 890) = 3.186, p = .553), however, these findings were non significant. See Table 12 for frequencies and means.

Misophonia, Absorption and Anxiety

The ASMR-15 and subscales were correlated with the existing BIS, CES, and MAQ measures to assess construct validity on the combined dataset (n = 820). It was expected that ASMR would demonstrate convergence with measures of anxiety and absorption, and divergence from misophonia. Somewhat consistent with expectations, the Pearson's correlation coefficient for the relationship between participant scores on the ASMR-15 and BIS was very weak, yet significant (n = 820; r = .13, p < .001). Similarly, anxiety (BIS) correlated weakly with Relaxation (r = .11, p =.002), Altered Consciousness (r = .09, p = .008), and Affect (r = .09, p = .011). Further, a weak correlation was found between absorption (CES) and ASMR (r = .29, p <.001), as well as the Altered Consciousness (r = .25, p <.001), Affect (r = .26, p <.001), Relaxation (r = .12, p = .001) and Sensation (r = .11, p = .001) subscales. Weak, yet significant correlations were found between absorption and misophonia (r = .15, p <.001), absorption and anxiety (r = .19, p < .001), and between anxiety and misophonia (r = .26, p <.001). For correlations, see table 13.

Table 12

Means and Frequencies of Demographic Variables for the ASMR-15

Variable	Frequency	ASMR-15 Mean (*M*)
Gender		
Male	580	55.57
Female	229	56.26
Level of Education		
Some High School	34	57.18
High School or Equivalent	132	56.30
Some College	232	55.75
Associate's Degree	52	58.15
Bachelor's Degree	263	55.29
Master's Degree	71	54.64
Doctoral Degree	24	55.83
Other	12	53.00
Country of Residency		
Australia and New Zealand	57	56.30
Canada	76	54.84
Europe	105	53.79
United Kingdom	84	55.48
United States	472	56.50
Other	26	53.00

N = 820.

Table 13

Correlations Between the ASMR-15, Subscales and Total Score Measures

Measure	AC	S	R	A	BIS	CES	MAQ
ASMR-15	.676**	.669**	.493**	.714**	.129**	.291**	.075
AC		.075	.145**	.272**	.093*	.250**	.112*
S			.168**	.403**	.060	.113*	.005
R				.337**	.106*	.120*	.036
A					.089	.261**	.020
BIS						.188**	.258**
CES							.150**

Note. $N = 820$. AC = Altered Consciousness; S = Sensation; R = Relaxation; A = Affect. **p <.001, *p <.01. BIS = Behavioural Inhibition System Anxiety Scale; CES = Curious Experiences Scale; MAQ = Misophonia Assessment Questionnaire.

Regression Analysis

A multiple linear regression was undertaken to predict the ASMR-15 and subscales based on the CES, MAQ and BIS. A significant regression equation was found for the ASMR-15 ($F(3, 816) = 27.092$, $p < .001$), with an R^2 of .091, suggesting that a very small proportion of variance in the ASMR-15 can be explained by existing measures. Absorption ($\beta = .399$, $p < .001$) and anxiety ($\beta = .136$, $p = .036$) were found to be significant predictors of ASMR. Further, absorption was found to be a significant predictor of Altered Consciousness ($\beta = .178$, $p < .001$), Sensation ($\beta = .073$, $p = .003$), Relaxation ($\beta = .036$, $p = .003$) and Affect ($\beta = .112$, $p < .001$). Anxiety significantly predicted scores on Relaxation ($\beta = .017$, $p = .017$), and misophonia was a predictor of scores on Altered Consciousness ($\beta = .042$, $p = .050$).

Discussion

Overall, the results of the factor analyses support the conceptualisation of ASMR seen in content analysis and scale construction. As the first designated ASMR scale, the measure intended to assess a range of common features of the phenomenon as well as establishing a means from which to assess relationships to similar paresthetic sensations and altered states. A mixed-methods approach was undertaken to address these aims. Through content analysis, significant variation across cases was observed. Specific points of contention emerged within nodes and categories suggesting that accounts of ASMR may differ experientially. Despite this, a large proportion of cases reported similar shifts in affect, consciousness and specific sensations.

The created ASMR-31 was derived from emergent categories in content analysis, and assessed with respect to internal consistency, factor structure and divergent validity from related constructs. Following reduction, the resultant 15-item ASMR scale identified four underlying factors, Altered Consciousness, Sensation, Relaxation and Affect. Across EFA and CFA, the ASMR-15 appears to adequately reflect the factor structure seen in a large convenience sample (n = 896). Future work will assess the performance and reliability of the ASMR-15 when administered to a non-specialised sample. Assessment of the internal consistency of the ASMR-15 suggested the creation of a sufficiently reliable total score measure (α = .78), with four reliable subscales (George & Mallery, 2003). It is expected that a more generalised sample will allow for greater variation in scores on the ASMR-15, and may further improve reliability statistics.

A number of items were removed in refining the ASMR measure, notably M5 ("*the sensation begins in my head and travels downwards through the rest of my body"*). The cephalocaudal direction of sensation was previously thought to be a defining feature of ASMR, and one that distinguished the phenomenon from other paresthetic experiences.

However, due to the combination of head and body in M5, it is possible that ASMR sensations predominantly travel in a cephalocaudal manner, beginning in the neck or shoulders, or that the experience is primarily head oriented in some participants. Further qualitative examination of the specific location and direction of ASMR experiences would be of benefit, and allow for greater differentiation between ASMR, frisson and kundalini.

The ASMR-15 demonstrated convergent and divergent validity from a number of similar constructs. As expected, ASMR demonstrated some convergence with absorption and flow states, and divergence from frisson. Contrary to expectations, alexithymia did not demonstrate convergence with ASMR; rather the relationship between alexithymia and ASMR was non-significant ($r = .07$, $p = .197$). This suggests that ASMR is not associated with poor discrimination of sensations within the self, however further examination is required. ASMR does not appear to be adequately accounted for by existing constructs such as misophonia, anxiety, or absorption, and is only moderately related to frisson ($r = .25$, $p < .001$) and flow states ($r = .44$, $p < .001$). This suggests that while there may be commonalities, or a shared underlying capacity between ASMR, frisson, and flow, they appear to be distinct experiences.

Importantly, while ASMR appears unrelated to misophonia, environmental context may have influenced the results. The modified MAQ provided examples of sounds that commonly induce misophonia. However, a number of respondents in Study 3 provided feedback that emphasised the role of context in determining whether an audiovisual stimulus is experienced as pleasant or aversive. For example, intentional engagement with whispering in an ASMR video produced a pleasant sensation, while incidental whispering resulted in feelings of anger and displeasure, akin to misophonia. Due to the highly individualised nature of these experiences, and the ecological differences encountered when viewing ASMR media in a

controlled setting, compared to incidental interactions, future work will need to consider the role of context, expectations and environmental influences in disambiguating these experiences.

Additionally, there were a number of limitations in the present work that would be best addressed in future research. Firstly, as de-identified, archival data was utilised in Study 1 for the generation of ASMR items, no demographic information was available for the sample. This was unfortunate as it did not allow for evaluation of the representativeness of the sample, and examination of the effect of gender or age on qualitative accounts. Similarly, there was a significant mean difference found between country of residency and ASMR-15 scores (p = .014). The largest mean difference, and lowest mean was found for countries within the "Other" category, which are primarily non-English speaking countries. It is possible that there may be a language effect complicating the relationship between ASMR scores and location. However, it is important to note that the majority of participants resided in Western, English-speaking regions, which may limit the generalisability of findings overall. Further, as the data came from numerous online sources, including forums, there may have been some effect of suggestion on the descriptions provided by commenters, particularly in response to other's reported experiences.

In utilising a niche sample, participant responses may have potentially been influenced by perceived demand characteristics. In other words, participants sourced from an ASMR interest group might display a somewhat homogenous perception of the phenomenon of interest, and may have endorsed items accordingly, or unwittingly responded in ways that would aid the researcher (Nichols & Maner, 2008). Future research could attempt to examine ASMR experiences in a less specialised sample, and through utilising Modern Test Theory analyses such as Rasch scaling (Lange, 2017). Such approaches are becoming increasingly

recognised and adopted in studies of consciousness, and may address response bias issues (Lange, 2017). Consequently, with respect to replication of the present research, addressing issues such as potential demand characteristics and suggestibility, and adopting these alternative statistical approaches is advisable. Similarly, scores on the ASMR and absorption measures may have been somewhat inflated due to the dissociative content of some items. Higher endorsement of dissociative items has been seen in individuals less adept at discerning feelings and sensations within the self (Merckelback, Boskovic, Pesy, Dalsklev & Lynn, 2017), which may complicate the relationship between absorption, alexithymia and ASMR experiences.

ASMR appears to share numerous characteristics with other, established alterations and altered states of consciousness. Examination of dispositional differences in participants who score highly on the ASMR-15, alongside physiological markers would help to further disentangle ASMR from other established phenomena, and may provide further validity for the ASMR-15. Similarly, measures assessing the highly sensitive person construct, and transliminality would be valuable inclusions in future work, particularly items in the Revised Transliminality Scale (RTS; Lange, Thalbourne, Houran & Storm, 2000) related to immersion and altered states.

The ASMR-15 appears to be an effective self-report measure of ASMR propensity, demonstrating sufficient replicability of factor structure, reliability and internal consistency across assessments. Through reliability and factor analyses, the ASMR-15 appears to meet necessary preliminary criteria for a self-report measurement instrument. It is of note, however, that the predictive validity of the ASMR-15 with respect to physiological markers has yet to be assessed. This assessment is a necessary step in disambiguating the underlying affective and cognitive components of ASMR, as well as increasing the specificity of the

physical and experiential markers of the phenomenon. As demonstrated, the ASMR-15 shows consistency in the recognition and encapsulation of diverse facets of ASMR experiences. The ASMR-15 may, in turn, be a valuable measurement tool in assessing the relationships between ASMR propensity, personality factors, and alterations of consciousness more broadly.

References

Ahuja, N. K. (2013). It feels good to be measured: Clinical role-play, Walker Percy, and the tingles. *Perspectives in Biology and Medicine, 56,* 442-451.

Andersen, J. (2014). Now you've got the shiveries: Affect, intimacy, and the ASMR whisper community. *Television & New Media, 1*, 1-18.

Bagby, R. M., Parker, J. D., & Taylor, G. J. (1994). The twenty-item Toronto Alexithymia Scale. I. Item selection and cross-validation of the factor structure. *Journal of Psychosomatic Research, 38*, 23–32.

Bagby, R. M., Taylor, G. J., & Parker, J. D. (1994). The twenty-item Toronto Alexithymia Scale. II. Convergent, discriminant and concurrent validity. *Journal of Psychosomatic Research, 38*, 33–40.

Banerjee, S., & Iglewicz, B. (2007). A simple univariate outlier identification procedure designed for large samples. *Communications in Statistics - Simulation and Computation, 36*, 249-263.

Barratt, E. L. & Davis, N. J. (2015). Autonomous sensory meridian response (ASMR): A flow-like mental state. *PeerJ, 3*, 1-17.

Barušs, I. (2003). *Alterations in Consciousness: An Empirical Analysis for Social Scientists*, Washington, DC: American Psychological Association.

Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS Scales. *Journal of Personality and Social Psychology*, *67,* 319-333.

Colizoli, O., Murre, J. M. J., & Rouw, R. (2013). A taste for words and sounds: a case of

lexical-gustatory and sound-gustatory synesthesia. *Frontiers in Psychology, 4*, 1-16.

Corbin, J. M. & Strauss, A. L. (1990). *Basics of qualitative research* (Vol. 15). Newbury Park, CA: Sage.

Dozier, T. H. (2015). Treating the initial physical reflex of misophonia with the neural repatterning technique: A counterconditioning procedure. *Psychological Thought*, *8*, 189-210.

George, D., & Mallery, P. (2003). Frequencies. *SPSS for Windows step by step: A simple guide and reference, 11.0 update (4th ed.).* Boston, MA: Allyn & Bacon.

Goldberg, L. R. (1999). The Curious Experiences Survey, a revised version of the Dissociative Experiences Scale: Factor structure, reliability, and relations to demographic and personality variables. *Psychological Assessment*, *11,* 134-145.

Grewe, O., Katzur, B., Kopiez, R., & Altenmuller, E. (2010). Chills in different sensory domains: Frisson elicited by acoustical, visual, tactile and gustatory stimuli. *Psychology of Music, 39*, 220-239.

Greyson B. (1993). The physio-kundalini syndrome and mental illness. *Journal of Transpersonal Psychology, 25*, 43-58.

Harrison, L, & Loui, P. (2014). Thrills, chills, frisson, and skin orgasms: toward an integrative model of transcendent psychophysiological experiences in music. *Frontiers in Psychology, 5*, 1-6.

Hoaglin, D. C., & Iglewicz, B. (1987), Fine tuning some resistant rules for outlier labeling, *Journal of American Statistical Association, 82*, 1147-1149.

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content

analysis. *Qualitative Health Research*, *15*, 1277-1288.

Hu, L. & Bentler, P. M. (1999). Cuttoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*, 1-55.

Jackson, S. A. & Eklund, R. C. (2002). Assessing flow in physical activity: The Flow State Scale-2 and Dispositional Flow Scale-2. *Journal of Sport and Exercise Psychology, 24,* 133-150.

Jackson, S. A. & Marsh, H. W. (1996). Development and validation of a scale to measure optimal experience: The flow state scale. *Journal of Sport and Exercise Psychology, 18,* 17-35.

James, W. (1902). *The Varieties of Religious Experience: A Study in Human Nature.* New York: Modern Library.

Johnson, M. (2014, February). *50 cases of misophonia using the MMP*. Paper presented at the misophonia conference of the Tinnitus Practitioners Association, Atlanta, GA.

Lange, R. (2017). Rasch scaling and cumulative theory-building in consciousness research. *Psychology of Consciousness: Theory, Research and Practice, 4*, 135-160

Lange, R., Thalbourne, M. A., Houran, J., & Storm, L. (2000). The Revised Transliminality Scale: Reliability and validity data from a Rasch top-down purification procedure. *Consciousness and Cognition, 9*, 591-617.

Loevinger, J. (1957). Objective tests as instruments of psychological theory: Monograph supplement 9. *Psychological Reports, 3,* 635-694.

Ludwig, A. M. (1966). Altered states of consciousness. *Archives of General Psychiatry, 15*, 225-234.

Maslow, A. H. (1964). *Religions, Values, and Peak-Experiences*. Columbus, OH: Ohio State University Press.

Mason, O., Tyson, M., Jones, C., & Potts, C. (2005). Alexithymia: Its prevalence and correlates in a British undergraduate sample. *Psychology and Psychotherapy: Theory, Research and Practice, 78,* 113-125.

Merckelbach, H., Boskovic, I., Pesy, D., Dalsklev, M., & Lynn, S. J. (2017). Symptom overreporting and dissociative experiences: a qualitative review. *Consciousness and Cognition, 49,* 132-144.

Modestino, E. J. (2016). Neurophenomenology of an altered state of consciousness: An fMRI case study. *Explore: The Journal of Science and Healing*, *12*, 128-135.

Møller, A. R. (2011). Misophonia, phonophobia, and "exploding head" syndrome. In *Textbook of tinnitus*. New York, NY: Springer.

Nichols, A. L., & Maner, J. K. (2008). The good-subject effect: Investigating participant demand characteristics. *The Journal of General Psychology*, *135*, 151-166.

Polito, V., Langdon, R., & Brown, J. (2010). The experience of altered states of consciousness in shamanic ritual: The role of pre-existing beliefs and affective factors. *Consciousness and Cognition, 19*, 918-925.

Raubenheimer, J. (2004). An item selection procedure to maximise scale reliability and validity. *SA Journal of Industrial Psychology, 30*, 59-64.

Rudestam, K. E., & Newton, R. R. (2007). *The method chapter: Describing your research plan. Surviving your dissertation.* Thousand Oaks, CA: Sage Publications.

Schäfer, T., Fachner, J., & Smukalla, M. (2013). Changes in the representation of space and time while listening to music. *Frontiers in Psychology*, *4,* 1-15.

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *The Journal of Educational Research*, *99*, 323-338.

Silvia, P. J., & Nusbaum, E. C. (2011). On personality and piloerection: Individual differences in aesthetic chills and other unusual aesthetic experiences. *Psychology of Aesthetics, Creativity, and the Arts*, *5,* 208-214.

Sloboda, J. A. (1991). Music structure and emotional response: Some empirical findings. *Psychology of Music, 19*, 110-120.

Tellegen, A., & Atkinson, G. (1974). Openness to absorbing and self-altering experiences ("absorption"), a trait related to hypnotic susceptibility. *Journal of Abnormal Psychology, 83*, 268-277.

Valanciute, A., & Thampy, L. A. (2011). Physio Kundalini syndrome and mental health. *Mental Health, Religion & Culture*, *14*, 839-842.

Worthington, R. L., & Whittaker, T. A. (2006). Scale development research a content analysis and recommendations for best practices. *The Counselling Psychologist, 34*, 806-838.

Wu, M. S., Lewin, A. B., Murphy, T. K., & Storch, E. A. (2014). Misophonia: incidence, phenomenology, and clinical correlates in an undergraduate student sample. *Journal of Clinical Psychology, 70*, 994-1007.

Introduction to Chapter 3.

As discussed in the previous chapter, the Autonomous Sensory Meridian Response Scale was substantially improved through further refinement, producing a total score measure with four distinct subscales which correlate modestly. Specifically, as seen in Table 13, the Altered Consciousness component of the experience was weakly correlated with Relaxation and Affect dimensions, and appeared unrelated to Sensation. In addition, the sensory component of ASMR appeared to be most correlated with the affective dimensions of the experience, and was only weakly related to Relaxation, suggesting some clustering of sensory-affective experience. The internal consistency and model fit suggested the creation of a reliable measure suited for use among specialised participants aware of ASMR terminology. However, as discussed previously, there is presently little consensus on the prevalence of ASMR experiences outside of online or self-selected samples. As a result, a primary aim of this study concerned establishing an estimate of the distribution of multidimensional ASMR propensity among psychology undergraduate students. However, in order to do so, we needed to modify the ASMR measure to suit those who were unaware of ASMR prior to participation.

Consequently, the focus of this study concerned the modification of the ASMR measure, and an assessment of ASMR experiences in a non-specialised sample. In addition, we were interested in understanding whether there was a particular personality profile of individuals who experience ASMR. As a result, we wanted to assess the relationships between a number of individual differences, including Extraversion, Neuroticism, Openness, Agreeableness, and Conscientiousness, as well as sensory-processing sensitivity, and self-reported ASMR propensity.

Chapter 3

Autonomous Sensory Meridian Response: Sensitivity and Personality Correlates

Author Contribution: Natalie Roberts was responsible for the concept and design of the project, data analysis and write-up. Associate Professor Simon Boag and Dr. Alissa Beath provided supervision and guidance on the research design, data analysis and feedback on the manuscript.

Abstract

Autonomous Sensory Meridian Response (ASMR) is a pleasurable, tingling sensation induced by exposure to specific, audio-visual triggers, producing feelings of relaxation and euphoria. This article examines the relationship between ASMR propensity using a recently developed self-report measure (ASMR-15), Big Five personality factors, and sensory-processing sensitivity, in a general population. Thus far, the ASMR-15 has only been validated on self-selected ASMR-specific samples, and so it is yet to be determined whether the measure can be adapted to assess ASMR in a non-specialised sample. Furthermore, the distribution of ASMR-15 scores within the non-specialised population is also unknown. To address this, $N = 187$ undergraduate psychology students were recruited for a survey study. A confirmatory factor analysis was undertaken on the ASMR-15, which replicated the factor structure previously demonstrated. Correlational and regression analyses showed limited, weak associations between ASMR-15 scores and personality factors: ASMR was related to greater Openness to Experience and sensory-processing sensitivity, and lower levels of Conscientiousness. The possibility that ASMR experience may be a by-product of high dispositional sensitivity is discussed. Additionally, the ASMR-15 may be useful for researchers interested in further exploring ASMR experiences in both specialised and non-specialised samples.

Keywords: ASMR; Autonomous Sensory Meridian Response; Personality; Sensitivity; Prevalence

Autonomous Sensory Meridian Response (ASMR) is generally described as a pleasurable, head-orientated tingling sensation that typically occurs in response to audiovisual triggers, producing feelings of relaxation, comfort and euphoria (Roberts, 2015; Andersen, 2014; Colizoli, Murr & Rouw, 2013; Barratt & Davis, 2015). Common ASMR triggers include whispering, tapping, and crisp sounds (Ahuja, 2013; Barratt & Davis, 2015), although there appears to be significant variation in preferences across individuals (Barratt, Spence & Davis, 2017). Deliberate ASMR induction has been reported by experiencers as having numerous benefits, with seekers frequently citing relaxation, sleep promotion, and anxiety reduction motives (McErlean & Banissy, 2017). Additionally, discussions of ASMR experiences have gained steady interest online. As of January 2019, 18 million ASMR trigger videos have been uploaded to YouTube, and the subReddit forum *ASMR: Sounds That Feel Good* has accrued over 150,000 subscribers. Despite this, research into the exact parameters of the phenomenon, including causes, correlates, and relative prevalence, is still in its infancy. As a result, there have been few recent attempts to quantify ASMR experiences, in a way that would allow for such systematic observations.

Given the level of interest in, and potential benefits associated with exploring and inducing ASMR experiences, a first step in research involves identifying the characteristics of people who experience the phenomenon. A relevant question in this respect is whether those who experience ASMR differ with respect to personality and dispositional sensitivity, compared to those who do not experience ASMR. Dispositional sensitivity refers to psychobiological sensitivity to social and environmental stimuli (Benham, 2006), and higher levels of this sensitivity may explain why some individuals respond to ASMR triggers while others do not. Until recently, however, a barrier to assessing the relationship between ASMR and individual difference has been the lack of a reliable, valid and multifaceted measure of ASMR propensity, suitable for use in both specialised (self-selected ASMR experiencers)

and non-specialised samples. Prior attempts at assessing ASMR experiences have tended toward unidimensional measures or categorical approaches, which may come at the expense of more nuanced multidimensional information about individual differences (see MacCallum, Zhang, Preacher & Rucker, 2002). To address these issues, Roberts (2015; Chapter 2) recently developed a multi-faceted, dimensional measure of ASMR propensity (ASMR-15), validated within specialised ASMR communities. Utilising this new measure, the present study attempted to address the role of personality and individual differences in ASMR experiences, by administering a modified version of the ASMR-15. However, unlike previous work, the aim of the current study was to examine the relative prevalence of ASMR within a non-specialised sample while further examining correlates with Big Five personality factors (BFI; John, Donahue & Kentle, 1991) and sensory processing sensitivity (SPS; Aron & Aron, 1997).

ASMR, Synaesthesia and Individual Differences

ASMR appears to be a specific, externally-induced phenomenon with a common set of characteristics endorsed across individuals (Roberts, 2015). In Chapter 2 we found that ASMR is a multifaceted experience, characterised by distinct sensory effects, and shifts in affect, relaxation, and conscious experience. While there currently exists no data on the estimated prevalence of ASMR experiences in the general population, the endorsement of a specific, common experience across individuals may nevertheless suggest that ASMR experiencers share common features. Some recent research suggests that this might be the case. For example, in the first study to assess neurological similarities between ASMR experiencers, Smith, Fredborg and Kornelsen (2016) utilised fMRI to examine the default mode networks (DMN) of 11 self-identified ASMR experiencers, and 11 age- and sex-matched controls. Their findings indicated that ASMR experiencers demonstrated greater connectivity between some brain regions when compared to controls (i.e. middle occipital

gyrus, cuneus, superior frontal gyrus, middle frontal gyrus and middle temporal gyrus). On the other hand, ASMR experiencers showed significantly decreased connectivity in other regions (i.e. superior temporal gyrus, middle temporal gyrus, precuneus, superior frontal gyrus, posterior cingulate, medial frontal gyrus and thalamus) compared to controls. Similarly, differences were found in thalamic connectivity seen across ASMR and non-ASMR experiencers, which may be implicated in the tingling and affective components of the experience (Smith et al., 2016). These findings suggest that there may be common structural or neurological patterns across ASMR experiencers, associated with ASMR propensity. By extension, there may be other patterns of characteristics (e.g. personality, arousal) seen among ASMR experiencers, that diverge from non-ASMR experiencers.

Other findings that potentially indicate a common characteristic in ASMR experiencers, pertain to synaesthesia, which has been associated with particular structural and personality profiles (Banissy et al., 2013). The term synaesthesia means "to perceive together" (Martino & Marks, 2001, p.62) and refers to an uncommon perceptual condition characterised by cross-modal stimulation. For example, a synaesthete will perceive a particular stimulus (e.g. sound) in the typical associated modality (e.g. hearing), as well as another non-typical modality (e.g. seeing colours; Martino & Marks, 2001). ASMR experiences similarly appear to involve a comparable cross-modal blending of senses, typically characteristic of synaesthesia. For instance, specific audiovisual triggers (e.g. whispering) produce physical responses (i.e. tingling), in the absence of tactile input. In addition, and akin to ASMR, some synaesthetes also report experiencing strong emotions in response to stimuli. For example, in a study by Ramachandran and Brang (2008), two tactile-emotion synaesthetes and 18 non-synaesthetic control participants touched a number of textured objects, including paper, denim, and sand, under observation. It was found that the tactile-emotion synaesthetes appeared to automatically, involuntarily, and reliably experience

strong emotional responses to the objects (i.e. Tylenol gel caps produced feelings of jealousy, orange peel felt like an electric shock, corduroy created feelings of disappointment etc.). While the textural component of tactile-emotion synaesthesia may not explain the effects of audiovisual triggers in ASMR, the expression of emotion in response to sensory stimuli may indicate a common underlying mechanism, such that ASMR may represent a hybrid form of synaesthesia.

With respect to individual differences, there is also evidence that synaesthetes might share a pattern of personality traits, distinct from non-synaesthetes. In a study by Banissy et al. (2013), 81 grapheme-colour synaesthetes and 112 age-matched controls were recruited from a university database. All participants completed two measures of empathy (Empathy Quotient; Baron-Cohen & Wheelwright, 2004; Interpersonal Reactivity Index; Davis, 1980) alongside the Big Five Inventory (John et al., 1991). Their findings revealed that synaesthetes scored significantly higher on Openness to Experience, and significantly lower on Agreeableness, compared to controls. Nevertheless, it is unclear if synaesthesia completely accounts for the phenomenology of ASMR experiences. For example, Smith et al. (2016) noted that most participants in their study reported the ability to wilfully dampen the intensity of ASMR experiences, suggesting some deviation from synaesthesia. However, these findings were sourced from a very small sample (n = 11), and thus may not be representative of all ASMR-experiencers. This notwithstanding, if ASMR and synaesthesia are similar, it is possible that individuals sensitive to ASMR experiences may also demonstrate a particular personality profile associated with cross-modal stimulation.

ASMR, Big Five Personality Factors, and Sensory-Processing Sensitivity

There has been an increased interest in assessing individual differences across ASMR and non-ASMR experiencers, through the examination of Big Five personality traits (BFI; John et al., 1991). Fredborg, Clark and Smith (2017) examined the relationship between self-

reported ASMR propensity and scores on the BFI. Their study compared 290 self-identified individuals from a large, online ASMR interest group (http://www.reddit.com/r/ASMR) who reported previously experiencing ASMR, with 290 matched controls. All participants completed the BFI (John et al., 1991), while the ASMR participants completed an additional measure known as the ASMR checklist created for that study. The ASMR checklist is a 14-item Likert-scale, modelled around common triggers (e.g. *"watching someone draw", "tapping sounds"*). ASMR participants were asked to rate their recall of "tingles" typically experienced as a result of viewing each trigger, on a 7-point Likert scale from 0, *"no tingles"*, to 6, *"the most intense ASMR experience"*, with an "*unknown*" option included for trigger item unfamiliarity. Significant differences were found between the ASMR and control groups on all BFI subscales, whereby the ASMR group reported higher scores on Openness and Neuroticism, and significantly lower on Conscientiousness, Extraversion, and Agreeableness than controls. Higher tingles intensity ratings were also weakly, yet significantly correlated with higher scores on Openness and Neuroticism, among ASMR experiencers. While unclear, the relationship between greater Neuroticism and ASMR may reflect a common susceptibility towards emotional reactivity, however, this has yet to be directly assessed.

In a similar study, McErlean and Banissy (2017) assessed personality differences among ASMR and non-ASMR experiencers. A total of 83 self-identified ASMR experiencers were recruited from an ASMR Facebook group (https://www.facebook.com/groups/ASMRGroup/) alongside 85 university student gender and age-matched controls. Control participants were self-identifying non-ASMR experiencers, provided with a definition of ASMR and asked to indicate whether they had, or had not experienced the phenomenon. Participants then completed the BFI alongside measures of empathy. As with Fredborg et al. (2017), a significant difference was found

between groups on Openness to Experience, whereby ASMR-experiencers scored significantly higher than controls. ASMR-experiencers also scored significantly lower than controls on Conscientiousness. A weak relationship between Neuroticism and ASMR was further found, although the effect was nullified upon adjustment for multiple correlations. While these findings are generally similar to those reported by Fredborg et al. (2017), no differences in either Agreeableness or Extraversion scores were found between the ASMR and control group. However, ASMR-experiencers also scored significantly higher on measures of Fantasy and Empathic Concern, assessed using the Inter-Personal Reactivity Index (Davis, 1980). McErlean and Banissy (2017) argued that evidence of greater imaginative propensity among ASMR-experiencers, through fantasy and empathic concern, may explain the appeal of video stimuli that features role-playing, point-of-view interactions, and personal attention.

One question that arises from the findings reported above concerns explaining the inconsistency in relation to ASMR-propensity and extraversion. Fredborg et al. (2017) found significantly lower levels of Extraversion amongst ASMR participants, compared to controls, whereas this effect was not observed by McErlean and Banissy (2017). One potential explanation here is that ASMR may reflect an overall heightened dispositional sensitivity, or sensory processing sensitivity (SPS), which might explain the sensitivity component of ASMR experiences, beyond introversion and anxiety. Sensory-processing sensitivity (SPS) refers to an innate heightened psychobiological sensitivity to social and environmental stimuli (Acevedo, Aron, Aron, Sangster, Collins & Brown, 2014; Aron & Aron, 1997). Distinct from social introversion, highly sensitive individuals may exhibit a greater sensitivity to the arts, subtleties, other people's moods, and overstimulation (Aron & Aron, 1997). In previous work, anxiety moderately positively correlated with SPS (Smolewska, McCabe & Woody, 2006). Although ASMR was only weakly, positively correlated with

anxiety in Chapter 2, sensory-processing sensitivity (as captured by the Highly Sensitive Person Scale; Aron & Aron, 1997) may nevertheless explain the quality and appeal of particular types of ASMR stimuli. For example, an increased sensitivity to subtleties may explain the appeal of tapping, whispering, and crisp sounds, while a heightened sensitivity to the emotions of others may underpin a preference for caring and nurturing roleplay stimuli, beyond imaginative propensity (cf. McErlean & Banissy, 2017). Accordingly, given self-reported ASMR experience having sensory, affective, relaxation, and consciousness components, sensory-processing sensitivity may be an important factor underlying ASMR propensity.

A New Way of Assessing ASMR Propensity

As previously discussed, a number of studies have assessed individual differences in ASMR experiencers, through self-selection screening and a focus on trigger preferences. These 'trigger' approaches measure the self-reported effectiveness of common ASMR triggers as the primary indicator of ASMR propensity. While valuable, the current trend towards operationalising and assessing ASMR experiences using 'trigger' oriented approaches has its limitations. For example, Fredborg et al.'s (2017) ASMR checklist only comprises "tingles" sensations and not other possible features of ASMR experience. While useful in examining the effectiveness of particular types of stimuli in inducing "tingles", this narrow focus ignores other relevant components of the experience, including alterations in consciousness, shifts in affect, and relaxation effects frequently reported by experiencers (Roberts, 2015). Furthermore, it is this combination of shifts in affect, relaxation, consciousness, and sensory experience that appear to be unique to ASMR experiences, and allow for the differentiation of ASMR from other, often conflated paresthetic experiences (e.g. frisson; Roberts, 2015). Further, given the appeal of deliberate ASMR induction for the

promotion of sleep, and anxiety-reduction motives (McErlean & Banissy, 2017), it would seem that the absence of a relaxation dimension misses a core element of the phenomenon.

To address this issue, Roberts (2015) created the first multi-faceted, dimensional measure of ASMR propensity, with four reliable subscales: *Relaxation* (physical and emotional shifts in arousal), *Affect* (changes in emotional experience), *Altered Consciousness* (changes in perception and awareness) and *Sensation* (the experience and spread of ASMR sensations throughout the body). The ASMR-15 and subscales demonstrated good reliability when administered to online, self-selected ASMR samples, and this measure appears to be a promising, valid instrument of ASMR propensity for use in future work. Distinct from previous ASMR measures, which focus on one aspect of ASMR experience, the ASMR-15 is a multidimensional assessment of ASMR experiences. Additionally, as the ASMR-15 assesses ASMR propensity along a continuum, the measure presents a distinct advantage in assessing the nuances of ASMR propensity, as well as the relationship between ASMR and dimensional personality traits. Nevertheless, the format of the ASMR-15 used in previous studies was only suitable for specialised participants already familiar with ASMR experiences, since the items referenced pre-existing experience with ASMR. As a result, some modification of the measure was required in order to assess ASMR experiences and personality in non-specialised samples.

Aims of the Present Study

The aims of the present study were to explore the relationships between ASMR propensity and individual differences in BFI personality traits and sensory-processing sensitivity, in a non-specialised population. To date, the relative prevalence and experiential qualities of ASMR experiences have yet to be assessed in a non-specialised population. The study thus further aimed to assess the relative prevalence of ASMR experiences and validate the existing ASMR-15 within a non-specialised sample. To achieve these aims, the existing

ASMR-15 was modified with a preceding description of ASMR-like experiences, but without using the term 'ASMR'. The study also examined whether Big Five personality traits were associated with greater ASMR propensity, and explored the relationship between ASMR and self-reported sensory-processing sensitivity. It was hypothesised that higher scores on the ASMR-15 would be correlated with higher scores on the HSPS, Openness, and Neuroticism scales. Consistent with previous work, it was expected that ASMR would correlate negatively with Conscientiousness, and be unrelated to Agreeableness and Extraversion.

Method

Participants

Participants were English-speaking students over the age of 18 recruited from a first-year psychology cohort at an Australian university. The flyer advertised participation in an online research study entitled *Personality Style and Altered States of Consciousness,* and participants were awarded research credit upon completion.

A convenience sample was employed to assess the distribution of reported ASMR experiences in a typical undergraduate student sample, allowing for variation across demographic variables of interest. A total of 204 participants signed up for the study, resulting in 187 completed responses for the Autonomous Sensory Meridian Response Scale (ASMR-15). In total, 185 individuals completed the entire questionnaire (98.9%), consisting of 21 males and 163 females, with a mean age of 19.61 years (SD = 3.45). No significant differences were found between participants who completed all measures, and those who failed to complete the questionnaire, in terms of demographics, ASMR and personality variables.

Instruments

Demographics questionnaire. Participants who met study criteria were asked to

complete three demographics questions, assessing age, gender, and highest level of academic attainment.

Autonomous Sensory Meridian Response Scale (ASMR-15). The ASMR-15 is a 15-item scale designed to measure ASMR propensity, with 4 identified subscales: sensation (5 items), altered consciousness (4 items), relaxation (3 items), and affect (3 items). Participants are asked to indicate their level of agreement with varying aspects of the ASMR experience on a Likert-scale from 1, *completely untrue for me,* to 5, *completely true for me*. In the original version of the ASMR-15, items are presented following the statement stem "When I experience ASMR…". Total scores are calculated as the sum of item scores, producing a range of total scores from 15 to 75, with higher scores indicating greater ASMR propensity. As a total score measure, the ASMR-15 has evidenced good reliability in previous work. See Table 4 for subscale reliabilities in the present, and prior work.

In the present study, the ASMR-15 instructions were modified to accommodate a more generalised sample. Participants were presented with the following statements to guide item responses:

> "This survey is looking at how certain stimuli affect you. Some individuals experience intense physical and emotional responses upon hearing particular sounds. These sensations and feelings can be pleasant or unpleasant. Sounds such as whispering, crackling, tapping or scratching may produce particular experiences described below. Using the scale, please indicate your level of agreement with each statement, upon hearing any of these, or similar sounds."

Participants endorsed each item in response to the statement, "When I hear certain sounds, such as whispering, crinkling, tapping...".

Highly Sensitive Person Scale (HSPS). The Highly Sensitive Person Scale (HSPS; Aron & Aron, 1997) is a 27-item self-report measure of sensory processing sensitivity (SPS).

The scale was created to explore the experience of sensory processing sensitivity and differentiate the construct from a cluster of commonly grouped phenomena, including introversion, inhibition and emotionality (Aron & Aron, 1997). Items were developed from interviews with self-identified highly sensitive people, in order to extract the common characteristics of the experience. Items are scored on a Likert-scale from 1, *not at all* to 7, *extremely*, with total scores calculated as the average of all item scores, producing a total score with a possible range from 1 to 7 (Benham, 2006). Higher scores on the HSPS indicate greater sensory processing sensitivity. Participants are asked to respond to items based on how they personally feel, including "are you easily overwhelmed by strong sensory input?", "do other people's moods affect you?" and "do you startle easily?". The scale evidenced good reliability in the present study, recording a Cronbach's alpha of .89, consistent with the findings of previous work (α = .86; Benham, 2006).

The Big Five Inventory (BFI). The Big Five Inventory (John, Donahue, & Kentle, 1991) is a 44-item self-report scale assessing five dimensions of personality. Items were phrased as "I see myself as someone who…", and assessed levels of openness to experience (e.g. "is inventive"), conscientiousness (e.g. "is a reliable worker"), extraversion (e.g. "is talkative"), agreeableness (e.g. "is generally trusting"), and neuroticism (e.g. "worries a lot"; John & Srivastava, 1999). Responses are rated on a Likert-scale from 1, *disagree strongly* to 5, *agree strongly*. Subscale scores were calculated as the average of all items, producing a possible range of scores between 1 and 5 for each subscale. Higher scores on each subscale reflect a greater tendency towards each trait. The BFI contains 16 negatively-keyed items, in order to highlight acquiescent response style.

The BFI subscales have demonstrated good internal consistency in previous work: Openness to experience (α = .80), conscientiousness (α = .82), extraversion (α = .86), agreeableness (α = .79), neuroticism (α = .84; Srivastava, John, Gosling & Potter, 2003).

These reliabilities were similar to those found in the present study: Openness to experience (α = .70), conscientiousness (α = .75), extraversion (α = .82), agreeableness (α = .69), neuroticism (α = .76). In addition, scores on the BFI subscales demonstrated excellent test-retest reliability in previous work, ranging between .93 and .96 (Arterberry, Martens, Cadigan, & Rohrer, 2014).

Previous ASMR Experiences and Prior ASMR Awareness. In order to assess the relationship between prior awareness of ASMR phenomena, and previous ASMR experiences on ASMR-15 scores, two additional items were included. Participants were asked, "do you know what Autonomous Sensory Response (ASMR) is?" and "have you experienced ASMR?". Responses were recorded as either 1, *yes*, 2, *no*, or 3, *I would prefer not to answer*. These items were included at the end of the questionnaire, to avoid biasing ASMR-15 responses.

Procedure

This study was approved by and conducted in accordance with the requirements of the Macquarie University Human Research Ethics Committee. The questionnaire was hosted online through the Qualtrics survey platform (https://mqedu.qualtrics.com). When opened, participants were presented with an online version of the Participant Information and Consent Form, a demographics questionnaire, the Autonomous Sensory Meridian Response Scale (ASMR-15), the Highly Sensitive Person Scale (HSPS; Aron & Aron, 1997), and the Big Five Inventory (John, Donahue & Kentle, 1991), in that order. The ASMR-15 was presented first to minimise potential cross-over effects from the other instruments, however, future work may benefit from a randomization of measures. Participants were blind to the hypotheses of the study. Additionally, participant consent and a confirmation of being over the age of 18 were required in order to progress through to the survey questions.

Results

Quantitative Data Analysis

Once the maximum number of research slots were filled, the questionnaire was closed. Data were downloaded from Qualtrics (https://mqedu.qualtrics.com) and analysed using the Statistical Package for Social Sciences (SPSS), Version 24.0. Prior to univariate analyses, a confirmatory factor analysis was undertaken in Amos on the ASMR-15, to assess the model fit in a non-specialised sample. Following this, reliability and correlational analyses were conducted on all scales and subscales. Differences in ASMR-15 scores with respect to demographic factors were assessed through independent samples *t*-tests, and correlational analyses. Chi-square analyses were undertaken on Previous ASMR Experiences and Prior ASMR Awareness items. To assess the extent to which ASMR-15 scores may be predicted by personality variables, regression analyses were performed. Due to the exploratory nature of the study, and the increased statistical power that comes from a moderate sample size, we decided to set our significance level for all statistical tests at $p = .01$.

Descriptive Statistics.

Participant Demographics. A total of 185 participants completed the entire battery of instruments. Eight categories were included for educational attainment. However, due to minimal variation and low endorsement of categories across the sample, education was grouped into ‘high school or equivalent’ and ‘other’ in presentation of results below. The most frequently reported highest level of educational attainment across the sample was ‘high school or equivalent’ ($n = 149$; 80.5%).

Previous ASMR Experiences and Prior ASMR Awareness. In response to the question “Do you know what Autonomous Sensory Meridian Response (ASMR) is?”, 1 participant declined to answer. Of those who responded, 122 participants selected ‘no’ (66.3%). Further, when asked “Have you experienced ASMR?”, 10 participants requested not

to answer. In total, 39 (22.3%) participants indicated 'yes', while 136 (77.7%) selected 'no'.

Confirmatory Factor Analysis of the ASMR-15.

Because the factor structure of the ASMR-15 had previously only been validated in a specialised ASMR sample, a confirmatory factor analysis was undertaken on the CFA in order to assess the four-factor model fit in a non-specialised sample. Model fit indices largely supported the fit of the model in this sample: X^2 (82, N = 185) = 142.13, p < .001, CFI = .97, TLI = .96, RMSEA = .06 (Hu & Bentler, 1999).

Scale Means and Frequencies.

In examining the distributions of scores on the ASMR-15, some subscales appeared to be positively skewed. Most notably, between one quarter and one third of respondents selected the lowest possible score for all items in the Affect (34.1%), Relaxation (27.0%) and Altered Consciousness (26.5%) subscales. However, Sensation did not conform to this trend, with only 9.7% of participants selecting the lowest score across items. Within the ASMR-15 total score measure, only 5.4% of respondents scored 1, indicating the selection of the lowest score across all items. These results indicate that while a substantial proportion of participants did not experience *any* specific component of ASMR, not experiencing any of *all* components was quite uncommon. For the histogram of ASMR-15 total scores, see Figure 1. For a comparison of ASMR-15 total score and subscale means across specialised (Study 1) and non-specialised samples (present study), see Table 1. The scale means, standard deviations, and ranges of scores on the HSPS and BFI can be seen in Table 1.

Table 1

Mean, Range and Standard Deviation of Measures

Instrument and Subscale	Range	Mean (*SD*)
HSPS	1.19 – 6.44	4.51 (0.84)
Openness	1.63 – 4.88	3.34 (0.71)
Conscientiousness	1.67 – 4.78	3.39 (0.62)
Extraversion	1.38 – 5.00	3.21 (0.75)
Agreeableness	1.56 – 5.00	3.77 (0.60)
Neuroticism	1.63 – 4.88	3.28 (0.71)

Note. $N = 187$.

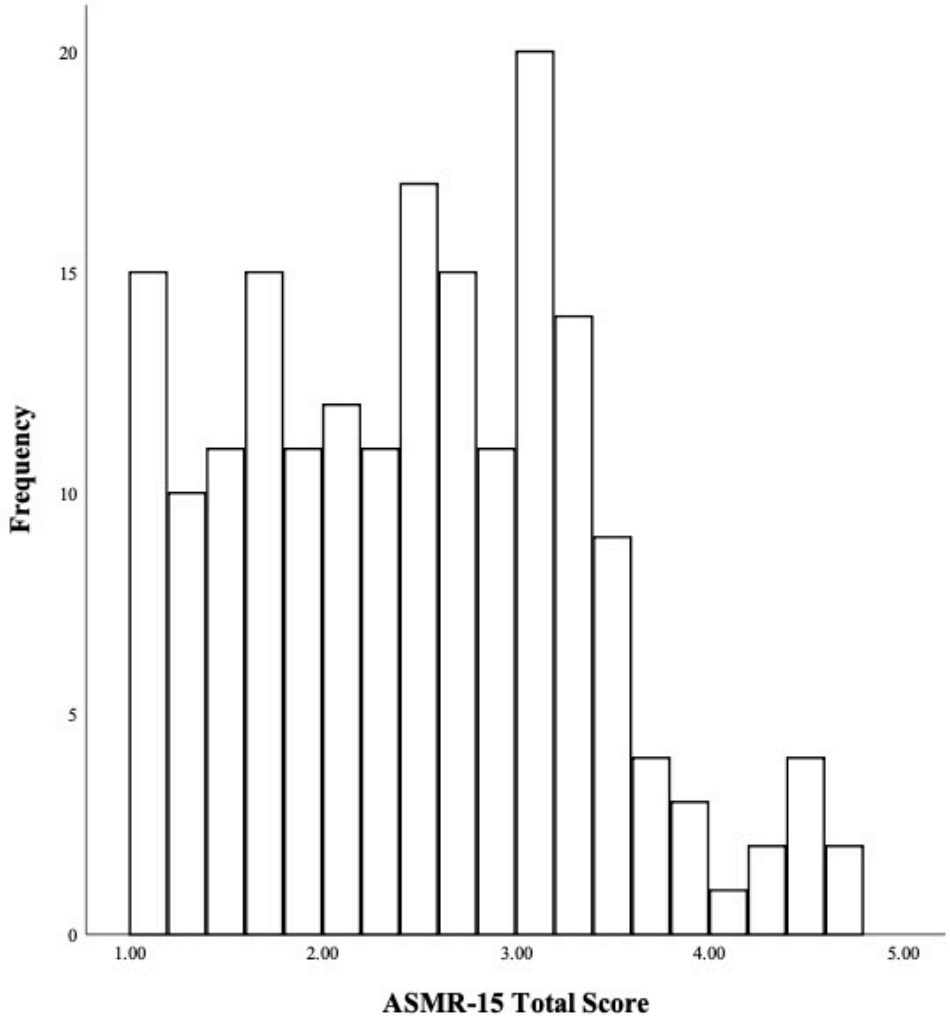


Figure 1. Frequency of ASMR-15 Scores. *Note*. *N* = 187.

In order to assess the relative frequency of higher levels of ASMR propensity, the proportion of '4' (endorsing an item as *"somewhat true"*) or '5' (endorsing an item as *"completely true"*) responses to ASMR-15 items were examined. One fifth of respondents (21.1%) did not endorse any item with a '4' or '5', meaning that otherwise 78.9% had a relatively strong experience of some element of ASMR. Additionally, 15.7% selected '4' or '5' for more than half (8) of the ASMR-15 items. The proportion of participants endorsing a '4' or a '5' for more than half of the items differed across the Sensation (42.7%), Relaxation (18.9%), Affect (11.9%) and Altered Consciousness (7.0%) subscales. See Tables 2 and 3 for all frequencies.

Table 2

Frequency of 4 or 5 Scores on ASMR-15

Number of Items	Frequency (*f*)	Percentage (%)	Cumulative (%)
0	39	21.1	21.1
1	15	8.1	29.2
2	20	10.8	40.0
3	32	17.3	57.3
4	18	9.7	67.0
5	12	6.5	73.5
6	11	6.0	79.5
7	9	4.8	84.3
8	10	5.4	89.7
9	2	1.1	90.8
10	6	3.3	94.1
11	2	1.0	95.1
12	2	1.1	96.2
13	5	2.7	98.9
14	1	0.6	99.5
15	1	0.5	100.0

Note. $N = 187$.

Table 3

Frequency of 4 or 5 Scores on Sensation, Relaxation, Affect, and Altered Consciousness

Subscale	Number of Items	Frequency (*f*)	Percentage (%)	Cumulative (%)
Sensation	0	51	27.6	27.6
	1	18	10.3	37.3
	2	37	20.0	57.3
	3	28	15.1	72.4
	4	27	14.6	87.0
	5	24	13.0	100.0
Relaxation	0	120	64.9	64.9
	1	30	16.2	81.1
	2	16	8.6	89.7
	3	19	10.3	100.0
Affect	0	144	77.8	77.8
	1	19	10.3	88.1
	2	6	3.3	91.4
	3	16	8.6	100.0
Altered Consciousness	0	135	73.0	73.0
	1	21	11.3	84.3
	2	16	8.7	93.0
	3	12	6.5	99.5
	4	1	0.5	100.0

Note. $N = 187$.

Table 4

Study and Literature Reliability (Cronbach's Alpha) and Means of ASMR-15 and Subscales

	Present study			Study 1		
Instrument and Subscale	Range	Mean (*SD*)	α (items)	Range	Mean (*SD*)	α (items)
ASMR-15	1.00 – 4.73	2.44 (0.88)	0.93 (15)	1.00 – 5.00	3.72 (0.53)	0.78 (15)
Sensation	1.00 – 5.00	2.93 (1.12)	0.87 (5)	1.00 – 5.00	4.06 (0.74)	0.72 (5)
Altered Consciousness	1.00 – 4.50	2.15 (0.98)	0.88 (4)	1.00 – 5.00	2.44 (1.02)	0.82 (4)
Relaxation	1.00 – 5.00	2.34 (1.13)	0.88 (3)	1.00 – 5.00	4.48 (0.63)	0.74 (3)
Affect	1.00 – 5.00	2.10 (1.11)	0.93 (3)	1.73 – 5.00	4.09 (0.79)	0.74 (3)

Note. $N = 187$ for present study; $N = 896$ for Study 1. Literature analyses were conducted on a specialised ASMR sample.

Reliability Analyses.

Scales and subscale reliabilities were considered in line with the George and Mallery (2003) guidelines of acceptability, where a Cronbach's alpha of .70 indicates sufficient internal consistency. The ASMR-15 total score and subscales all demonstrated good-to-excellent internal consistency. These reliabilities were improved for the present sample compared to previous work with a specialised sample (Study 1).

Openness, Agreeableness, Extraversion, Conscientiousness, Neuroticism and HSP.

The ASMR-15 total score demonstrated significant, weak, positive correlations with Openness and SPS (see Table 5). Despite the evidence of an effect of neuroticism on SPS scores (Aron & Aron, 1997), the correlation between SPS and ASMR remained significant when neuroticism was controlled for (partial correlation $r = .217$, $p = .003$). Contrary to expectations, ASMR did not correlate significantly with Neuroticism, Conscientiousness, Extraversion, or Agreeableness. Sensory processing sensitivity (SPS) was not correlated with

higher scores on Extraversion or Agreeableness.

Of the ASMR-15 subscales, Altered Consciousness was weakly, positively correlated with Openness. Sensation was moderately positively correlated with SPS. Similarly, Affect was significantly, weakly, positively correlated with Openness. Extraversion, Agreeableness, Conscientiousness and Neuroticism were not significantly correlated with ASMR-15 subscales or sensory processing sensitivity at the .01 level. For all correlations, see Table 5.

Table 5

Correlations Between the ASMR-15, Subscales and Total Score Measures

Measure	AC	S	R	A	SPS	EXTRA	AGREE	CONSC	NEURO	OPEN
ASMR-15	.829**	.841**	.719**	.868**	.222**	.053	-.121	-.151	.072	.220**
AC		.574**	.534**	.619**	.158	.035	-.102	-.137	.035	.189**
S			.347**	.645**	.322**	.022	-.156	-.094	.172	.180
R				.636**	-.014	.030	-.013	-.166	-.069	.110
A					.175	.100	-.085	-.112	.026	.240**
SPS (HSPS)						-.122	.021	.164	.518**	.268**
EXTRA.							.106	.035	-.311**	.148
AGREE.								.330**	-.101	.107
CONSC.									-.055	.020
NEURO.										.008

Note. N = 187. ASMR-15 = Autonomous Sensory Meridian Response Scale; AC = Altered Consciousness; S = Sensation; R = Relaxation; A Affect; SPS = Sensory procesing sensitivity; HSPS = Highly Sensitive Person Scale; Extra. = Extraversion; Agree. = Agreeableness; Consc. = Conscientiousness; Neuro. = Neuroticism.

Demographic Factors.

Scores on the ASMR-15 did not correlate with age (r = -.037, p = .612), or differ significantly across genders (M_{male} = 2.43, SD_{male} = 0.82; M_{female} = 2.44, SD_{female}= 0.90; t(184) = -.001, p = .999; d = -.01). Further, there did not appear to be a significant difference in ASMR scores between those whose highest educational attainment was high school (or equivalent) or other (M_{high} = 2.45, SD_{high} = 0.85; M_{other} = 2.41, SD_{other} = 1.02; t(185) = .253, p = .800; d = .05).

ASMR-15, Previous ASMR Experiences and Prior ASMR Awareness.

In examining the relationship between prior awareness of ASMR and scores on the ASMR-15, independent samples t-tests were undertaken. A moderate Cohen's (1977) effect size and significant difference in ASMR-15 scores were found across differences in ASMR awareness, with higher scores found among participants who were aware of ASMR prior to participation in the study (t(183) = 3.826, p < .001; d = .60). With respect to subscales, prior ASMR awareness was associated with small-to-moderate, significantly higher scores on Altered Consciousness (t(183) = 3.069, p = .002; d = .48). Significantly, moderately higher scores were observed across Relaxation (t(183) = 4.164, p < .001; d = .65) and Affect (t(183) = 3.203, p = .002; d = .50) among individuals with prior ASMR awareness. Sensation did not significantly differ across participants who were aware of ASMR prior to the study (t(183) = 2.417, p = .017; d = .38), and those who were not, at the .01 level. See Table 6 for means and effect sizes of all differences.

Similarly, individuals who reported having previously experienced ASMR had significantly higher ASMR-15 total scores with a large effect size (n = 176; t(174) = 5.657, p <.001; d = 1.20). Moderate-to-strong effects and significant differences between participants with and without prior ASMR experiences were observed across all ASMR-15 subscales. Participants who self-reported previous ASMR experiences had moderately significantly

lower Conscientiousness scores ($t(174) = -3.307$, $p = .001$; $d = -0.62$). See Table 6 for means. See Figure 2 for ASMR-15 and subscale scores across levels of previous experience.

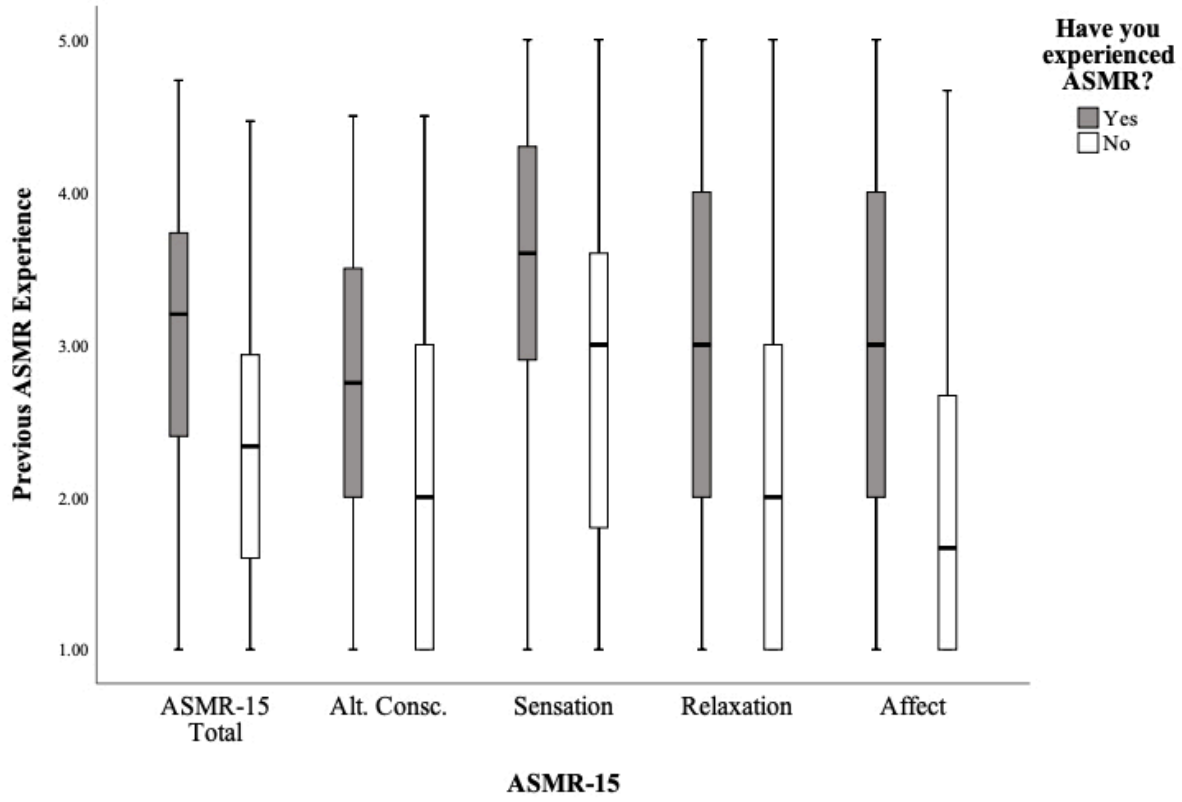


Figure 2. Previous ASMR Experience on ASMR-15 and Subscale Scores. Note. $N = 187$. ASMR-15 = Autonomous Sensory Meridian Response Scale; Alt. Consc. = Altered Consciousness.

Table 6

Mean Differences of Prior ASMR Awareness and Previous ASMR Experience on ASMR-15, Subscales, BFI and HSPS

	Prior Awareness					Previous Experience				
	Yes		No			Yes		No		
Instrument and Subscale	Mean	*SD*	Mean	*SD*	*d*	Mean	*SD*	Mean	*SD*	*d*
ASMR-15	2.77	1.01	2.26	0.77	0.60	3.11	0.96	2.26	0.78	1.20
Sensation	3.20	1.12	2.79	1.09	0.38	3.59	0.98	2.76	1.10	0.78
Altered Consciousness	2.46	1.00	2.00	0.94	0.48	2.66	0.99	2.02	0.94	0.68
Relaxation	2.80	1.24	2.09	0.99	0.65	3.07	1.26	2.11	1.01	0.90
Affect	2.46	1.30	1.92	0.95	0.50	2.94	1.31	1.90	0.94	1.01
SPS (HSPS)(HSPS)	4.41	0.72	4.55	0.90	-0.17	4.58	0.76	4.47	0.87	0.13
Openness	3.46	0.59	3.29	0.55	0.30	3.54	0.60	3.30	0.56	0.42
Conscientiousness	3.23	0.60	3.46	0.61	-0.38	3.11	0.65	3.47	0.57	-0.62
Extraversion	3.08	0.75	3.29	0.73	-0.29	3.04	0.78	3.28	0.74	-0.32
Agreeableness	3.75	0.51	3.78	0.65	-0.05	3.66	0.56	3.82	0.60	-0.27
Neuroticism	3.25	0.74	3.28	0.69	-0.04	3.38	0.86	3.21	0.65	0.24

Note. *N* (Yes) = 62; *N* (No) = 123. ASMR-15 = Autonomous Sensory Meridian Response Scale.

Partial correlations were undertaken to assess the influence of prior ASMR awareness, and previous ASMR experiences on the relationships between ASMR and personality variables. When controlling for prior ASMR awareness in the relationship between ASMR and personality variables, significant correlations remained between ASMR and Openness (r = .19, p = .010), as well as ASMR and SPS (r = .26, p < .001). No significant relationships were found between ASMR and Extraversion (r = .09, p = .221), Agreeableness (r = -.12, p = .113), Conscientiousness (r = -.11, p = .149), or Neuroticism (r = .08, p = .271). Similarly, when previous ASMR experiences were controlled for, a significant correlation was maintained between ASMR-15 scores and SPS (r = .23, p = .003). No significant correlations were found between ASMR and Extraversion (r = .11, p = .160), Agreeableness (r = -.07, p = .336), or Neuroticism (r = .04, p = .587). The weakly negative correlation for Conscientiousness, and weakly positive correlation for Openness were nullified when prior experiences were partialled out (Conscientiousness; r = -.05, p = .524; Openness r = .18, p = .018).

Regression Analysis

A multiple linear regression was undertaken to predict the ASMR-15 and subscales based on SPS and BFI scores. The overall ASMR-15 total score regression model was significant ($F(6, 179) = 4.320$, p < .001), with an R^2 of .126, suggesting that a small proportion of variance in the ASMR-15 can be explained by personality factors. Sensory processing sensitivity (B = .262, $SE\ B$ = .093, β = .245, p = .006), Conscientiousness (B = -.245, $SE\ B$ = .109, β = -.167, p = .026), and Openness (B = .239, $SE\ B$ = .116, β = .160, p = .041) were found to be significant independent predictors of ASMR. By contrast, Extraversion (B = .067, $SE\ B$ = .088, β = .057, p = .446), Agreeableness (B = -.146, $SE\ B$ = .110, β = -.100, p = .184) and Neuroticism (B = -.073, $SE\ B$ = .109, β = -.059, p = .503) were not significant predictors.

Of the subscales, only 8.4% of variance in Altered Consciousness was explained by personality variables ($F(6, 179) = 2.743$, $p = .014$). The only significant predictor of Altered Consciousness was SPS ($B = .214$, $SE\ B = .105$, $\beta = .184$, $p = .044$). Altered Consciousness was not explained by Extraversion ($B = .037$, $SE\ B = .100$, $\beta = .029$, $p = .709$), Agreeableness ($B = -.134$, $SE\ B = .125$, $\beta = -.082$, $p = .285$), Conscientiousness ($B = -.235$, $SE\ B = .123$, $\beta = -.148$, $p = .059$), Neuroticism ($B = -.095$, $SE\ B = .123$, $\beta = -.068$, $p = .445$), or Openness ($B = .254$, $SE\ B = .132$, $\beta = .148$, $p = .055$).

With respect to Sensation, personality and sensitivity correlates accounted for 15.6% of variance in scores ($F(6, 179) = 5.515$, $p < .001$). However, only Agreeableness ($B = -.271$, $SE\ B = .136$, $\beta = -.147$, $p = .048$) and SPS ($B = .422$, $SE\ B = .115$, $\beta = .319$, $p < .001$) were significant predictors. Extraversion ($B = .099$, $SE\ B = .109$, $\beta = .067$, $p = .365$), Conscientiousness ($B = -.184$, $SE\ B = .134$, $\beta = -.102$, $p = .174$), Neuroticism ($B = .010$, $SE\ B = .134$, $\beta = .006$, $p = .944$), and Openness ($B = .200$, $SE\ B = .144$, $\beta = .102$, $p = .166$) were not significant predictors of Sensation scores.

Relaxation was not significantly predicted by existing personality measures ($R^2 = .048$; $F(6, 179) = 1.516$, $p = .175$). Conscientiousness was a significant predictor of Relaxation ($B = -.344$, $SE\ B = .144$, $\beta = -.189$, $p = .018$). However, Extraversion ($B = -.012$, $SE\ B = .117$, $\beta = -.008$, $p = .921$), Agreeableness ($B = .052$, $SE\ B = .146$, $\beta = .028$, $p = .721$), Neuroticism ($B = -.160$, $SE\ B = .144$, $\beta = -.101$, $p = .269$), Openness ($B = .202$, $SE\ B = .154$, $\beta = .102$, $p = .191$), and SPS ($B = .053$, $SE\ B = .123$, $\beta = .040$, $p = .665$) did not significantly predict Relaxation scores.

By contrast, 10.7% of the variance in Affect scores were explained by personality variables ($F(6, 179) = 3.564$, $p = .002$), with Openness ($B = .366$, $SE\ B = .147$, $\beta = .188$, $p = .014$) and SPS ($B = .248$, $SE\ B = .117$, $\beta = .189$, $p = .036$) being significant predictors.

Extraversion (B = .132, $SE\ B$ = .111, β = .090, p = .235), Agreeableness (B = -.154, $SE\ B$ = .139, β = -.084, p = .271), Conscientiousness (B = -.224, $SE\ B$ = .137, β = -.125, p = .106), and Neuroticism (B = -.094, $SE\ B$ = .137, β = -.060, p = .495), did not substantially explain Affect scores.

Discussion

The aims of the present study were to explore the relationships between ASMR propensity and individual differences in BFI personality traits and sensory-processing sensitivity, in a non-specialised sample. The study further aimed to assess the relative distribution of ASMR experiences and validate the existing ASMR-15 on a non-specialised sample. To achieve these aims, the existing ASMR-15 was modified to include a description of ASMR-type experiences, without using the term 'ASMR'. In summary, we found that greater ASMR propensity was weakly correlated with higher scores on Openness to Experience, and sensory processing sensitivity, and lower scores on Conscientiousness.

A confirmatory factor analysis assessing the factor structure of the ASMR-15 found that the four-factor structure was also valid in this new sample, when examined with respect to fit indices. The ASMR-15 appeared to function reliably as a total score measure of ASMR propensity, when altered to suit a non-specialised sample. The Sensation, Altered Consciousness, Relaxation, and Affect subscales further demonstrated excellent internal consistency. The present findings thus indicate that the ASMR-15 can be used with non-specialist populations, or undergraduate student samples not selected based on previous interest, or experiences with ASMR. Given that prior research into ASMR experiences relied on self-selected participants, with prior awareness of the phenomenon and terminology, the modified ASMR-15 opens future research opportunities for ASMR research within non-specialised samples. This may be especially critical in understanding the nature of ASMR experiences outside of samples that label the experience as "ASMR". Unsurprisingly, the

mean ASMR-15 score was approximately one point, or 9% lower, compared to that found in a specialised sample (Study 1). Nevertheless, this non-specialised sample endorsed components consistent with ASMR experiences. Consequently, studies relying only on self-identifying ASMR participants appear to be missing a subset of the population who experience some level of the phenomenon. Future work could utilise the ASMR-15 in different samples (e.g. international, non-psychology undergraduate students) to assess the replicability of these findings.

In terms of the distribution of ASMR propensity within the general community, this study presents the first tentative estimates of the prevalence of ASMR experiences in a non-specialised sample. In examining the number of participants who indicated agreement or considerable agreement with more than half the items on the ASMR-15, it appears that around a sixth (15.7%) of psychology undergraduate students experience a substantial level of ASMR. Moreover, it would appear that experiencing some elements of ASMR is also fairly common. Only 5.4% of respondents scored at the lowest score across all items, indicating that the vast majority of participants self-reported experiencing components indicative of ASMR. Nevertheless, a positive skew was observed for some subscales. Specifically, a large proportion of respondents selected the lowest possible score for all items in the Affect (34.1%), Relaxation (27.0%) and Altered Consciousness (26.5%) subscales, suggesting that some elements of ASMR (i.e. Sensation) may be more accessible, than others.

Importantly, two-thirds of participants were unaware of ASMR prior to participating, and less than one quarter indicated having previous ASMR experiences. Notably in this respect, while only 33.5% of participants indicated prior awareness of ASMR, 78.9% endorsed some level of the experience (rated at least one ASMR-15 item a 4 or 5). The ASMR-15 thus appears to capture the phenomenon among individuals who may have had previous ASMR experiences, without necessarily having labelled those experiences as

'ASMR'. This is important because research relying on self-selecting individuals with self-professed ASMR experience potentially introduces acquiescent response bias. Moreover, it would appear that relying on self-selecting samples would especially exclude those sensitive only to the sensory components of the experience, where 72.4% of participants demonstrated agreement with at least one element of the Sensation subscale. It is of note, however, that items in isolation may also reflect qualitatively similar experiences (e.g. paresthesia seen in frisson), and that ASMR itself appears to be a multidimensional phenomenon (Barratt & Davis, 2015; Chapter 2). The possibility of a broad range of ASMR and related types of experiences thus requires future research attention.

In relationship to the issues above, unsurprisingly, scores on the ASMR-15 and subscales were significantly higher among participants who reported having previously experienced ASMR, compared to those who had not. Further, a significant mean difference in ASMR-15 scores was found, where individuals without prior awareness scored moderately lower than participants who were previously aware of ASMR. Prior awareness of ASMR was also associated with significant, moderately higher scores on the Relaxation and Affect subscales. A small, but significant effect was found between prior awareness and higher Altered Consciousness scores. However, prior ASMR awareness was not significantly associated with higher scores on Sensation. This may reflect different levels of ASMR experience, or difficulties in recalling more nuanced shifts in affect and consciousness. For instance, the sensory elements of ASMR may be more memorable than the accompanying changes in emotional or conscious experience. On the other hand, while moderate and significantly lower Conscientiousness scores were found for participants who had previously experienced ASMR, no significant correlation was found between Conscientiousness and ASMR-15 scores. This suggests that Conscientiousness is associated more with whether participants had experienced ASMR before, rather than the kind of ASMR experience that

they have. Alternatively, it may be that individuals lower in Conscientiousness are more likely to seek out ASMR experiences.

The findings also indicate that personality only accounts for a small proportion of ASMR propensity. Multiple regression revealed that personality variables only accounted for 12.6% of variance in total ASMR scores, demonstrating that the vast majority of variance in ASMR experience is unaccounted for by personality. Nevertheless, significant correlations between ASMR-15 scores, SPS, and Big Five personality factors were found. As anticipated, higher scores on the ASMR-15 were associated with greater Openness and SPS. With respect to Openness, the pattern of correlations were similar to those found by Fredborg et al. (2017) and McErlean and Banissy (2017), where ASMR was associated with higher Openness. In addition, the positive relationship between Openness and ASMR scores somewhat reflects the findings of Banissy et al. (2013), who similarly found significantly higher levels of Openness among grapheme-colour synaesthetes, when compared to controls. Given the similarities between the phenomena, future work may benefit from a more direct examination of the relationships between ASMR and various synaesthetic experiences, particularly those involving strong emotional responses.

With respect to Conscientiousness, while previous studies (McErlean & Banissy, 2017; Fredborg et al., 2017) found that self-identified ASMR responders scored significantly lower on Conscientiousness than controls, in the present study, lower Conscientiousness scores were only found for participants who had previous ASMR experiences. Importantly, across all studies, this suggests that self-identifying participants exhibit lower Conscientiousness, however, this effect was not observed in the present study when examining participants without prior awareness of ASMR. Taken together, these findings suggest that those who seek out ASMR may be less cautious, orderly, conventional and reliable, and more creative, imaginative and original than non-experiencers (Feist, 1998).

Additionally, however, since the ASMR-15 provides multifaceted, dimensional data, as opposed to unidimensional and categorical data, the ASMR-15 may help provide a greater understanding of the specific nature and degree of these relationships.

On the other hand, no significant relationship was found between ASMR and Extraversion, however, and only a weak correlation (significant at the .05 level) was found between Neuroticism and the Sensation subscale, which somewhat diverges from previous work. Fredborg et al. (2017), for instance, found a strong negative relationship between ASMR and Extraversion, and a strong positive correlation between Neuroticism and ASMR intensity, when ASMR was assessed as an exclusively sensory experience. The ASMR-15 assesses the tendency to experience a number of facets of ASMR experiences, rather than the intensity of any one sensory element. By contrast, Fredborg et al's. (2017) ASMR checklist operationalises ASMR as the intensity of tingles experiences in response to particular triggers. It is possible, therefore, that lower Extraversion and higher Neuroticism are associated with more intense ASMR experiences, but not necessarily indicative of greater ASMR propensity, as a whole. Consistent with this, McErlean et al. (2017) found no evidence of lower Extraversion among ASMR experiencers, when compared to controls.

Scores on the ASMR-15 were also modestly correlated with sensory processing sensitivity, and a moderate correlation was found between SPS and the Sensation subscale. One possibility here is that the experience of ASMR, and in particular the sensory component, may be a by-product of higher dispositional sensitivity. The exact mechanisms of this, however, are still unclear, and the correlational nature of the data do not permit causal inference. Future work could assess the interactions between SPS, empathy, and trigger preferences (e.g. emotional content vs. tapping sounds) in ASMR experiencers, to better explain this relationship.

In addition, it is important to address the potential limitations of the present work. While a noted strength of this study is that participants were sourced from a non-specialised pool, there may be sampling issues that could have impacted the findings. Unlike previous work, which has to date typically recruited participants specifically via self-identifying as having experienced ASMR, the present study had no specific inclusion criteria, and did not even mention the term ASMR in the study advertisement or survey materials (except for the final two questions). However, in utilising an undergraduate psychology sample, SPS scores may be inflated compared to those of non-psychology majors. In previous work, psychology majors were found to score higher on SPS, than other samples (Aron & Aron, 2013). Similarly, as the advertisement for the study was framed around altered states of consciousness and sensory experiences, the sample may have somewhat self-selected, based on interest in these areas, potentially inflating scores on SPS and ASMR. As a result, there may be benefit in assessing the relationship between SPS and ASMR in a more heterogeneous sample, recruited through less targeted advertisements.

Additionally, while these data have shown that ASMR appears unrelated to age and educational attainment, and not differing significantly across genders, the sample was overwhelmingly female (88.1%). This differs substantially from previous Reddit samples, where the samples were predominantly male (70.0%; 71.5%; Study 1). The age range (18 - 42), and variation in educational attainment were also fairly limited, which may impede the generalisability of findings. Related to this, previous work has indicated some effect of country of residence on ASMR-15 scores, where higher ASMR scores were observed for participants from the United States, United Kingdom, Canada, Australia and New Zealand (Study 1), while participants from Europe and ‘Other’ countries (Brazil, Costa Rica, India, Israel, Mexico, Pakistan, the Philippines, Singapore, Sint Maarten, South Africa, South Korea, Thailand, Venezuela, Zimbabwe) scored significantly lower on ASMR. It is unclear

whether regional differences were attributable to language and interpretability, however, and future work would benefit from assessing the performance of the ASMR-15 in more balanced and diverse, international samples. Should interpretability of the ASMR-15 be limited, translations of the measure may be necessary.

Similarly, in modifying the ASMR-15 for use in more generalised samples, it is of note that the choice of wording used in the contextualised preamble of the ASMR-15 may have primed participant responses. While every effort was made to avoid biasing participant responding, participants may have been unwittingly influenced to more strongly endorse ASMR-15 items given the description of ASMR experiences as "intense physical and emotional responses". Future work would benefit from an assessment of the test-retest reliability of the ASMR-15, particularly in comparing the performance of the measure when presented with, and without contextual information. In addition, some manipulation of the presentation of the contextualised ASMR-15 may be useful in assessing the impact of word choice in the endorsements of ASMR experiences.

It is also of note that the predictive validity of the ASMR-15 has yet to be assessed. For instance, it remains to be seen whether self-reported ASMR experiences, when captured by the ASMR-15, predict changes in physiological arousal in response to typical ASMR triggers. Such testing would require the stimulation of ASMR in a laboratory setting, which necessitates the identification of reliable and effective ASMR stimuli. Systematic and methodical examination of the myriad of trigger material available online, to identify such stimuli, would be a valuable contribution to experimental research in this area.

In conclusion, the findings of this study suggest that ASMR may be a relatively common phenomenon among undergraduate psychology students. While only a small proportion of ASMR propensity appears to be explained by personality factors, higher scores on the ASMR-15 were associated with greater levels of Openness and sensory-processing

sensitivity, and somewhat lower scores on Conscientiousness. Additionally, the ASMR-15 has been shown to be a reliable and valid measure of ASMR propensity, suitable for use in both specialised and non-specialised samples. Prior to this, research into ASMR experiences relied on self-selected participants, with prior awareness of the phenomenon and terminology. As demonstrated, the ASMR-15 appeared to replicate the findings of previous work involving self-identified participants. As a result, the ASMR-15 may be a particularly valuable tool for researchers interested in discerning ASMR sensitivity among naïve participants, and in examining the relationships between ASMR propensity, individual differences, and alterations of consciousness more broadly.

References

Acevedo, B. P., Aron, E. N., Aron, A., Sangster, M. D., Collins, N., & Brown, L. L. (2014). The highly sensitive brain: An fMRI study of sensory processing sensitivity and response to others' emotions. *Brain and Behavior*, *4*, 580-594.

Ahuja, N. K. (2013). It feels good to be measured: Clinical role-play, Walker Percy, and the tingles. *Perspectives in Biology and Medicine, 56,* 442-451.

Andersen, J. (2014). Now you've got the shiveries: Affect, intimacy, and the ASMR whisper community. *Television & New Media, 1*, 1-18.

Aron, E. N., & Aron, A. (1997). Sensory-processing sensitivity and its relation to introversion and emotionality. *Journal of Personality and Social Psychology, 73*, 345-368.

Aron, E., & Aron, A. (2013). *Tips for SPS research* [Fact sheet]. Retrieved from http://hsperson.com/pdf/Tips_for_SPS_Researchers_Nov21_2013.pdf.

Aron, E. N, Aron, A., & Davies, K. M. (2005). Adult shyness: The interaction of temperamental sensitivity and an adverse childhood environment. *Personality and* Social *Psychology Bulletin*, *31*, 181-197.

Arterberry, B. J., Martens, M. P., Cadigan, J. M., & Rohrer, D. (2014). Application of generalizability theory to the Big Five Inventory. *Personality and Individual Differences, 69,* 98-103.

Banissy, M. J., Holle, H., Cassell, J., Annett, L., Tsakanikos, E., Walsh, V., Spiller, M. J., & Ward, J. (2013). Personality traits in people with synaesthesia: Do synaesthetes have an atypical personality profile? *Personality and Individual Differences, 54,* 828-831.

Barratt, E. L. & Davis, N. J. (2015). Autonomous sensory meridian response (ASMR): A flow-like mental state. *PeerJ, 3*, 1-17.

Benham, G. (2006). The highly sensitive person: Stress and physical symptom reports. *Personality and Individual Differences*, *40*, 1433-1440.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*, 822-848.

Cohen, J. (1977). Statistical power analysis for behavioral sciences (revised ed.). New York: Academic Press.

Colizoli, O., Murre, J. M. J., & Rouw, R. (2013). A taste for words and sounds: a case of lexical-gustatory and sound-gustatory synesthesia. *Frontiers in Psychology, 4*, 1-16.

Davis, M. H. (1980). A multidimensional approach to individual differences in empathy. *JSAS Catalog of Selected Documents in Psychology, 10*, 85.

Fredborg, B., Clark, J., & Smith, S. D. (2017). An examination of personality traits associated with autonomous sensory meridian response (ASMR). *Frontiers in Psychology*, *8*, 1-9.

George, D., & Mallery, P. (2003). Frequencies. *SPSS for Windows step by step: A simple guide and reference, 11.0 update (4th ed.).* Boston, MA: Allyn & Bacon.

Hu, L. & Bentler, P. M. (1999). Cuttoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*, 1-55.

John, O. P., Donahue, E. M., & Kentle, R. L. (1991). The Big Five Inventory--Versions 4a and 54. Berkeley, CA: University of California, Berkeley, Institute of Personality and Social Research.

John, O. P., & Srivastava, S. (1999). The Big Five trait taxonomy: History, measurement, and theoretical perspectives. *Handbook of Personality: Theory and Research*, *2*, 102-138.

Lau, M. A., Bishop, S. R., Segal, Z. V., Buis, T., Anderson, N. D., Carlson, L., Shapiro, S., Carmody, J., Abbey, S., & Devins, G. (2006). The Toronto mindfulness scale: Development and validation. *Journal of Clinical Psychology, 62*, 1445-1467.

Liss, M., Mailloux, J., & Erchull, M. J. (2008). The relationships between sensory processing sensitivity, alexithymia, autism, depression, and anxiety. *Personality and Individual Differences*, *45*, 255-259.

McErlean, A. B. J., & Banissy, M. J. (2017). Assessing individual variation in personality and empathy traits in self-reported autonomous sensory meridian response. *Multisensory Research*, *30*, 601-613.

Ramachandran, V. S., & Brang, D. (2008). Tactile-emotion synesthesia. *Neurocase, 14,* 390-399.

Roberts, N. M. (2015). *Towards the development of an integrative measure of autonomous cephalocaudal paresthesia* (Unpublished master's thesis). Macquarie University, Sydney, Australia.

Smith, S. D., Fredborg, B. K., & Kornelson, J. (2016). An examination of the default mode network in individuals with autonomous sensory meridian response (ASMR). *Social Neuroscience, 12*, 361-365.

Smolewska, K. A., McCabe, S. B., & Woody, E. Z. (2006). A psychometric evaluation of the Highly Sensitive Person Scale: The components of sensory-processing sensitivity and their relation to the BIS/BAS and "Big Five". *Personality and Individual Differences*, *40*, 1269-1279.

Srivastava, S., John, O. P., Gosling, S. D., & Potter, J. (2003). Development of personality in early and middle adulthood: Set like plaster or persistent change? *Journal of Personality and Social Psychology*, *84*, 1041-1053.

TubeBuddy. (2019). TubeBuddy | The Premier YouTube Channel Management and Optimization Toolkit. Retrieved from https://www.tubebuddy.com.

Introduction to Chapter 4.

The Autonomous Sensory Meridian Response Scale, as modified in the previous chapter, appeared to be suitable for assessing ASMR propensity among undergraduate psychology students. Notably, the description of ASMR was adequate enough to be interpreted by naïve participants, such that ASMR propensity could be assessed among individuals unfamiliar with ASMR. Additionally, multidimensional ASMR experiences, as captured by the ASMR scale, were reported by the majority of participants, despite a large proportion indicating no prior awareness of ASMR. As a result, ASMR propensity appeared to be relatively prevalent among the sample, allowing for the further assessment of personality and individual differences.

As a result, these findings provided early evidence for the suitability of the ASMR-15 in capturing ASMR propensity within undergraduate psychology samples, suggesting that the measure may be useful in further work. Consequently, the present study utilised the ASMR-15 among undergraduate psychology students, to establish the predictive validity of the measure. This was achieved by assessing the relationships between self-reported ASMR propensity and responses to a variety of ASMR stimuli via laboratory induction. Attempting to induce ASMR within a laboratory setting was a necessary step in further addressing the validity of the scale, particularly in moving beyond the limits of recalled experiences. Moreover, this study would be the first to examine whether ASMR could be induced in a controlled environment, using audiovisual stimuli, among non-specialised participants. A further aim of this study concerned the relationship between ASMR and frisson. While these variables were explored in Chapter 2, we wanted to verify the divergence of the constructs, beyond self-report questionnaires.

Chapter 4

Autonomous Sensory Meridian Response: Induction and Frisson

Author Contribution: Natalie Roberts was responsible for the concept and design of the project, data analysis and write-up. Associate Professor Simon Boag provided supervision and gave input on the research question, study design, data analysis and manuscript preparation. Dr. Alissa Beath provided supervision and guidance on data analysis and manuscript revisions.

Abstract

Autonomous Sensory Meridian Response (ASMR) is a pleasurable, head-oriented tingling sensation, typically induced by exposure to audiovisual triggers, producing feelings of relaxation and euphoria. This article explores the induction of ASMR experiences in a laboratory setting amongst non-specialised participants, as well as the relationship between ASMR and frisson, or 'musical chills'. In previous work, the ASMR-15 was found to be a novel and reliable measure of ASMR propensity, however, the predictive validity of the measure has yet to be determined. The aim of this study was to address the predictive validity of the ASMR-15 by assessing whether ASMR-15 scores predict greater ASMR induction in an experimental setting. To address this, $N = 100$ undergraduate psychology students completed the ASMR-15 and a measure of frisson, before viewing ASMR and frisson stimulus videos under controlled conditions. Qualitative and quantitative responses indicated the successful induction of ASMR amongst some participants. Correlational analyses showed some convergence between ASMR-15 scores and video ratings, as well as divergence between ASMR and frisson scores, providing further evidence for the independence of the constructs. The ASMR-15 appears to be a relatively effective predictor of ASMR responses, and may be particularly useful for researchers utilising non-specialised samples.

Keywords: ASMR; Autonomous Sensory Meridian Response; Frisson; Induction; Chills

Autonomous Sensory Meridian Response (ASMR) is a pleasurable tingling sensation that typically occurs in response to audiovisual stimuli, producing feelings of euphoria, comfort and relaxation (Roberts, Beath & Boag, 2018; Poerio, Blakey, Hostler, & Veltri, 2018; Barratt & Davis, 2015). Commonly cited triggers include soft speaking, whispering, and crisp sounds (Barratt & Davis., 2015). Often drawing comparison to synaesthesia (Barratt & Davis, 2015) and other sensory-induced phenomena, such as frisson (or "musical chills"; Del Campo & Kehle, 2016), ASMR appears to be a unique, multidimensional experience (Roberts et al., 2018). While a relatively new focus of research, there is evidence that ASMR is a fairly common phenomenon. In addition to the over 18 million ASMR videos that have been uploaded to YouTube (TubeBuddy, 2019), in a previous study, approximately 15% of undergraduate psychology students demonstrated a substantial level of self-reported ASMR propensity (Chapter 3). Despite this, there is little currently known about whether ASMR experiences can be induced experimentally in a non-specialised population, and how distinct the experience is from related paresthetic phenomena such as frisson.

ASMR and Frisson

Thus far, significant attention has been focused on disentangling ASMR from frisson (Roberts et al., 2018; Lochte, Guillory, Richard & Kelley, 2018; Kovacevich & Huron, 2019). Frisson, or 'musical chills', refer to moments of profound resonance with music that elicit a bodily response, including chills, piloerection, and goosebumps (Harrison & Loui, 2014). Signalling the manifestation of awe (Silvia, Fayn, Nusbaum & Beaty, 2015), the incidence of frisson has been associated with unexpected harmonies, peaks in loudness, and dynamic leaps in music (Harrison et al., 2014). As an externally-induced paresthetic phenomenon with emotional and aesthetic ties, frisson appears to be conceptually related to ASMR-type experiences. Nevertheless, while debated, there appear to exist significant

differences in the induction and experiential qualities of ASMR and frisson (Kovacevich & Huron, 2019).

Previous research indicates that ASMR diverges from frisson with respect to self-reported propensity. For instance, Roberts et al. (2018) found that the ASMR-15 correlated only weakly with an established measure of frisson (AES; Silvia & Nusbaum, 2011), suggesting that they are related, yet distinct constructs. A similar finding was observed by Fredborg, Clark and Smith (2018), where ASMR participants and age and sex-matched controls completed a created self-report ASMR checklist, assessing tingles experienced upon exposure to 14 common ASMR stimuli. Within the checklist were additional items assessing previous experiences with frisson. The results suggested that of the ASMR participants, 87% identified with experiencing frisson. Of those participants, 91% indicated that ASMR and frisson were qualitatively different experiences. However, these experiential differences have yet to be assessed experimentally, a step that necessitates the identification of reliable trigger material to stimulate these experiences, and a laboratory setting that is conducive to both ASMR and frisson induction.

Identifying Effective ASMR Stimuli

In line with these aims, there has been increased interest in identifying and isolating the most effective qualities of ASMR-inducing stimuli. In a study conducted by Smith, Fredborg and Kornelson (2016), 22 participants underwent fMRI to compare the functional connectivity of the default mode networks (DMN) of self-identified ASMR experiencers, with those of established controls. Prior to examination, the trigger preferences of the 11 participants in the ASMR condition were collected. The majority of participants identified a preference for tapping and scratching sounds, and all ASMR participants reported whispering as an effective trigger (Smith et al., 2016). Further to this, the delay of onset varied across the sample, ranging from 0 to 90 seconds, with an average viewing time of one minute necessary

for ASMR induction (Smith et al., 2016). However, due to the limited sample size, and reliance on self-identifying participants, the external validity of the results is unclear.

In an attempt to further identify the most effective components of ASMR-inducing trigger material, Barratt, Spence and Davis (2017) recruited 130 participants who self-identified as having experienced ASMR via *Facebook, Reddit,* and *Twitter*. Participants were asked to describe their preferences for ASMR stimuli, with respect to triggers, atmosphere, realism, distance from subject, context, object manipulation, and audio features. Despite the seemingly highly individualised nature of ASMR stimuli preferences, distinct patterns emerged across the data. With respect to triggers, the highest proportion of participants (38%) preferred stimuli that focused on particular triggers for 1-5 minutes, followed by 6-10 minutes (30%; Barratt et al., 2017). Further, 48% of participants reported a dual-trigger preference. Videos utilising binaural techniques were also appreciated by the sample, with 58% citing the practice as being more effective at producing tingles than standard delivery, and 61% indicating that binaural sounds increased the intensity of tingles (Barratt et al., 2017).

The atmospheric quality, audio features and realism of ASMR videos were similarly evaluated. Participants indicated a preference for videos with relaxed, inviting, and happy atmospheres, and expressed a distaste for simulated dangerous, clinical, or scripted content (Barratt et al., 2017). Cohesion between the visual demonstrations of objects, and auditory output was also appreciated amongst participants, with 51.2% of the sample also indicating that object sounds were an “extremely important” inclusion in effective trigger stimuli (Barratt et al., 2017, p.7). A further 77% of the sample indicated that the pitch of sounds had an effect on ASMR induction, with lower pitched sounds more likely to produce intense sensations (Barratt et al., 2017). Importantly, 71% of the sample endorsed the statement

"background music inhibits me from feeling strong tingles" (Barratt et al., 2017, p. 9), suggesting some divergence from frisson, which is typically induced through music.

Aims of the Present Study

Currently, ASMR has not yet been induced in a laboratory setting via presenting audio-visual stimuli to non-specialised participants. Further, while frisson and ASMR have been disentangled with respect to self-report inventories, the phenomena have not been meaningfully compared experimentally, with respect to induction. Given the limitations of self-report inventories in assessing novel and unusual experiences (i.e. demand characteristics; Nichols & Maner, 2008), experimental induction may further validate the independence of these constructs. In addition, while the ASMR-15 appears to function reliably in both specialised and non-specialised samples (Chapter 2; Chapter 3), the predictive validity of the measure has yet to be determined. Establishing a relationship between ASMR-15 scores and ASMR experiences in response to stimuli in a laboratory environment, is a necessary step in further validating the ASMR-15.

Broadly, the goal of this study was to extend on the current understanding of the phenomenology of ASMR experiences through attempting to induce ASMR in a laboratory setting. As a novel area of research, there is currently little consensus on the parameters of ASMR experiences, and how they may be best operationalised with respect to self-report methods of assessment. Consequently, an exploratory approach was adopted in order to address our broad research questions. Specifically, the aims of the present work were to: (i) identify stimuli for effective ASMR induction; (ii) induce ASMR in a non-specialised sample, within a laboratory setting; (iii) induce and assess frisson in a non-specialised sample; (iv) assess the relationship between self-report ASMR and frisson propensity, and recorded ASMR and frisson responses; (v) to compare induced ASMR and induced frisson

responses; and (vi) to assess the extent to which responses to ASMR stimuli can be predicted from ASMR-15 and subscale scores. It was hypothesised that individuals with greater ASMR propensity, as measured by the ASMR-15, would report higher ASMR intensity ratings to the ASMR-inducing stimuli. It was also anticipated that higher ASMR-15 scores would be associated with qualitative descriptions consistent with ASMR experiences. Similarly, consistent with the findings of Chapter 2, it was expected that scores on the ASMR-15 would demonstrate divergence from frisson scores. Further, it was anticipated that higher frisson scores would correlate positively with responses to frisson-stimuli, and frisson intensity ratings.

Method

ASMR Stimulus Selection

While there has been an increase in studies attempting to induce ASMR in a laboratory setting, there are currently no identified, reliable stimuli for such research. To address this gap, seven videos were sourced from YouTube (www.youtube.com), which were subsequently trialled by an informal pilot group, and reduced to the five most effective stimuli. Videos were selected in line with the previously discussed criteria identified by Barratt et al. (2017), outlined in detail below. In addition to this, the YouTube view count and the number of video "likes" also influenced stimulus selection, where comparable videos with higher view counts and more favourable "like" ratios were preferentially selected.

Video Length. Barratt et al. (2017) indicated that participants preferred stimuli that focused on particular triggers for 1-5 minutes. As a result, videos were selected and edited to fall within this time frame, and to approximately match the length of comparable frisson stimuli. Practically, this also allowed for the inclusion of numerous, diverse stimuli, while being conscious of participant fatigue.

Inclusion Criteria. Stimuli selection attempted to cover a variety of triggers and delivery styles. Consistent with the triggers identified by Barratt and Davis (2015), stimuli included videos with whispering, personal attention, crisp sounds, and slow and repetitive movements. Videos with bright colours, or involving clinical, scripted, and dangerous scenarios were avoided, in favour of videos with warm, relaxed, inviting, and happy atmospheres (Barratt et al., 2017). Further, media that focused on two triggers at a time were selected over those that isolated a single trigger, or combined three or more triggers (Barratt et al., 2017). Slow and/or repetitive movements were classed as ancillary, rather than primary triggers. Further, binaural videos were selected preferentially to those not utilising "ear-to-ear" techniques.

Exclusion Criteria. Videos were deemed inappropriate or unsuitable if they contained any of the following: (1) Only audio and no visuals, (e.g. dramatic readings or roleplays involving blindfolds or sleeping); (2) Were difficult to comprehend without previous contextual information (e.g. videos comprising a multi-part series); (3) Disturbing or threatening content (e.g. simulated eating of live animals; kidnapping scenarios etc.); (4) Medical or clinical content, roleplay, or settings (e.g. doctor's offices, cranial nerve exams etc.); (5) Shorter than 2 minutes; (6) Recreational drug use; (7) Music or singing (due to poor discrimination between frisson and ASMR); (8) Stark or vividly coloured backgrounds; (9) Presence of the words "ASMR", "tingles" or other directing terms that could prime participant responses.

Stimuli

The seven initial videos selected for the pilot screening covered a variety of triggers, accents, styles, and content. Video segments were selected based on the techniques exhibited by the video creator, length of time focused on for each trigger, and contextual information (e.g. selecting the beginning of the video in roleplay stimuli). YouTube video comments were

taken into consideration, particularly ones that included timestamps (specific times in the video that were especially effective), or those that mentioned specific triggers or techniques the creator utilised. Videos were embedded within Qualtrics, and began and ended within the specified timestamps.

The titles of the selected stimuli were: 1. TingleBelleASMR – Ear to Ear, Case Tapping, Mouth Sounds, Unintelligible Whispering, MORE; 2. Gibi ASMR – Gaming Store Roleplay; 3. Hungry Cakes – ASMR: Kardashian Salad Eating Sounds MUKBANG; 4. W Magazine – Cara Delevingne ASMR: How She Became June Moone and Enchantress for 'Suicide Squad' | W Magazine; 5. Jojo's ASMR – WARNING: INTENSE RELAXATION TOP 10 ASMR TRIGGERS; 6. ASMR Darling – ASMR 20 Triggers to Help You Sleep; 7. Bob Ross – Frozen Solitude (Season 13 Episode 2**)**. For all details and timestamps of included stimuli, see Appendix A.

Pilot Study. Informal pilot testing of the seven ASMR stimuli was conducted on family and friends. Twelve family members and friends were contacted via email with an online advertisement to participate in an ASMR pilot study. Participants were informed that the study would take between 25-30 minutes to complete, and would involve viewing excerpts from 7 ASMR videos. Following viewing, participants would be asked to describe how the videos made them feel. Previous ASMR experience was not necessary to participate in the study, and participants were informed that the results would be anonymous and confidential. Of those contacted, 6 participants completed the entire questionnaire. For detailed findings, see Appendix B. Pilot testing eliminated videos 2 and 3 from the main study, due to low endorsement.

Frisson Stimulus Selection.

Frisson stimuli selection were informed by prior research, assessing the effectiveness of various musical stimuli in inducing frisson in a laboratory setting (Colver & El-Alayli,

2016; Bannister & Eerola, 2017). A variety of stimuli were selected, including those representing different genres (e.g. classical, anthem, ambient rock), as well as instrumental pieces, and excerpts featuring vocals in different languages. Videos were selected from YouTube and embedded within the specified timeframes. The visuals varied across videos from still images to live performances and music videos. However, participants were instructed to close their eyes during stimulus presentation, to maximise immersion (Panksepp, 1995).

The five included stimuli were: 1. Hans Zimmer – Oogway Ascends; 2. Lady Gaga – Star Spangled Banner; 3. Gustav Holst – The Planets – Jupiter; 4. Sigur Ros – Glosoli; 5. Chopin's Piano Concerto No.1 in E Minor. For all details on the selected excerpts, see Appendix C.

Recruitment

Participants were recruited via an online Study Flyer hosted by the Macquarie University psychology research participation pool, and participated in exchange for course credit. The advertisement sought participants interested in watching YouTube videos, in order to assess the relationship between responses to common audio-visual triggers. Participants were informed that they would be required to watch 10 brief videos in a laboratory setting, with headphones. Following stimulus presentation, participants would be asked to describe their thoughts, feelings and reactions to each video. Finally, three short surveys would be presented, assessing general responses to music and sounds. The study took approximately one hour to complete.

Participants

In total, 100 participants (M_{age} = 19.38, SD_{age} = 2.48; n_{male} = 28; n_{female} = 72) were recruited from a first-year psychology cohort and completed the study. All participants were English-speaking and over the age of 18.

Instruments

Demographic Questionnaire. Participants were asked to complete a short, 2-item demographic questionnaire, assessing age and gender.

The Autonomous Sensory Meridian Response Scale (ASMR-15). The ASMR-15 is a 15-item self-report measure of ASMR propensity, with 4 identified subscales. Five items assess the sensory component of ASMR experiences (Sensation), 3 items address the relaxation effects (Relaxation), 4 items measure the resultant shifts in consciousness as a result of ASMR induction (Altered Consciousness), and 3 items assess changes in emotional state (Affect). Participants are asked to indicate their level of agreement with each item on a Likert-scale from 1, *completely untrue for me,* to 5, *completely true for me.* The ASMR-15 has a possible range of scores from 15 to 75, with total scores calculated as the average of item scores. Higher scores on the ASMR-15 indicate a greater tendency towards ASMR experiences.

The ASMR-15 was developed and refined via samples familiar with ASMR experiences. In the present study, the modified ASMR-15 was utilised, which includes a brief contextual introduction, to aid participant comprehension in a non-specialised sample. Participants were presented with the following paragraph to inform item responses:

> "This survey is looking at how certain stimuli affect you. Some individuals experience intense physical and emotional responses upon hearing particular sounds. These sensations and feelings can be pleasant or unpleasant. Sounds such as whispering, crackling, tapping or scratching may produce particular experiences described below. Using the scale, please indicate your level of agreement with each statement, upon hearing any of these, or similar sounds."

Participants endorsed items following the statement, "When I hear certain sounds, such as whispering, crinkling, tapping...", including "I feel relaxed" and "I experience time

distortions". This contextualised ASMR-15 demonstrated good reliability in previous work. See Table 1 for total score and subscale reliabilities in the present, and previous work.

Table 1.

Study and Literature Reliability (Cronbach's Alpha) of ASMR-15 and Subscales

Instrument and Subscale	Chapter 2 α (items)	Chapter 3 α (items)	Chapter 4 α (items)
ASMR-15	0.78 (15)	0.93 (15)	0.92 (15)
Sensation	0.72 (5)	0.87 (5)	0.84 (5)
Altered Consciousness	0.82 (4)	0.88 (4)	0.87 (4)
Relaxation	0.74 (3)	0.88 (3)	0.87 (3)
Affect	0.74 (3)	0.93 (3)	0.93 (3)

Note. Chapter 2 (N = 896), study conducted on specialised, self-identified ASMR sample; Chapter 3 (N = 185), study conducted on non-specialised sample; present study (Chapter 4; N = 100).

Modified Aesthetic Experiences Scale (AES). Silvia and Nusbaum's (2011) Aesthetic Experiences Scale is a 10-item self-report measure of aesthetic chills and experiences in viewing various art forms. In order to assess music-specific experiences, the authors also released a modified version of the AES pertaining to music (Nusbaum & Silvia, 2011). When contextualised within music listening experiences, participants nominate the frequency of aesthetic experiences, including how often they "feel like crying" in response to music. Responses are scored on a 7-point Likert scale from 1, *never or rarely*, to 7, *nearly always*, producing a possible total score ranging between 7 and 70. In previous work, the music-specific AES demonstrated good reliability (α = .87; Roberts et al., 2018).

Within the music-specific AES, Nusbaum and Silvia (2011) identified a 3-item frisson subscale, that demonstrated sufficient reliability in previous work (α = .85). Participants are asked to rate how frequently they "get goosebumps", "feel like [their] hair is

standing on end" and "feel chills down [their] spine" while listening to music. Total scores on the frisson subscale range between 3 and 21, with higher scores indicating more frequent frisson experiences. In the present study, consistent with previous work, the music-specific AES was administered, including the frisson subscale. This allowed for the examination of the prevalence of frisson experiences, as well as music-specific aesthetic experiences, more broadly. The AES and frisson subscale evidenced good reliability in the present work, recording alphas of .90 and .86, respectively.

Descriptive and Intensity Scale (DIS). In order to empirically assess the experiential quality of induced ASMR and frisson experiences, a brief mixed-methods self-report scale was developed. Participants were instructed to press "play" and watch, or listen to, the embedded video that would run for approximately 3 minutes. While watching, participants were encouraged to "pay attention to how the video makes you feel" and to answer the following questions once the video stopped. The qualitative component required participants to "briefly describe the experience [they] had while watching the excerpt (e.g. thoughts, feelings, sensations etc.)" in a free text box. Following this, participants were asked to rate the intensity of what they experienced, as a result of watching each video. Intensity was measured on a 10-point Likert-scale from 1 to 10, with 10 being the most intense. A total of five DIS scales were administered for the ASMR block, and 5 for the frisson block.

Materials

Headphones and Computers. The study was conducted on 21.5in iMacs, at desks separated by wall dividers. Participants were not able to directly view each other or the researcher while partaking in the study, in order to encourage feelings of comfort, anonymity, and isolation. The headphones used in the study were Robotel model SC2500-HS2 headsets. The testing rooms had lighting, and air conditioning set to 23ºC, in line with previous frisson

research (Trappe & Voit, 2016). Air conditioning did not directly blow on participants. The volume was set to level 6 (or 40%) across computers as the default, prior to testing.

Procedure

Participants were invited into the lab in groups of up to five. Following set-up, participants were asked to watch each video with headphones and follow the prompts. Participants were further instructed to set the headphones to an individualised, comfortably loud volume, and encouraged to adjust the level for each video to maximise comfort and enjoyment.

In order to maximise immersion and to capitalise on the potential compounding effects of videos, whereby ASMR or frisson induction may be more effective with successive presentation of stimuli, videos were not completely randomised (alternating between ASMR and frisson stimuli). The presentation order of the frisson and ASMR question blocks were counterbalanced to prevent any cumulative effect across the ASMR and frisson media. Stimuli within blocks were presented in the same order (see Appendix A). Participants were able to write or select "I would prefer not to answer" for each free text or Likert-scale item, to further minimise any potential for discomfort.

Data Coding and Analysis

As an exploratory, mixed-methods study, data analysis occurred across multiple stages. The first stage of analysis was qualitative, where ASMR responses were coded based on the presence or absence of reported facets of ASMR experiences (e.g. sensation, relaxation, affect, altered consciousness) across all videos. Following this, the quantitative stage of analysis focused on the operationalisation of ASMR responses. As this study is largely an exploratory work, three approaches were adopted. These involved the computation of (i) ASMR Response Category Scores (frequency of dimensions of ASMR experiences

present across all videos), (ii) ASMR Response Video Scores (frequency of any dimension of ASMR experiences within each video) and (iii) an ASMR Response Combined Score (a total score comprised of Response Video Scores across all videos with Intensity ratings). Additionally, the same methodology was employed for coding frisson responses, producing three experimental frisson scores: Frisson Response Category Scores, Frisson Response Song Scores, and Frisson Response Combined Score.

Data coding for the pilot study analysis was undertaken by the Principal Investigator, who has experience coding qualitative descriptions of ASMR, as well as mixed-methods research, more broadly. A de-identified subset (20%) of the qualitative data in the main study was double-coded by an individual with experience and interest in ASMR, as well as a background in science, but was otherwise unaffiliated with the study. The second coder was firstly presented with a sample of cases (n = 5), as well as definitions of each element of ASMR to identify across qualitative responses. Once 100% agreement was met for the sample of cases, the second coder was provided with the subset of data (20%) for the main study. Initial agreement was 80% across coders, and all discrepancies were discussed and resolved until 100% agreement was achieved.

Pilot Study Analysis. A mixed-methods approach was adopted to select the five most effective videos, based on qualitative descriptions, and quantitative intensity ratings. Qualitative data were coded based on the subscales of the ASMR-15, creating Sensation (e.g. responses referring to tingles, goosebumps etc.), Affect (e.g. positive affect, happiness, enjoyment, satisfaction), Relaxation (e.g. relaxation, calming, soothing, sleep), and Altered Consciousness (e.g. meditation, absorption etc.) coding categories. Due to the frequency of response statements indicating displeasure, two additional categories were created: Negative Affect (e.g. annoyance, frustration etc.) and Discomfort (e.g. uncomfortable, creepy,

unsettling, physical discomfort, invasive, disturbing). For each category, a 1 or 0 was given based on the presence or absence of the ASMR element per participant per video.

Results

Pilot Study Results.

Sensation, Affect, Relaxation and Altered Consciousness. Sensations were frequently cited (n = 21) by participants, most frequently referred to as "tingles" (n = 19). For example, "tingles, starting around the middle of my head, moving through my cheeks and shoulders simultaneously, then down my legs seeming to skip my thighs" (P2), and "a tingling sensation around the middle of my back" (P1). Tingles sensations were most frequently induced by Videos 1 (n = 5) and 3 (n = 4), and least frequently during Video 6 (n = 1). Some participants critiqued the microphone quality and background noise present in Video 6, as well as individual differences (i.e. having short hair), impeding their immersion in the roleplaying stimuli.

Indicators of enjoyment and positive affect were relatively frequent among participants (n = 19). For example, one participant (P3) found Video 7 "quite captivating and engaging, wanted to keep listening". Of the seven videos, Video 7 generated the most positive emotions (n = 6), while no positive feelings were stimulated by Video 1.

Relaxation was also frequently mentioned by participants (n = 28). Videos were often described as relaxing (n = 15), calming (n = 7) and soothing (n = 6). For example, one participant described feeling "drowsy and relaxed" (P6) while watching Video 5, while another described the chopping elements of Video 3 as "pleasant and soothing" (P3). Videos 1 and 6 (n = 6) both generated the most relaxation, while Video 2 elicited the least relaxation (n = 2).

Descriptions of Altered Consciousness were very limited in the pilot study (n = 1). This may be due to the participants' familiarity with ASMR stimuli, and the adoption of a

more critical approach to viewing. However, one participant described immersion in Video 5 as so intimate that "it felt like we were in the middle of foreplay" (P5).

Displeasure and Misophonia. Despite having experienced ASMR prior to participation, some participants experienced displeasure (n = 23) whilst watching the video excerpts. Displeasure was frequently due to discomfort (n = 9), disinterest (n = 1), annoyance (n = 7), disgust (n = 3), and creepiness (n = 2). For example, some participants found the eating sounds in Video 3 "very uncomfortable" (P1) and "quite disgusting" (P3). Other participants (n = 2) indicated a level of displeasure and discomfort indicative of misophonia, for example, "it's actually painful to listen to her swallow" (P2). Of the stimuli presented, Videos 1 and 4 were the least unpleasant (n = 1), whilst Video 3 was the most aversive (n = 8).

Intensity. Intensity scores were assessed on a Likert scale from 1 to 10. Videos 5 and 6 achieved the highest scores of 9, whilst Videos 2 and 3 failed to score above 5. Video 5 was the most consistently well rated (M = 7.17), with a minimum score of 6. Videos 2 (M = 3.50) and 3 (M = 3.67) were the least highly rated overall.

Final Stimuli. From the pilot, we expected that videos 6, 1, 5, 7 and 4 would be the most effective ASMR stimuli to utilise in the main study. Videos 2 and 3 were omitted from further testing. Note: These videos were re-titled to reflect the new order for the main study - (Pilot Video 1 = Video 1; Pilot Video 4 = Video 2; Pilot Video 5 = Video 3; Pilot Video 6 = Video 4; Pilot Video 7 = Video 5).

Main Study Results.

Qualitative Analysis.

ASMR Qualitative Analysis. The same coding methodology from the pilot was utilised in the main study, with the addition of "positive" (e.g. "the middle and whole back of my head felt tingly and sooo nice!"; P90) and "negative" (e.g. "it was boring without any

excitement. What's the point?!"; P71) categories to aid analyses. Due to the nature of the sample (i.e. those likely unfamiliar with ASMR media), mentions of "weirdness" or "strangeness" were not included as indicators of negative affect or discomfort. Similarly, mentions of "laughter" or "humour" were not coded under "Affect". At least six participants appeared to be aware of ASMR throughout the experiment, making nine mentions of "ASMR" in written responses across all videos.

Sensation. Descriptions of sensory experience were frequently cited within the sample, endorsed by 28.8% of participants averaged across all videos. Sensory experiences were most frequent during Video 1 (50%), and least prominent for Video 5 (16%). It is unclear whether habituation to sensation occurred with successive video presentation, however, but the pattern of responses suggests not. For example, the following pattern of variation was observed for videos 2 (19%), 3 (32%), and 4 (27%).

Tingles and tingling sensations were frequently cited by participants across videos (19.6%), with one participant (P90) stating "The sound of her whispers and the plastic made a tingly sensation in the back of my head. It made me feel calm and felt satisfying when she was taking off the rapper (sic)." Tingles were frequently experienced in the head (n = 26), for example, "I felt a strong tingling sensation in back of my head" (P41), as well as shoulders (n = 2), neck (n = 5), back (n = 13), arms (n = 4), and legs (n = 4). One participant (P52) "experienced tingles and feelings on the back of my head, sides of my head and I had feelings even in my legs that were were (sic) intense". Tickling sensations were also reported (n = 5), with one participant stating that the simulated hair brushing made them "feel rushes and pulses throughout my body, especially tickling on my legs and back" (P23).

Relaxation. Relaxation was frequently cited by participants, endorsed by an average of 27.8% of the sample. Video 5 was most commonly endorsed as relaxing (48%), while Video 2 was the least conducive to relaxation (17%). Across all videos, relaxation was a

frequent occurrence (*n* = 78), for example, “I felt like I could go to sleep and that I was sinking into my chair. Felt very safe and relaxed” (P72). Similarly, across all videos, many participants found the experience calming (*n* = 83) and soothing (*n* = 16). For example, one participant stated, “I felt very calm and found myself taking deeper breaths and my thoughts were calming down and I was becoming more focused and mindful” (P52), while another found Video 4 “soothing and relaxing as if she was whispering into my ear” (P68).

Affect. Emotional responses to the stimuli were frequently cited by the sample, endorsed by 25% of participants, when averaged across all videos. Affective experiences were most frequent in reaction to Video 7, where 61% of participants indicated experiencing positive emotions. Video 4 was the least emotionally stimulating, with only 12% of the sample indicating positive affect. Videos were frequently described as satisfying (*n* = 52), for example “this was really satisfying, I was calm the whole time” (P45), as well as good (*n* = 10) and nice (*n* = 10). Participants also frequently described experiencing enjoyment (*n* = 32), for example, “I enjoyed the tapping nose (sic) from the paint pallet, it provokes a satisfying feeling in my head” (P100).

Altered Consciousness. As with the pilot study, alterations in consciousness were relatively uncommon across the sample, endorsed by an average of 12.4% of participants, across all videos. However, of those who did experience altered consciousness, Video 1 appeared to be most effective (21%), while Video 3 was the least effective (8%). Some participants compared the experience to that of meditation (*n* = 3), while others experienced time distortions (*n* = 4), feelings of immersion (*n* = 8), and feeling as though they were somewhere else (*n* = 9). Similarly, many participants expressed a blurring of the boundary between self and video (*n* = 39). Specifically, some participants felt that someone was actually behind, or next to them (*n* = 18), for example, “It felt like someone was really next to me” (P7). Other participants felt that they were actually being touched (*n* = 18), “I

experienced goosebumps and sensations mainly on my skull because I felt as if she was brushing my hair" (P77), and "I felt hyper aware of my surronding (sic) and of myself (e.g. where I was, my cloths (sic) on my arms). As the sounds intensifies, I could almost "feel" the sound on either side of me" (P62). Interestingly, a small number of participants felt that they could touch, smell, or were actually performing the actions in the video (n = 3). For example, one participant wrote "felt like I was touching the actual bottle, playing with the lid" (P3), while another expected to smell a scent associated with the stimulus of interest. For example, "when mentioning cinnamon, I was trying to actually smell it or find the smell" (P4).

Negative Affect and Discomfort. Negative emotions were reported by some participants, with an average of 24.8% of the sample experiencing some negative affect. The lowest level of negative affect was found for Video 5 (11%), while Video 3 was the most disliked (43%). Some participants expressed annoyance (n = 33) at the delivery or content (e.g., "so much white noise it was really annoying to listen to"—P35). Other frequently cited negative emotions included distrust (n = 9), feeling on edge (n = 7), disinterest (n = 6), unease (n = 6), and anger (n = 2). However, these appraisals appeared to vary, with some participants expressing comfort and then annoyance, and vice versa. For example, "at the start felt annoyed and angry that it was another video with whispering but then as I listened more into the video I started feeling peaceful and really satisfied and sleepy" (P59), and "sense of danger at first, especially with the whispering. Later, when you comprehend with the content of the whispers, you become relatively more relaxed. At peace." (P48).

Discomfort was cited by an average of 29.4% of the sample. Some desensitisation may have occurred with successive stimuli presentation, since 51% of the sample experienced discomfort while watching Video 1, while only 9% of the sample found Video 5 uncomfortable. While some variation was observed across Videos 2 (23%), 3 (39%), and 4 (25%), substantial variation in discomfort was found across participants. For example, one

participant felt “slightly uncomfortable but I found it funny and entertaining” (P2), while another stated “I felt weirded out like some (sic) was playing with the insides of my brain. I hated this experience” (P31). As with the pilot study, some participants indicated negative affect and discomfort akin to misophonia. For example, one participant stated that “some of the sounds were interesting but some sounded to me like fingernails on a chalk board and gave me shivers” (P58). Other participants indicated frustration (e.g., “it made me want to take my headphones off and throw them at him”—P75), and “when he starts scratching the bottom of the jar I want to punch him”—P8).

Positive and Negative. To add another dimension to the analysis, ‘positive’ and ‘negative’ categories were created to assess the overall valence of participants’ experiences. Coded as either a 1 (present) or 0 (absent), participants could either have a positive experience as a result of viewing a stimulus (e.g., “the sounds she was making were quite satisfying and calming, made me feel sleepy”—P19), or a negative experience (e.g., “uncomfortable feeling, shivers down my spine”—P25). Participants were awarded a 1 for both if they had both a positive and negative experience (e.g. “when she was taking the plastic off I got tingles down my spine but I didn’t like her whispering”—P54). Similarly, 0 was given to both for participants who indicated neutral responses (e.g., “the crumpling of the plastic gives a weird feeling in the upper back however it also doesn’t really affect me overall or make me feel uncomfortable”—P43). Substantial differences in the ratios of positive and negative appraisal were observed across videos. For instance, participant enjoyment appeared to increase across videos, with the exception of Video 3: Video 1 (36%), 2 (37%), 3 (30%), 4 (55%), and 5 (86%). A similar pattern was observed for negative ratings, where negative appraisal appeared to decrease across videos, again with the exception of Video 3: Video 1 (65%), 2 (39%), 3 (64%), 4 (35%), and 5 (17%).

Frisson Qualitative Analysis. Qualitative data were coded into three categories based on descriptions in the frisson subscale items of the AES (Silvia & Nusbaum, 2011). A '1' or '0' was allocated based on the presence or absence of each facet of frisson: feeling "chills down your spine", "goosebumps", and feeling "like your hair is standing on end". Beyond chills, goosebumps and hair-raising sensations, emotional and visual experiences were frequently cited by the sample in relation to Frisson stimuli. Specifically, across all songs, 55% of participants reported emotional-type experiences, including nostalgia, pride, motivation, and sadness. For example, one participant wrote, "I felt uplifted and wanted to fly" (P23). Similarly, across all songs, 16% of the sample reported visual imagery. For example, "I picture a shooting star or a comet flying up into the atmosphere like pressure has finally been released" (P88) and "I just kept picturing different creatures and characters who I imagined to be dancing" (P59).

Chills, Goosebumps, and Hair Standing on End. Chills were cited by 14.8% of the sample, across all songs. Song 2 was the most effective at eliciting chills, stimulating 30% of the sample, while only 5% of participants experienced chills while listening to Song 5. For example, one participant wrote, "The experience was overwhelming. I felt chills throughout my entire body during the entire song" (P10).

Goosebumps were cited by 9.8% of the sample, averaged across all videos. Again, Song 2 was the most effective, with 26% of the sample experiencing goosebumps from listening, while only 1% of participants cited goosebumps from listening to Song 5. For example, one participant wrote that the song "gave me goosebumps for a second or two, a couple times, that were chilling but also warm" (P28).

The experience of having one's hair stand on end was very uncommon amongst participants, with only 1.4% of the sample reporting the sensation, on average, across videos. The experience was equally as common for participants when listening to Song 1 (3%) as

Song 2 (3%). For example, one participant wrote, “during the crescendo I felt a wave go through my arms and felt my hair stand on end (P75)”. No accounts of hair raising were found for Songs 3 and 4.

Quantitative Analysis.

Following coding in Excel, the qualitative data were imported into SPSS and computed into scales within and across videos. As noted earlier, three types of variables were created to best assess and operationalise ASMR responses: ASMR Response Category Scores, ASMR Response Video Scores, and an ASMR Response Combined Score. In addition, two variables were created to operationalise frisson responses: Frisson Response Song Scores and a Frisson Response Combined Score. Correlational analyses were run to examine the relationships between ASMR-15 and subscale scores, ASMR Response Video Scores and ASMR Response Category Scores. *T*-tests were run to assess the differences in ASMR scores across gender. Statistical significance of all statistical tests was set as $p < .05$.

ASMR Response Category Scores. ASMR categories were summed across videos, to assess the prevalence of reported affective, relaxation, sensory, and altered consciousness dimensions of ASMR experience, across all ASMR stimuli. These produced separate Affect, Relaxation, Sensation, and Altered Consciousness scores across all videos. These scores ranged from 0 to a possible 5, with the score representing the number of videos the participant reported that particular facet of ASMR. For example, if a participant reported Relaxation experiences for videos 1 and 4, this would produce a score of 2 (out of 5). (Note: The possible range later changed from 0 to 4 when Video 5 was excluded from analysis.)

ASMR Response Video Scores. To assess the effectiveness of each stimulus, total scores were computed within videos. These scores comprised the prevalence of reported Affect, Sensation, Relaxation, and Altered Consciousness experiences within each video, as well as the Intensity (1 – 10) ratings. These scores ranged from 1 to 15. For example, if a

participant reported sensory and relaxation experiences from viewing Video 1, and rated the video '3' for intensity, they would have a Video 1 Response score of 5 (out of a possible 15).

ASMR Response Combined Score. Finally, a combined score was created across videos, comprising the Affect, Relaxation, Sensation, Altered Consciousness, and Intensity ratings, from videos 1 to 4. This was computed by summing the ASMR Response Video Scores for each video, to produce a total score. (Note: this total does not include video 5, as it was later removed from analysis). The ASMR Response Combined Score had a total range from 4 to 56.

Frisson Response Song Scores. As with ASMR Response Video Scores, total scores were computed within each song, comprising the incidence of chills, goosebumps, and reports of hair standing on end, as well as Intensity (1 – 10) ratings. These scores ranged from 1 to 14. For example, if a participant reported experiencing chills from Song 1, and rated the song '5' for intensity, they would have a Song 1 Response score of 6 (out of a possible 14).

Frisson Response Combined Score. A combined score was created across songs, comprising the summed Frisson Response Song Scores across songs 1 to 5. The Frisson Response Combined Score had a total possible range from 5 to 70.

Descriptive Statistics

Participant Demographics. Of the 100 participants 28 were male (28.0%) and 72 were female (72.0%), with ages ranging from 18 to 29 years (M = 19.38; SD = 2.48).

Scale Means and Frequencies. The mean ASMR-15 score in the present study was comparable to that found in a previous non-specialised sample. Consistent with previous findings (Chapter 3), there appeared to be a floor effect across some ASMR-15 subscales. A proportion of participants selected the lowest possible score for all items in the Affect (20.0%) and Altered Consciousness (22.0%) subscales. However, Sensation and Relaxation were not as affected, with only 5% and 10% of participants selecting the lowest score for all

subscale items. Within the ASMR-15 total score measure, only 1% of respondents scored 15, or the lowest score across all items. Importantly, the floor effect appeared to be less prominent in the present study, when compared to previous work (Chapter 3).

In assessing the relative frequency of higher scores on the ASMR-15, the proportion of '4' or '5' responses to items were examined. The proportion of '4' or a '5' responses for half of the items differed across the Sensation (29.0%), Relaxation (23.0%), Affect (12.0%) and Altered Consciousness (14.0%) subscales, and over a quarter (28.0%) of participants endorsed at least half of the ASMR-15 items with a '4' or '5'. These proportions were slightly higher than those observed in previous work (Chapter 3).

Intensity. The intensity ratings for ASMR videos were assessed with respect to distribution and ASMR-15 scores. Overall, participants rated Video 5 as the most intense (M = 6.45, SD = 2.62), while Video 2 (M = 4.47, SD = 2.34) was scored as least intense, on average. See Appendix C for all ASMR and frisson stimulus intensity ratings.

ASMR Response Category Scores. The frequency of ASMR experiences were assessed by category. For instance, 72% of the sample reported at least one incidence of Sensation across Videos 1 to 5, while 67% cited Relaxation, 72% experienced Affect and 42% indicated experiencing at least one incidence of Altered Consciousness as a result of watching Videos 1 to 5. (Note: these proportions were reduced once Video 5 was excluded from analysis: e.g. Altered Consciousness 31%; Sensation 66%; Relaxation 54%; Affect 38%).

The frequencies of ASMR coding categories were examined across videos. Specifically, the presence of each ASMR element across three or more videos was assessed. Within the sample, sensory experiences were the most common, with 20% of the sample experiencing Sensation across three or more videos. Relaxation (12%), Affect (4%), and Altered Consciousness (4%) were less prevalent. Moreover, 6% of participants reported

sensory experiences across all four videos, while 1% experienced Relaxation across all stimuli.

Similarly, the proportion of participants experiencing no single element of ASMR was assessed. A similar pattern was observed, with 34% of the sample experiencing no instance of Sensation, while 46% experienced no Relaxation. The least common elements were again Affect and Altered Consciousness, unreported by 62% and 69% of the sample across any video.

ASMR Response Video Scores. The frequency of ASMR experiences were also assessed within videos; specifically, the presence of two or more elements of ASMR (i.e. Affect, Sensation, Relaxation, Altered Consciousness). Experiencing two or more ASMR elements were reported across all videos, however the highest proportion was observed for Video 5 (45%), Video 1 (30%), and Video 4 (25%), followed by videos 3 (16%) and 2 (8%).

Similarly, the frequency of non-ASMR responses, or the absence of any element, were examined. The largest proportion of non-ASMR response was seen for Video 2, with 60% of the sample scoring 0 across all ASMR elements. For example, “audio is not well mastered which gives me a sense of annoyance, more had an experience of boredom from this however” (P1). Videos 3 (47%) and 4 (42%) were similarly received, while Videos 1 (26%) and 5 (15%) appeared to be the most conducive to experiencing at least one element of ASMR experience.

ASMR-15 Scores and Demographic Factors

Scores on the ASMR-15 did not correlate with age (r = -.07; p = .469) or differ significantly across genders (M_{male} = 39.56, SD_{male} = 13.47; M_{female} = 41.10, SD_{female}= 13.21; $t(98)$ = -.521, p = .603).

Correlational Analyses

ASMR-15, Subscales, and Frisson. The ASMR-15 demonstrated weak-to-moderate

convergence with scores on the AES (r = .31; p = .001) and AES frisson subscale (r = .28; p = .005). Similarly, Altered Consciousness subscale scores correlated moderately with Aesthetic Experiences (r = .38; p < .001), and frisson (r = .31; p = .002). See Table 2 for all scale and subscale correlations.

Table 2

Correlations Between the ASMR-15, Subscales and Frisson

Measure	AC	S	R	A	AES	AES-FR	Range	Mean (*SD*)
ASMR-15	.813**	.785**	.731**	.855**	.314**	.281**	1.00 – 4.80	2.69 (0.86)
AC		.492**	.531**	.611**	.378**	.320**	1.00 – 5.00	2.94 (1.00)
S			.347**	.561**	.198*	.153	1.00 – 4.75	2.28 (1.03)
R				.627**	.209*	.240*	1.00 – 5.00	2.98 (1.18)
A					.202*	.238*	1.00 – 5.00	2.55 (1.18)
AES						.826**	20.00 – 70.00	44.41 (9.60)

Note. N = 100. AC = Altered Consciousness; S = Sensation; R = Relaxation; A = Affect. **p =.01, *p =.05. AES = Aesthetic Experiences Scale. AES-FR = Frisson subscale of the AES.

ASMR-15, Subscales and ASMR Response Video Scores. The ASMR-15 total score was significantly correlated with ASMR Video Scores (frequency of any dimension of ASMR experiences within each video) for all videos, demonstrating that higher ASMR-15 scores were associated with experiencing a greater number of elements of ASMR in the videos. See Table 3 for all correlations. No significant correlations were found between frisson and ASMR video scores. However, Video 5 correlated modestly with scores on the AES (r = .217, p = .030).

Intensity. With respect to ASMR-15 scores, the intensity scores of Videos 1 (r = .363, p < .001), 4 (r = .336, p = .001), 5 (r = .274, p = .006), and 3 (r = .243, p = .015) were significantly correlated with ASMR scores. The intensity ratings of Videos 2 (r = .174, p = .084) did not significantly correlate with ASMR-15 scores.

Partial correlations were undertaken to assess the role of Intensity scores in the relationship between ASMR Response Video scores and the ASMR-15. Significant correlations remained between ASMR-15 scores and Video 2 (r = .216, p = .034), Video 3 (r = .238, p = .020), and Video 4 (r = .204, p = .046). Video 1 was no longer significantly correlated with ASMR-15 scores (r = .147, p = .152), and Video 5 appeared unrelated to the ASMR-15 (r = .051, p = .620) when Intensity was partialled out. As a result, Video 5 was excluded from further analysis when calibrating total scores across categories and videos.

Table 3

Correlations Between the ASMR-15, Subscales, Frisson, and ASMR Response Video Scores

Measure	Video 1	Video 2	Video 3	Video 4	Video 5
ASMR-15	.389**	.225*	.307**	.386**	.283**
AC	.260**	.234*	.298**	.268**	.153
S	.313**	.142	.253*	.321**	.269**
R	.339**	.281*	.220*	.279**	.247*
A	.284**	.089	.195	.329**	.169
AES	.175	.035	.125	.057	.217*
AES-FR	.083	.001	.049	.059	.186

Note. N = 100. AC = Altered Consciousness; S = Sensation; R = Relaxation; A = Affect. **p =.01, *p =.05. AES = Aesthetic Experiences Scale. AES-FR = Frisson subscale of the AES. Video scores incorporate Intensity ratings.

ASMR-15, Subscales and ASMR Response Category Scores. Combined across Videos 1 to 4, the ASMR Response Category Scores (i.e. Affect, Relaxation, etc.) were correlated with the ASMR-15 total and subscale scores. When summed across Videos 1 to 4, the ASMR-15 correlated moderately with video scores ($r = .421$, $p < .001$).

The ASMR-15 total score correlated positively with the incidence of sensory experiences ($r = .371$, $p < .001$). Moreover, across Videos 1 to 4, reports of sensation were positively correlated with the Sensation ($r = .474$, $p < .001$), Altered Consciousness ($r = .301$, $p = .002$), and Relaxation ($r = .219$, $p = .030$) subscales of the ASMR-15. Similarly, the Relaxation subscale correlated positively with reports of relaxation ($r = .282$, $p = .005$). Affect correlated positively with incidence of affective experiences ($r = .198$, $p = .049$) and relaxation ($r = .221$, $p = .028$). However, Altered Consciousness did not correlate significantly with any ASMR Response Category Score.

Additionally, ASMR-15 scores correlated with positive ratings of ASMR stimuli ($r = .269$, $p = .007$). For all correlations, see Table 4.

Table 4

Correlations Between the ASMR-15, Subscales and ASMR Response Category Scores

Measure	AC Cat.	S Cat.	R Cat.	A Cat.	Positive	Negative
ASMR-15	.147	.371**	.195	.151	.269**	-.083
AC	.068	.301**	.028	.040	.129	.103
S	.101	.474**	.165	.090	.192	-.068
R	.100	.219*	.282**	.221*	.337**	-.103
A	.076	.128	.192	.198*	.242*	-.153

Note. $N = 100$. AC = Altered Consciousness; S = Sensation; R = Relaxation; A = Affect. **p =.01, *p =.05. Category scores do not include Intensity ratings. Positive = positive ratings across Videos 1 to 4; Negative = negative ratings across Videos 1 to 4.

ASMR-15, Subscales and ASMR Response Combined Score. The Response Video Scores for Videos 1 to 4 were combined to produce the ASMR Response Combined Score (Category Scores + Intensity Scores for Videos 1 to 4). The ASMR Response Combined Score correlated moderately with the ASMR-15 total score (r = .421, p <.001). With respect to the subscales, the ASMR Response Combined Score was significantly correlated with Sensation (r = .332, p =.001), Relaxation (r = .338, p =.001), Altered Consciousness (r = .341, p =.001), and Affect (r = .291, p =.004).

Frisson. Across all songs, the Frisson Response Song Scores did significantly correlate with scores on the AES (r = .234, p = .020) but not specifically with the frisson subscale (r = .143, p = .159). Songs 1 and 3 (r = .231, p = .021) correlated significantly with scores on the AES (r = .285, p = .004). Moreover, Frisson Response Combined scores correlated significantly though weakly with the ASMR-15 (r = .257, p = .011), Altered Consciousness (r = .259, p = .010), and Sensation (r = .242, p = .016). subscales. Additionally, Frisson Response Combined scores and ASMR Response Combined scores were significantly, moderately, correlated (r = .373, p < .001).

Regression

In order to address the predictive validity of the ASMR-15, and four subscales, a multiple linear regression model was fit to predict ASMR Response Combined Scores using the four ASMR-15 subscales. The subscales explained a total of 18.8% of the variance in induced ASMR experience ($F(4, 94) = 5.433$, p = .001), which is considered a moderate effect. In investigating the relative predictive effects of each individual subscale, relaxation (β = .227, p = .067) and sensation (β = .211, p = .069) had the strongest effects, followed by altered consciousness (β = .177, p = .161), while affect had negligible effect (β = -.080, p = .576). This demonstrates that the breadth and depth of individuals' ASMR experience as

induced in the lab is best predicted by self-reported tendency to experience sensation and relaxation elements.

Discussion

The aims of the present work were to assess the accessibility of ASMR experiences, among a non-specialised sample within a laboratory setting, and in doing so, identify effective stimuli for experimental ASMR induction. The study further aimed to assess the relationship between self-report ASMR and frisson propensity, and recorded ASMR and frisson responses, following deliberate induction. To achieve these aims, the ASMR-15 scale and the AES (including frisson subscale) were administered to 100 undergraduate psychology students in a laboratory, alongside five selected ASMR and five frisson stimuli. Responses to these stimuli were recorded qualitatively and quantitatively, and examined to assess the relationships between self-report ASMR and frisson propensity and responses to ASMR and frisson stimuli. In summary, the qualitative results of this study indicate that ASMR experiences can be induced in a laboratory setting among non-specialised participants, and that the ASMR-15 is a useful tool in discerning ASMR propensity in such samples.

Experiencing at least one aspect of ASMR in response to video stimuli appeared to be a common occurrence within the sample, with 88% of participants reporting an experience consistent with at least one dimension of ASMR (e.g. affect, sensation, relaxation, altered consciousness). However, while promising, this should be taken tentatively, as previous research indicates that ASMR is typically a multidimensional experience (Chapter 2; Chapter 3). With respect to the effectiveness of the chosen stimuli as a whole, one fifth of the sample experienced an ASMR-type sensation across three or more videos, while approximately one eighth experienced three incidences of relaxation. However, an absence of Sensation or Relaxation was also common, with a third (34%) of the sample experiencing no Sensation, and nearly a half (46%) indicating no Relaxation across any videos. Affective and altered

consciousness experiences were even less consistent. Only 4% of the sample experienced Affect or Altered Consciousness across three or more videos, and approximately two thirds (62%; 69%) of the sample did not experience either element across any video. This indicates that affective and altered consciousness experiences may be relatively infrequent and inconsistent, and/or difficult to induce within a laboratory setting. However, it is important to also note that only 28% of the sample endorsed a substantial level of self-reported ASMR propensity. As such, it is likely the incidence rates of experienced ASMR would be higher in more ASMR-sensitive samples.

The findings of the present study provide the first evidence of the predictive validity of the ASMR-15 scale. ASMR-15 scale scores were significantly associated with ASMR responses to the four videos, showing concordance between self-reported propensity to experience ASMR and actual momentary ASMR experiences in response to appropriate stimuli. The ASMR-15 correlated weakly-to-moderately with both sensory experiences and positive responses. Providing further validation for the ASMR-15 subscales, Sensation correlated moderately with sensory experiences, and Relaxation correlated with reports of relaxation. Additionally, Affect scores correlated weakly with the incidence of Affect in response to ASMR stimuli. These results were similarly reflected in the findings from the linear regression, where Sensation and Relaxation demonstrated the largest predictive effects in explaining reported ASMR experiences (ASMR Combined Response Score). Moreover, when all four ASMR subscales were entered into the regression, they explained a moderate to large proportion of the variance in ASMR Combined Response Scores. This is a promising result given the apparent individual variation in preferences, and relatively small battery of stimuli. As such, the ASMR-15 may be used as a screening tool for future studies wanting to identify participants who may be susceptible to ASMR experiences. However, not all scale scores and experiences were concordant: Altered Consciousness scores did not correlate with

any category of ASMR responses, including altered consciousness experiences. However, it is also important to note that only a relatively small proportion of participants experienced a substantial shift in Affect and Altered Consciousness. This means that it is likely to be more difficult to assess these components of ASMR within non-specialised samples.

It is also possible that the intensity of ASMR experiences explains a significant proportion of ASMR propensity. For instance, ASMR-15 scores were significantly correlated with ASMR responses to Videos 1, 3 and 4 when intensity scores were included. Similarly, when averaged across videos, the ASMR-15 correlated moderately with video responses. Across Videos 1 to 4, ASMR responses were significantly, and to a similar degree, correlated with Altered Consciousness, Sensation, Relaxation and Affect subscale scores. When examined alongside the correlations between the ASMR-15 subscales and ASMR video category scores, it would appear that experienced intensity provides a unique and valuable contribution to our understanding of ASMR propensity. Taken together, this also suggests that the ASMR-15 quite effectively captures the incidence of ASMR, when assessed with respect to the dimensions and intensity of the experience. It is also worthwhile noting that since the ASMR-15 does not provide categorical data with respect to ASMR and non-ASMR experiencers, it may be premature to establish cut-offs when the parameters and phenomenology of the experience are still being established. As a result, exploratory approaches to quantifying ASMR, utilising dimensional measures, may provide a more nuanced representation of the phenomenon, as a whole.

With respect to the relationship between ASMR and frisson, the present study explored this experimentally and through self-report inventories. The ASMR-15 correlated weakly-to-moderately with aesthetic experiences and frisson. This relationship was most pronounced for the Altered Consciousness component of ASMR, which significantly correlated with aesthetic experiences and frisson. The weakest correlation was observed

between the sensory component of ASMR and frisson experiences (r = .153), providing further evidence for the distinctiveness of the sensory component of ASMR experiences. While ASMR and frisson responses were significantly related, the relationship may be partially attributable to the testing environment. For instance, there may be a cross-over or priming effect from attempting to induce both phenomena in a single study, whereby experiencing ASMR increases the sensitivity to frisson stimuli, or vice versa.

As anticipated, scores on the AES (and frisson subscale in particular) did not correlate with responses to ASMR stimuli. However, not all frisson stimulus responses correlated with scores on the AES and frisson subscale. For instance, only Song 1 responses correlated with AES scores. No frisson stimuli correlated significantly with the frisson subscale. Further, no significant correlations were found when Intensity ratings were excluded from frisson scores, suggesting that the intensity of experiences provides important information about frisson propensity. While these findings suggest that the frisson excerpts selected in the present study may not have been ideal for induction, four out of five of the selected excerpts were chosen from previous research (Colver & El-Alayli, 2016; Bannister & Eerola, 2017). Furthermore, upon analysis of the qualitative descriptions, frisson did appear to be induced in the sample. For example, nearly half of the sample (46%) experienced at least one incidence of chills, while a third of the sample (36%) experienced at least one episode of goosebumps from listening. Hair raising was considerably less common, with less than one tenth (7%) of participants experiencing the phenomenon. On the face of it, then, the general validity of the existing self-report frisson measure is potentially in doubt (e.g. AES; Silvia & Nusbaum, 2011). It may also be possible that, like ASMR, particular elements of frisson experiences appear more commonly than others. Alternatively, environmental conditions may have impeded immersion in the stimuli to adequately produce frisson, in otherwise susceptible individuals.

This study is the first to successfully induce ASMR within laboratory conditions in a non-specialised sample, and as such, has provided preliminary support for the accessibility of ASMR experiences. Nevertheless, it is important to address the possible limitations of the present work. Firstly, numerous issues and considerations arise when attempting to induce a specific state of experience in a laboratory setting. The laboratory setting, while necessary in order to address the research questions of interest, is likely not the ideal environment for such experiences. While the participants were not in direct view of the researcher, a feeling of being monitored may have impeded immersion. Further, participants may have felt pressure to respond in a way that would aid the researcher, leading to an inflation of scores. On the other hand, a large difference (d = .73) was observed between aesthetic experience scores in the present work (M = 44.41) compared to those seen in a previous Reddit sample (N = 394; M = 37.35). This effect was smaller (d = .26) for frisson scores across the present (M = 11.84) and previous samples (N = 394; M = 10.91). This may be attributable to sampling differences, or reflect demand characteristics associated with laboratory versus online data collection.

In addition, while the temperature of the room was set in line with recommendations for frisson research (Trappe & Voit, 2016), it is not yet known whether ASMR is better induced in warmer or colder environments. The lower temperature may have been uncomfortable for participants and impeded ASMR induction. Finally, the presence of other noises in the room may have impacted participant immersion in the stimulus of interest. Some participants made loud fidgeting noises, which may have prevented absorption for them, as well as the participants around them. Other sounds such as typing or coughing may have further distracted from the stimulus of interest. Future work may benefit from one on one testing to minimise sources of interference.

With respect to the study design, there were a number of technical and audiovisual choices made that also may have impacted results. Firstly, the volume of each video varied

slightly, which may have had an effect on ASMR and frisson induction. To maximise comfort and immersion, participants were allowed, and encouraged, to adjust the volume for each video as often as they wished. While this does not allow for consistency in volume across all participants, the method compensated for individual differences and preferences, and has greater ecological validity. In a non-laboratory setting, individuals engaging with ASMR and frisson media will likely have control over the volume of the stimulus of interest, and feel able to seek comfort through volume adjustment. While no data on this were collected, there was evidence of adjustments made to volume across participants after testing sessions. Future work could collect data on these volume adjustments and preferences, and investigate how they relate to ASMR, misophonia, and frisson induction. Additionally, control over the volume provided the participants with another escape from displeasure in the event of misophonic experiences.

Another issue to consider concerns the choice of video length. In attempting to represent a variety of ASMR genres and preferences (with respect to gender, age, accent, trigger content and style, and so on), a number of ASMR videos were included. As a result, the length of the videos averaged about 3 minutes. While Smith et al. (2016) found that ASMR induction occurred, on average, after 1 minute of stimulation among self-selected participants, it may take longer than 3 minutes to induce ASMR in less sensitive, or non-specialised individuals. In addition, the participants in the Smith et al. (2016) study may have had expectations of experiencing ASMR, as the purpose of the experiment was to induce ASMR in a laboratory setting. However, given the more generalised sample in the present work, it may have created discomfort if longer ASMR stimuli were selected, especially given the prevalence of negative affect. On the other hand, as physiological data were not gathered (i.e. measures of arousal), there may have been an effect of the time of day, amount of sleep, level of relaxation, and prior stimulant consumption on the receptiveness of participants to

ASMR stimuli. Future studies should consider examining or controlling for these factors, to determine whether they have any impact on ASMR susceptibility.

Given the variation in preferences for online trigger material (Barratt et al., 2017), it is unsurprising that responses to ASMR stimuli varied significantly across the sample. However, difficulties emerged when interpreting responses to Video 5. Upon analysis, it appeared that participants endorsed Video 5 (Bob Ross) in a way that was distinct from the other ASMR stimuli. For example, 86% of the sample indicated some enjoyment from viewing the video, which differed significantly from the pattern of positive and negative ratings seen across Videos 1 to 4. Moreover, the affective enjoyment appeared to be largely expressed as "satisfaction" (n = 25), as opposed to pleasure, suggesting that Video 5 may be stimulating another enjoyable, but non-ASMR experience. This theory was supported by the quantitative analyses, which revealed that Video 5 correlated with the AES. Further, while Video 5 responses were related to ASMR-15 scores, the effect was nullified when Intensity was controlled for. It is possible, therefore, that the Intensity ratings for Video 5 reflect participants' enjoyment of the video, as opposed to their degree of ASMR experience. These results suggest that the selected Bob Ross excerpt may not be a good ASMR discriminator for research, and enjoyment of such may be more indicative of aesthetic experiences as a whole.

The order of presentation of the questionnaires, and ASMR and frisson blocks must also be considered. While the ASMR and frisson block presentation were counterbalanced to compensate for any additive effect of ASMR and frisson induction, there may have been a potential carryover effect of any experienced misophonia or annoyance, to other ASMR videos. Additionally, as the ASMR-15 and AES were presented prior to ASMR and frisson stimuli, there may have been a potential priming effect of the scale items on experiential descriptions. Words such as "tingles" featured prominently in responses, and it should be considered that this word selection may have been influenced by prior exposure. It should be

noted that a small number of (n = 6) participants mentioned "ASMR" specifically in the qualitative descriptions, suggesting a prior awareness of the phenomenon. Future work should consider the inclusion of items assessing prior awareness, and experience of ASMR, to assess the impact of previous knowledge, exposure, and expectation on stimuli responses in a laboratory setting. In line with this, there may have been some effect of familiarity with the individuals featured in the videos, and ASMR induction. Some participants recognised Cara Delevingne (n = 4) and Bob Ross (n = 6) and indicated some affinity for them and their work. While not necessarily a weakness, future work could explore and overcome the potential familiarity issue by creating ASMR stimuli specifically for assessment purposes.

Finally, the stimuli selected for the pilot and final study may have varying strengths and weaknesses. Overall, there appears to exist myriad individual differences in preferences for ASMR stimuli, particularly with respect to gender, accents, settings, delivery, and content. Additionally, the manifestation of ASMR appears to vary in terms of relaxation, sensation, affect and consciousness. As a result, the selected subset of the over 18 million ASMR videos on YouTube will be limited in a variety of ways. The five stimuli may not be the most effective stimuli for all participants, or capture all relevant facets of the phenomenon. As an exploratory work, this is to be expected, particularly given the limited information available in order to select the most effective, general ASMR stimuli. This issue is further exacerbated by the role of content and delivery in the effectiveness of stimuli. For example, some participants may have a preference for whispering videos, but the particular ASMRtist featured may not meet other preferences. Specifically, the individual's voice, accent, technique, or appearance may make a stimulus more or less appealing. In addition, if expectancy effects impact the effectiveness of stimuli, it may be difficult to gather stimuli suitable for both novice and experienced ASMR participants. As a result, while further consultation with reliable ASMR experiencers may help refine stimulus selection, individual

differences and preferences will likely remain obstacles in trying to create or identify universal stimuli.

In conclusion, the findings of this study suggest that ASMR is a relatively common experience that may be induced in a laboratory environment. While only a moderate proportion of ASMR responses can be explained by ASMR-15 scores, some predictive validity was demonstrated for the total score measure, as well as the Sensation and Relaxation subscales. Moreover, further evidence for the divergence between ASMR and frisson was established experimentally and through self-report inventories. The ASMR-15 again appeared to replicate the findings of previous work involving a convenience sample, and the selected ASMR stimuli appear to have largely met the requirements for ASMR induction among non-specialised participants. Future work assessing the physiological differences observed during ASMR experiences may help to further elucidate the underlying mechanisms of the phenomenon. As a result, researchers may be interested in utilising the ASMR-15 and identified stimuli in future work involving the induction of ASMR in a laboratory environment, or in the assessment of ASMR experiences more broadly.

References

Aron, E. N., & Aron, A. (1997). Sensory-processing sensitivity and its relation to introversion and emotionality. *Journal of Personality and Social Psychology, 73*, 345-368.

Bannister, S., & Eerola, T. (2017, August). Musically-induced chills: The effects of "chills sections" in music. Paper presented at the Proceedings of the 25th Anniversary Conference of the European Society for the Cognitive Sciences of Music.

Barratt, E. L. & Davis, N. J. (2015). Autonomous sensory meridian response (ASMR): A flow- like mental state. *PeerJ, 3*, 1-17.

Barratt, E. L., Spence, C., & Davis, N. J. (2017). Sensory determinants of the autonomous sensory meridian response (ASMR): Understanding the triggers. *PeerJ, 5*, 1-13.

Colver, M. C., & El-Alayli, A. (2016). Getting aesthetic chills from music: The connection between openness to experience and frisson. *Psychology of Music, 44*, 413-427.

Del Campo, M. A., & Kehle, T. J. (2016). *Autonomous sensory meridian response (ASMR) and frisson: Mindfully induced sensory phenomena that promote happiness.* International Journal of School & Educational Psychology, 4, 99-105.

Fredborg, B. K., Clark, J. M., & Smith, S. D. (2018). Mindfulness and autonomous sensory meridian response (ASMR). PeerJ, 6, 1-13.

Harrison, L, & Loui, P. (2014). Thrills, chills, frisson, and skin orgasms: toward an integrative model of transcendent psychophysiological experiences in music. *Frontiers in Psychology, 5*, 1-6.

Kovacevich, A., & Huron, D. (2019). Two studies of autonomous sensory meridian response (ASMR): The relationship between ASMR and music-induced frisson. *Empirical Musicology Review, 23*, 39-63.

John, O. P., Donahue, E. M., & Kentle, R. L. (1991). The Big Five Inventory--Versions 4a

and 54. Berkeley, CA: University of California, Berkeley, Institute of Personality and Social Research.

Lochte, B. C., Guillory, S. A, Richard, C. A. H., & Kelley, W. M. (2018). An fMRI investigation of the neural correlates underlying the autonomous sensory meridian response (ASMR). *BioImpacts, 8,* 295-304.

McErlean, A. B. J., & Banissy, M. J. (2017). Assessing individual variation in personality and empathy traits in self-reported autonomous sensory meridian response. *Multisensory Research*, *30*, 601-613.

Mitchell, T. (2009). Sigur Ros's heima: An Icelandic psychogeography. Transforming Cultures eJournal, 4, 172-198.

Nichols, A. L., & Maner, J. K. (2008). The good-subject effect: Investigating participant demand characteristics. *The Journal of General Psychology*, *135*, 151-166.

Nusbaum, E. C., & Silvia, P. J. (2011). Shivers and timbres: Personality and the experience of chills from music. *Social Psychology and Personality Science, 2*, 199-204.

Poerio, G. L., Blakey, E. Hostler, T. J., & Veltri, T. (2018). More than a feeling: Autonomous sensory meridian response (ASMR) is characterized by reliable changes in affect and physiology. *Plos One,* 13, 1-18.

Panksepp, J. (1995). The emotional sources of "chills" induced by music. *Music Perception, 13*, 171-207.

Roberts, N., Beath, A., & Boag, S. (2018, September 17). Autonomous Sensory Meridian Response: Scale Development and Personality Correlates. *Psychology of Consciousness: Theory, Research, and Practice*. Advance online publication. http://dx.doi.org/10.1037/cns0000168

Silvia, P. J., Fayn, K., Nusbaum, E. C., & Beaty, R. E. (2015). Openness to experience and

awe in response to nature and music: Personality and profound aesthetic experiences. *Psychology of Aesthetics, Creativity, and the Arts*, *9,* 376-384.

Silvia, P. J., & Nusbaum, E. C. (2011). On personality and piloerection: Individual differences in aesthetic chills and other unusual aesthetic experiences. *Psychology of Aesthetics, Creativity, and the Arts*, *5,* 208-214.

Smith, S. D., Fredborg, B. K., & Kornelson, J. (2016). An examination of the default mode network in individuals with autonomous sensory meridian response (ASMR). *Social Neuroscience, 12*, 361-365.

Trappe, H. J., & Voit, G. (2016). The cardiovascular effect of musical genres. *Deutsches Ärzteblatt International*, 113, 347-352.

TubeBuddy. (2019). TubeBuddy | The Premier YouTube Channel Management and Optimization Toolkit. Retrieved from https://www.tubebuddy.com.

Appendix A

ASMR Stimulus Videos

Video 1 - (TingleBelleASMR – Ear to Ear, Case Tapping, Mouth Sounds, Unintelligible Whispering, MORE). Video 1 was sourced from the YouTube channel TingleBelleASMR, and currently has over 4.8 million views. The video features a young woman sitting in front of a soft grey backdrop, interacting with a 3Dio microphone wrapped in plastic wrap. The excerpt selected runs from 1:28 – 4:36 (3m 8s). The microphone simulates the viewer's ears, and the young woman touches and peels off the plastic wrap, as if pulling it off the viewer. The excerpt features crinkling plastic sounds, ear to ear techniques, whispering, personal attention, as well as simulated direct conversation and eye contact. The video can be located at https://www.youtube.com/watch?v=0Orv5RXfWDg.

Video 2 - (Gibi ASMR – Gaming Store Roleplay). Video 2 was located on the YouTube channel Gibi ASMR, and currently has over 4 million views. The video features a young woman sitting on the floor in what appears to be a lounge room, wearing a hat and headphones. The background features wood panelling and warm colours. The excerpt selected runs for 3 minutes, between 0:00 – 3:00. The young woman plays the role of a retail worker in a video game store, interacting with the viewer as a new customer. The video features soft spoken dialogue, personal attention, role playing, peeling stickers and tapping sounds. Items are held up to the camera and moved from side to side to create an ear-to-ear effect. Video 2 can be located at https://www.youtube.com/watch?v=iM9qKNbNbXI.

Video 3 - (Hungry Cakes – ASMR: Kardashian Salad Eating Sounds MUKBANG). Video 3 was sourced from the channel Hungry Cakes, and has currently been viewed more than 1.2 million times. The video features a young woman wearing a white shirt, sitting on the floor in front of a small wooden table, with a muted, neutral background. The excerpt chosen runs for 3m 30s (0:00 – 3:30). The young woman opens the video with a

preview of her eating a large salad, before saying “the Kardashian salad is the best thing ever”. The video then cuts back to the young woman making and assembling the featured salad. The video contains whispering, crisp sounds, lettuce ripping, salad assembly, rattling, crunching and chewing sounds, as well as chopping, and instructional dialogue. The video can be located at https://www.youtube.com/watch?v=nY400qcaniw.

Video 4 - (W Magazine – Cara Delevingne ASMR: How She Became June Moone and Enchantress for ‘Suicide Squad’ | W Magazine). Video 4 was sourced from the W Magazine YouTube channel, and currently has over 4.2 million views. The selected excerpt runs from 0:27 – 2:29 (2m 2s), and features British actress Cara Delevingne. Cara sits close to the camera, in front of a cool grey backdrop. Cara introduces herself to the viewer and discusses the characters she played in two of her recent films, while switching between two microphones, creating an ear-to-ear effect. The video features whispering, eye contact and storytelling. Video 4 can be found at https://www.youtube.com/watch?v=1hyr7ZKkQbQ.

Video 5 - (Jojo’s ASMR – WARNING: INTENSE RELAXATION TOP 10 ASMR TRIGGERS). Video 5 was sourced from the channel Jojo’s ASMR, and currently has over 2.3 million views. The excerpt runs from 7:32 to 10:28 (2m 58s), and features a young Australian man sitting behind a microphone, with a neutral background. The man holds and taps on an empty cinnamon bottle and jostles the lid, while repeating the words “cinnamon bottle” and “cinnamony”. The stimulus contains whispering, tapping and jar sounds, as well as ear to ear effects, utilising multiple triggers at the same time. The video can be located at https://www.youtube.com/watch?v=nheG5trfctw.

Video 6 - (ASMR Darling – ASMR 20 Triggers to Help You Sleep). Video 6 was found on the YouTube channel ASMR Darling, and currently has over 14 million views, and more than 157 000 likes. The excerpt selected runs from 21:48 – 23:56 (2m 8s). The video features a young woman sitting in front of a neutral, cream coloured bedroom background.

There is simulated interaction with the viewer through whispering, compliments, simulated hair brushing and personal attention. The movements are focused and slow, to create a relaxing effect. Video 6 can be found at https://www.youtube.com/watch?v=DaXwnTk0hUE.

Video 7 - (Bob Ross – Frozen Solitude (Season 13 Episode 2)). Video 7 was found on the YouTube channel titled Bob Ross, and has 350 000 views. The content was sourced from the show The Joy of Painting (Season 13, Episode 2), and features artist Bob Ross demonstrating how to paint a snowy mountain landscape painting, to the audience. The excerpt selected runs from 7:22 – 11:55 (4m 33s), and features soft speaking, instructional dialogue, eye contact, tapping, paint mixing, scratching and brushing sounds. The movements are crisp and precise, and the narration is calm, with the repetition of “no pressure” and “happy little shadows”. Bob Ross combines multiple triggers at the same time, which may reduce the effectiveness of the stimulus. Video 7 can be located at https://www.youtube.com/watch?v=kNZssD9zWlw.

Appendix B

Frisson Stimulus Videos

Song 1 (Hans Zimmer – Oogway Ascends). Song 1, Ooogway Ascends, was identified as a reliable frisson trigger in a study by Colver and El- Alayli (2016). The song was written by Hans Zimmer as part of the film score for the Kung Fu Panda Soundtrack. The piece features sombre strings, woodwind instruments and a series of crescendos. Consistent with previous work, the excerpt selected plays for 2 minutes (0:00 – 2:00).

Song 2 (Lady Gaga – Star Spangled Banner). Song 2 was nominated as an effective trigger on reddit.com/frisson, and included to increase the diversity of musical stimuli, across genres. The excerpt is from a live performance of the Star Spangled Banner, sung by Lady Gaga at the 2016 Super Bowl, and runs from 0:19 – 2:53 (2m 34s). The excerpt features clear vocals with piano accompaniment, and crowd cheering. The video can be found at https://www.youtube.com/watch?v=GbXSZBnBOQ4.

Song 3 (Gustav Holst – The Planets - Jupiter). Song 3 was identified as an effective frisson trigger stimulus in a study by Bannister and Eerola (2017). The excerpt runs from 1:50 – 4:50 (3m) and features the movement 'Jupiter' from the orchestral suite 'The Planets' by Gustav Holst. The piece features a full orchestra, with brass, woodwind, strings and prominent timpani and other percussion sounds. The piece builds towards crescendos and increases in loudness towards the end.

Song 4 (Sigur Ros - Glosoli). Song 4, Glosoli, is performed by the Icelandic ambient rock band Sigur Ros (Mitchell, 2009), and was identified as an effective frisson trigger by Bannister et al. (2017). The song features dreamy vocals, performed in Icelandic, with pounding drums increasing in tempo. The crescendo builds throughout, culminating in a wall of heavy, melodic guitars, singing and drums. Consistent with previous work, the selected

excerpt runs from 1:58 – 6:15 (4m 17s), and can be found at https://www.youtube.com/watch?v=Bz8iEJeh26E.

Song 5 (Chopin's Piano Concerto No.1 in E Minor). Song 5 was identified as an effective stimulus in a study by Colver and El-Alayli (2016). The piece selected is from Piano Concerto No. 1 in E minor, composed by Chopin. The piece features a full orchestra, with prominent strings, flutes and bassoons. The tempo quickens and builds to a crescendo, before slowing again. Consistent with previous work, the excerpt runs from 0:09 – 2:26 (2m 15s), and can be found at https://www.youtube.com/watch?v=LPa7jjeKVR4.

Appendix C

Intensity Ratings of ASMR and Frisson Stimuli.

Stimulus	Range	Mean (*SD*)
ASMR Video 1	1.00 – 10.00	6.04 (2.46)
ASMR Video 2	1.00 – 10.00	4.47 (2.34)
ASMR Video 3	1.00 – 9.00	5.08 (2.46)
ASMR Video 4	1.00 – 10.00	5.13 (2.61)
ASMR Video 5	1.00 – 10.00	6.45 (2.62)
Frisson Song 1	1.00 – 10.00	6.88 (1.95)
Frisson Song 2	1.00 – 10.00	6.18 (1.99)
Frisson Song 3	1.00 – 10.00	6.19 (2.37)
Frisson Song 4	1.00 – 10.00	5.94 (2.68)
Frisson Song 5	1.00 – 10.00	5.73 (2.22)

Note: $N = 100$.

Introduction to Chapter 5.

As discussed in Chapters 3 and 4, the modified Autonomous Sensory Meridian Response Scale functioned reliably in two undergraduate samples. However, across studies, a similar pattern emerged with respect to the distribution of scores on the ASMR-15 subscales, suggesting that Altered Consciousness experiences were less prevalent among both specialised and non-specialised participants. Given the apparent similarity between ASMR and a number of altered states and alterations of consciousness, we wanted to investigate the relationship between ASMR and other, established traits, including transliminality, unusual experiences, mindfulness, and body consciousness. As a result, the primary aim of the study concerned the examination of ASMR in relation to existing altered states of consciousness. In doing so, we also explored the relationships between the Altered Consciousness dimensions of ASMR and existing consciousness constructs.

In addition, self-reported ASMR propensity appeared to correlate significantly with responses to ASMR stimuli in a controlled setting. While very promising, it was unclear whether the modified ASMR measure adequately replicated the original ASMR scale. As a result, we also wanted to examine whether the modified ASMR measure would perform similarly to the non-contextualised ASMR scale, when administered to specialised, online ASMR communities. If the modified scale was found to perform equally well within a specialised sample, then it would be possible to have a single scale suited for use in diverse samples.

A final, exploratory aim of the study pertained to ASMR trigger preferences. As discussed in Chapters 1 and 3, ASMR preferences appear to be diverse and idiosyncratic. While we did not have any specific hypotheses, we wanted to explore whether there was an overlap between the dimensions of ASMR and common trigger preferences (e.g. if a

preference for close personal attention was related to greater Affective experiences, or if Altered Consciousness was associated with an endorsement of simulated interaction etc.).

Chapter 5

Autonomous Sensory Meridian Response: Altered States and Consciousness Correlates

Author Contribution: Natalie Roberts was responsible for the concept and design of the project, data analysis and write-up. Associate Professor Simon Boag provided supervision and gave input on the research question, study design, data analysis and manuscript preparation. Dr. Alissa Beath provided supervision and guidance on data analysis and manuscript revisions.

This paper is currently under review at the *Psychology of Consciousness: Theory, Research, and Practice.* Submitted as:

Roberts, N., Boag, S., & Beath. (2019). *Autonomous sensory meridian response: Altered states and consciousness correlates.* Manuscript submitted for publication.

Abstract

Autonomous Sensory Meridian Response (ASMR) is a multidimensional sensory-affective experience typically described as a head-oriented tingling sensation that occurs upon exposure to specific audiovisual triggers. While previous work has established the relationships between openness, absorption, and ASMR propensity (ASMR-15), the altered consciousness dimension of ASMR experiences remains relatively unexplored. As a result, this article explores the relationships between ASMR and a number of alterations of consciousness. Additional aims of the study were to assess the replicability of the factor structure of the modified ASMR-15 in a specialised sample, and to explore the relationships between common ASMR trigger preferences and dimensions of ASMR propensity. To achieve this, the ASMR-15 was administered to participants from Facebook (n = 201) and Reddit (n = 256) ASMR interest groups, alongside measures of transliminality, unusual experiences, mindfulness, and body consciousness. Additional items assessed participants' stimulus preferences from a list of common ASMR triggers. Qualitative and quantitative responses revealed significant variation in preferences across the sample. Correlational analyses indicated convergence between ASMR, transliminality, body consciousness, and unusual experiences, and divergence between the ASMR-15 and mindfulness scores. These findings open new avenues of ASMR exploration in relation to consciousness, specifically with respect to whether ASMR propensity reflects permeable mental boundaries.

Keywords: ASMR; Autonomous Sensory Meridian Response; Altered States of Consciousness; Mindfulness; Mental Boundaries

Autonomous Sensory Meridian Response (ASMR) is a pleasurable, head-focused tingling sensation, typically induced by exposure to specific audiovisual triggers, producing feelings of relaxation, comfort and euphoria (Roberts, Beath & Boag, 2018). Common triggers include whispering, soft speaking and tapping sounds (Barratt & Davis, 2015). However, ASMR preferences appear to be largely idiosyncratic, as evident in the variety of stimuli that people find elicit ASMR responses (Poerio, 2016). For instance, as of January 2019 over 18 million ASMR stimulus videos have been uploaded to YouTube, frequently structured around different, specific trigger preferences. As a relatively new phenomenon to researchers, there has been substantial recent interest in quantifying and inducing ASMR experiences. Through exploratory and experimental works, ASMR appears to be a unique, multidimensional experience, able to be manipulated and induced in a laboratory environment (Roberts et al., 2018; Chapter 3; Chapter 4). However, despite considerable evidence of an altered consciousness dimension to ASMR experiences (Roberts et al., 2018; Chapter 3; Chapter 4), there has yet been little attempt to explore this aspect of ASMR. As such, the present study aimed to explore ASMR propensity and other kinds of altered consciousness, including unusual experiences and boundary permeability.

Alongside significant online interest, there is increasing evidence suggesting that ASMR may be a relatively common experience. Early estimates were established at a public engagement event in London in 2014, where approximately half (53) of 91 people surveyed indicated that they had experienced some level of ASMR (Poerio, 2016). Although the representativeness of that sample is questionable due to the self-selective nature of the event, the increasing public interest in phenomena such as ASMR, ‘chills’, and other paresthetic experiences suggests that these are somewhat common among the general population. This position is supported by the findings of previous work (Chapter 3), which assessed the prevalence of multidimensional ASMR propensity among university students. ASMR was

quantified using the ASMR-15, a multifaceted self-report measure of ASMR propensity with four distinct subscales: Sensation, Affect, Relaxation and Altered Consciousness. A total of 186 non-specialised undergraduate psychology students received a contextualised version (i.e. suitable for participants without prior awareness of ASMR) of the ASMR-15 alongside the Big Five Inventory (BFI; John, Donahue & Kentle, 1991) and the Highly Sensitive Person Scale (HSPS; Aron & Aron, 1997). Of the sample, 16% indicated substantial agreement with more than half of the ASMR-15 items, suggesting a relatively frequent degree of self-reported ASMR propensity. Using the same criteria in a laboratory experiment, a higher prevalence (28%) of ASMR propensity were reported among a similar student sample (Chapter 4). There may, however, have been perceived pressure to respond more favourably in a laboratory environment, compared to an online setting, so the larger estimate should be taken tentatively.

Self-reported ASMR propensity appears to be related to a broad cluster of personality traits and unusual experiences, including flow, absorption (Roberts et al., 2018), and openness to experience (Chapter 3). In previous work (Roberts et al., 2018), the ASMR-15 was administered to 896 participants from the online community *ASMR: Sounds That Feel Good* (https://www.reddit.com/r/ASMR), alongside measures of anxiety (BIS; Carver & White, 1994), misophonia (Misophonia Assessment Questionnaire; Johnson, 2014), and absorption (Curious Experiences Scale; Goldberg, 1999). With respect to correlates, significantly higher levels of absorption were reported by participants who scored higher on the ASMR-15 total score, as well as Altered Consciousness and Affect subscales. Additionally, among a non-specialised student sample (Chapter 3), higher ASMR-15 scores were significantly correlated with greater Openness to Experience and sensory-processing sensitivity. Further, while the Altered Consciousness dimension of the ASMR-15 was significantly related to Openness, this effect was not observed for sensory-processing

sensitivity. This may suggest that the consciousness components of ASMR have less to do with sensitivity and may be more attributable to an openness to unusual experiences.

ASMR has demonstrated further convergence with openness, when ASMR was differentially assessed within self-identified samples. In a study by McErlean and Banissy (2017), scores on the BFI (John et al., 1991) were compared between a sample of 83 self-identified ASMR experiencers from a Facebook ASMR interest group, and 85 university student sex- and age-matched controls. The results revealed that ASMR participants scored significantly higher on Openness than controls. In a similar study (Fredborg, Clark & Smith, 2017), 290 self-identifying ASMR participants from Reddit, and 290 matched controls completed the BFI. ASMR participants completed an additional ASMR checklist, structured around common triggers. Comprising 14 items, the ASMR checklist assesses the recollection of responses to 14 ASMR triggers, including "watching someone draw" and "tapping sounds". Participants then endorsed the effectiveness of each item in inducing "tingles" on a Likert-scale from 0, "*no tingles"* to 6, "*the most intense ASMR experience"*. Higher ASMR checklist scores were correlated with significantly higher scores on Openness, and ASMR participants scored significantly higher on Openness compared to controls. However, since both studies relied on self-identifying participants and did not assess the experiential qualities of ASMR, the latter approach is significantly limited by the operationalisation of ASMR as a solely sensory experience. As a result, these approaches did not assay other dimensions of ASMR experience (i.e. affect, relaxation, altered consciousness), captured by the ASMR-15.

ASMR, Mindfulness, and Body Consciousness

Considering the evidence for the relationships between openness, flow, ASMR, and absorption, ASMR is likely to diverge from mindfulness. Reflection-oriented mindfulness is a state of awareness characterised by reflective, non-judgemental acceptance of thoughts, sensations, and feelings within the attentional field (Bishop et al., 2004; Sheldon, Prentice &

Halusic, 2015). By comparison, flow absorption involves a deep focus on a task, resulting in a loss of self-awareness, self-consciousness, and time (Sheldon et al., 2015; Dietrich, 2004). In support of this, Sheldon et al.'s (2015) three-part study assessed the relationship between flow absorption and mindfulness among university students. Across studies, mindfulness appeared to be experientially incompatible with flow absorption. More specifically, among 272 psychology students, trait mindfulness was negatively related to scores on the absorption facet of flow (FSS). Given the moderate convergence between scores on the ASMR-15, absorption and flow, Rheinberg et al.'s findings suggest a possible divergence between ASMR and reflective mindfulness (Roberts et al., 2018; Chapter 3).

However, in contrast to the findings above, Fredborg, Clark and Smith (2018) found a positive relationship between ASMR and mindfulness, as captured by the Toronto Mindfulness Scale (TMS; Davis, Lau, & Cairns, 2009) and Mindful Attention and Awareness Scale (MAAS; Brown & Ryan, 2003). Fredborg et al. (2018) administered the TMS, MAAS and a created ASMR Checklist to 284 self-identified ASMR experiencers on Reddit, and 279 age- and sex-matched controls from an internet recruitment company. ASMR participants scored significantly higher on the MAAS, compared to controls. Further, scores on the MAAS were positively correlated with "tingles" intensity scores across stimuli. Nevertheless, while Fredborg et al. (2018) found a relationship between mindfulness and ASMR scores, this association is substantially limited by the reduced scope of assessment, specifically, as mentioned earlier, in measuring ASMR as a solely sensory experience. In contrast, when capturing the affective, relaxation, altered consciousness, and sensory components of ASMR experiences, the ASMR-15 has demonstrated significant overlap with absorption, openness to experience and sensory-processing sensitivity, suggesting a common cluster of experiences somewhat divergent from trait mindfulness.

As there has been evidence of a relationship between awareness of internal bodily sensations and greater Openness (Ferentzi et al., 2016), it is also possible that the sensory components of ASMR are indicative of a greater awareness of bodily sensations, independent of mindfulness. A relevant related construct in this respect is private body consciousness, the tendency to focus on internal bodily sensations or tensions, including dryness of mouth, heart beating, and sensations of hunger (Miller, Murphy, & Buss, 1981). In an experimental study, Miller et al. (1981) assessed the relationship between self-reported interoception, as captured by the Private Body Consciousness Scale (PBC; Miller et al., 1981), and sensitivity to changes in body state. To test this, 188 undergraduate psychology students were recruited across three samples. High and low body consciousness groups were established based on pre-screening responses to the PBC. All participants were then asked to consume hot chocolate. To manipulate participants' physiological state, caffeine was added to the beverages of participants in the experimental condition, while control participants did not ingest caffeine. After 30 minutes, participants were asked to indicate their experience of 12 common bodily responses to caffeine (e.g. shakiness), on a 5-point Likert-scale from 1, *not at all,* to 5, *intensely*. Across genders, only participants who scored highly on private body consciousness reported significantly more bodily sensations as a result of ingesting caffeine. These findings emphasise the importance of private body consciousness in perceiving induced changes to bodily state (Miller et al., 1981). This suggests that while an awareness of ASMR sensations could be attributable to mindfulness, the effect may be confounded or better explained by a tendency towards interoception.

ASMR, Unusual Experiences and Mental Boundaries

Alternatively, as addressed above, ASMR may be more closely related to the unusual experiences associated with higher levels of trait Openness. In this respect, higher levels of Openness have been associated with a related perceptual phenomenon—synaesthesia—also

involving cross-modal sensory stimulation (Colizoli, Murre & Rouw, 2013). For example, a synaesthete may experience tastes or smells as a result of stimulation of another sensory modality (Colizoli et al., 2013). However, unusual experiences may also resemble schizotypy or psychotic symptoms, such as feeling as though you are being watched, hearing voices, and believing you are being followed (Hassanali, 2015). While ASMR does not appear to be associated with pathology, it is unclear whether ASMR propensity is associated with an increased tendency towards unusual experiences. One potential underlying explanation for both experiences relates to the permeability of mental boundaries.

Hartmann (1991) proposed a dimension of personality pertaining to boundaries between a broad range of processes in the mind, including feelings, thoughts and perceptions. The thinness or thickness of the boundaries are thought to determine the degree of interconnectedness between such mental phenomena (Cowen & Levin, 1995). For example, individuals with thinner boundaries frequently tend towards fantasy, such that reality and fantasy may merge (Hartmann, Harrison & Zborowski, 2001). Additionally, thin boundaries have been associated with deep immersion in daydreams and difficulties discerning thoughts from feelings (Sherwood & Milner, 2004; Rawlings, 2002). By contrast, individuals with thicker, or less permeable boundaries tend to focus on one thing at a time and have a more stable sense of self, in relation to their environment (Sherwood & Miller, 2004). In order to assess the broad concept of mental boundaries, Hartmann (1991) created a 145-item measure known as the Boundary Questionnaire (BQ). In an attempt to establish the underlying factors of thick and thin boundaries, Rawlings (2002) administered the BQ to 300 undergraduate psychology students. Through factor analysis, seven meaningful factors emerged, including Unusual Experiences, Mysticism, Sensitivity, and Need for Order. Within the Unusual Experiences subscale, items assessed a number of unusual sensory and cognitive experiences,

including synaesthesia, dreaming and fantasy, and appeared to represent a combination of high Openness and Neuroticism.

In support of the findings of Rawlings (2002), greater levels of openness and absorption appear to be related to thinner mental boundaries. For instance, in a study by McCrae (1994), the Boundary Questionnaire (BQ; Hartmann, 1991) was administered to 124 participants previously identified through a study on aging, alongside broad measures of personality including trait Openness (NEO-PI; Costa & McCrae, 1985). A moderate-to-strong correlation was observed for scores between Openness and the BQ total score. Moreover, thinner boundaries were significantly correlated with all facets of Openness, most notably Aesthetics, Feelings, and Openness to Fantasy (McCrae, 1994). It is important to note here, as well, that these dimensions of Openness most closely relate to absorption, providing further support for the link between absorption and thinner mental boundaries (McCrae, 1994; Silvia, Fayn, Nusbaum, & Beaty, 2015). Due to the cluster of common phenomena, this raises questions as to whether ASMR propensity could be related to, or considered an artefact of, thinner mental boundaries.

ASMR and Transliminality

Sharing significant features with Hartmann's (1991) concept of mental boundaries, higher levels of transliminality may represent a form of thin boundary between levels of consciousness (Sherwood et al., 2004) and the external environment (Thalbourne & Maltby, 2008). Comprising the words "trans" (cross) and "limen" (threshold; Sherwood & Milner, 2004), transliminality has been defined as the hypersensitivity towards, and tendency for, psychological material to transcend the threshold of conscious awareness (Lange, Thalbourne, Houran, & Storm, 2000; Thalbourne & Maltby, 2008). In this instance, "threshold" refers to a doorway or gateway (Sherwood et al., 2004), as opposed to a level of stimulation, such that transliminality represents an "ungatedness" (Thalbourne & Maltby,

2008, p. 1618) or lack of separation between mental processes (Thalbourne, 1996). Transliminality appears to share some common features with ASMR experiences. For instance, highly transliminal individuals are more prone to fantasy, absorption, and hyperesthesia, or a heightened sensitivity to sensory stimulation (Sherwood & Milne, 2004; Thalbourne, 1996).

Originally formed as a composite of other measures of unusual traits and experiences, including absorption, magical ideation, paranormal and mystical beliefs, creativity, and manic experiences, the Revised Transliminality Scale (RTS; Lange, et al., 2000) was administered to 318 participants within a convenience sample (Lange et al., 2000). Through an examination of the hierarchy of transliminality items, it was revealed that lower to moderate levels of transliminality were characterised by fantasy proneness and ambiguous perceptions, including paranormal beliefs (Lange et al., 2000). Higher levels of transliminality were associated with stronger forms of the latter (i.e. cosmic enlightenment; receiving wisdom to communicate with humanity), including more intense sensory experiences (i.e. being overwhelmed by smells; being bothered by the brightness of indoor lights). Moreover, in a recent study (Evans, Lange, Houran & Lynn, 2018), 577 undergraduate students completed the RTS alongside additional measures of unusual traits, experiences, and clinical symptomatology. Moderate-to-strong, positive correlations were again found between transliminality, absorption, and mystical-type experiences, as well as dissociation and unusual perceptual phenomena. Consistent with expectations, transliminality appears to reflect a permeability of boundaries, and may affect an individual's conscious experience beyond beliefs, by altering the perceptual thresholds that govern one's interactions with the world (Lange et al., 2000).

Transliminality has also been explored in relation to synaesthesia, an experience that shares many features with ASMR, including a blending of sensory experience and a tendency

towards greater openness (Banissy et al., 2013). In a two-part correlational study, Thalbourne, Houran, Alias and Brugger (2001) assessed the relationship between transliminality (RTS) and self-reported synaesthesia, using a modified version of the Tellegen Absorption Scale (Tellegen & Atkinson, 1974). Across both samples, 357 participants were recruited, including 115 participants with a history of panic attacks, and their support givers, and 242 undergraduate psychology students. Synaesthesia and transliminality were significantly, moderately correlated in both samples, providing support for the theory of increased connectedness, or fluidity between mental processes (McCrae, 1994). However, it should be noted that some overlap in constructs may be attributable to the common absorption dimension across measures.

Aims of the Present Study

In addition to the common ties to openness, absorption, and unusual perceptual experiences, ASMR propensity appears to share numerous conceptual similarities with transliminality, body consciousness, and thin mental boundaries. Given that ASMR is a highly individualised experience (Poerio, 2016), it remains unclear whether individual differences in alterations of consciousness relate to ASMR propensity, and the relationships between trigger preferences and facets of ASMR experiences. As a result, the aims of the present study were to assess the relationships between ASMR and a number of alterations of consciousness, to understand the extent to which ASMR propensity may reflect permeable boundaries and a tendency towards unusual experiences. This study further aimed to examine the replicability of the factor structure of the modified ASMR-15, when administered again to a specialised sample. Given the diversity in preferences for ASMR stimuli (e.g. simulated interaction, tapping, whispering), as well as the varied endorsement of ASMR-15 subscales across samples, a final aim was to assess whether preferences for common ASMR triggers were related to particular facets of ASMR experience (i.e. ASMR-15 subscales) and

consciousness correlates. It was hypothesised that higher scores on the ASMR-15 and Altered Consciousness subscale would be associated with a greater propensity towards transliminality, unusual experiences, and body consciousness. In line with the relationship between ASMR and absorption, although contrary to previous findings (Fredborg et al., 2018), it was expected that ASMR propensity would be negatively associated with mindfulness. As the aim to investigate trigger preferences was exploratory, no specific hypotheses were generated regarding whether specific trigger preferences would be associated with ASMR-15 scores.

Method

Participants

Participants were English-speaking adults recruited via advertisements posted on two websites. The survey was first posted on the subReddit forum *ASMR: Sounds That Feel Good* (https://www.reddit.com/r/asmr/), which "was created to share videos that elicit this sensation (either intentionally or unintentionally), as well as discuss and try to understand this fascinating physical reaction". The survey was secondarily hosted on the Facebook group *ASMR Discussion and Research Forum* (https://www.facebook.com/groups/researchasmr/), which was formed "to connect people who experience ASMR, allow researchers to find other academics and willing subjects, and to serve as a forum to discuss ASMR in general". The flyers advertised participation in an online research study exploring the relationships between ASMR, anomalous experiences, and altered states of consciousness.

In total, 457 participants consented to participate in the study, including 173 males (43.3%) and 216 females (54.0%), between 18 and 79 years (M = 29.21; SD = 9.25). Of these, 256 participants were sourced via Reddit, and an additional 201 participants were recruited through Facebook. 384 participants completed the ASMR-15, comprising 171 males (43.0%) and 216 females (54.3%), between 18 and 79 years (M = 29.21; SD = 9.27).

318 participants completed the entire battery of instruments, with 139 males (43.7%) and 169 females (53.1%), between 18 and 72 years (M = 29.41; SD = 9.07). This was the final sample size that will be reported throughout the results.

Participants were sourced from 34 countries, grouped into six regions (i.e. Australia & New Zealand, Canada, United Kingdom, United States, Europe, Other), with 56.6% of participants residing in the United States. Twenty-two countries were included within "Europe" (i.e. Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Montenegro, Norway, Poland, Portugal, Romania, Scotland, Spain, Sweden, The Netherlands). Due to low frequency, 13 countries were grouped under "Other" (i.e. Algeria, Argentina, Chile, Israel, Japan, Libya, Malaysia, Mexico, Pakistan, South Korea, The Philippines, United Arab Emirates, Uruguay). The most frequent categories of educational attainment were "Bachelor's degree" (33.3%; n = 106) and "Some college/university" (31.8%; n = 101).

Instruments

Demographic Questionnaire. Participants completed a brief 4-item demographic questionnaire, assessing age, gender, country of residence, and highest level of academic attainment.

Autonomous Sensory Meridian Response Scale (ASMR-15). The ASMR-15 is a 15-item multidimensional measure of ASMR propensity, with 4 identified subscales: Affect (3 items), Altered Consciousness (4 items), Sensation (5 items) and Relaxation (3 items). Participants are asked to indicate their level of agreement with each item on a 5-point Likert scale from 1, *completely untrue for me,* to 5, *completely true for me.* Total scores are calculated as the averaged sum of item scores, producing a possible total score range from 15 to 75. Higher scores on the ASMR-15 demonstrate greater ASMR propensity. In previous work on specialised samples (Chapter 3), the ASMR-15 items followed the statement "When

I experience ASMR…". The specialised ASMR-15 has evidenced good reliability in previous work, recording a Cronbach's alpha of .77 as a total score measure.

In order to validate the ASMR-15 on non-specialised participants, a contextualised version of the ASMR-15 was utilised in previous work (Chapter 3). To contextualise the experience of interest, participants were presented with the following statements:

> "This survey is looking at how certain stimuli affect you. Some individuals experience intense physical and emotional responses upon hearing particular sounds. These sensations and feelings can be pleasant or unpleasant. Sounds such as whispering, crackling, tapping or scratching may produce particular experiences described below. Using the scale, please indicate your level of agreement with each statement, upon hearing any of these, or similar sounds."

Participants were then asked to indicate their level of agreement with each item, following the statement "When I hear certain sounds, such as whispering, crinkling, tapping...". The contextualised ASMR-15 evidenced excellent reliability in previous work on non-specialised participants, recording a total score Cronbach's alpha between .92 and .93 (Chapter 3; Chapter 4). The contextualised ASMR-15 was utilised in the present study in order to establish the validity of the modified instrument in a specialised sample. In the present study, the ASMR-15 total score achieved an alpha of .88. For subscale reliabilities in the present, and previous work, see Table 1.

Table 1.

Study and Literature Reliability (Cronbach's Alpha) of ASMR-15 and Subscales

Instrument and Subscale	Sample 1 α (items)	Sample 2 α (items)	Sample 3 α (items)	Study α (items)
ASMR-15	0.78 (15)	0.93 (15)	0.92 (15)	0.88 (15)
Sensation	0.72 (5)	0.87 (5)	0.84 (5)	0.81 (5)
Altered Consciousness	0.82 (4)	0.88 (4)	0.88 (4)	0.87 (4)
Relaxation	0.74 (3)	0.88 (3)	0.84 (3)	0.83 (3)
Affect	0.74 (3)	0.93 (3)	0.93 (3)	0.82 (3)

Note. $N = 398$ for present study. Sample 1 ($N = 896$; Roberts et al., 2018) were specialised participants, Sample 2 ($N = 185$; Chapter 3) and Sample 3 ($N = 100$; Chapter 4) were non-specialised participants.

Mindful Attention and Awareness Scale (MAAS; Brown & Ryan, 2003). The MAAS is a 15-item measure of awareness and attention in every day experiences. Items are framed in terms of *mindlessness* (the opposite of *mindfulness*), on a 6-point Likert scale from 1, *almost always,* to 6, *almost never*, with higher scores indicating greater mindfulness. Participants are asked to indicate how frequently or infrequently they have particular experiences, and are encouraged to answer what accurately reflects their experience, rather than what they think their experience should be. Example items include "I find it difficult to stay focused on what's happening in the present" and "I rush through activities without being really attentive to them". Higher scores indicate greater dispositional mindfulness, with total scores calculated as the averaged sum of item scores. In previous work, the MAAS demonstrated good test-retest reliability (.81, $p < .0001$; Brown & Ryan, 2003). For all reliabilities, see Table 2.

Table 2

Study and Literature Reliability (Cronbach's Alpha) of Measures

Instrument	Literature α (items)	Study α (items)	Range	Mean (*SD*)
MAAS	0.89 (15)	0.85 (15)	1.87 – 5.93	3.80 (0.81)
UE	0.80 (12)*	0.77 (11)	11.00 – 51.00	25.48 (8.23)
RTS	0.82 (17)**	0.77 (17)	0.00 – 17.00	7.42 (3.59)
PBCS	0.70 (5)	0.70 (5)	5.00 – 25.00	18.46 (3.68)

Note. $N = 318$. MAAS = Mindful Attention and Awareness Scale; UE = Unusual Experiences Scale; RTS = Revised Transliminality Scale; PBCS = Private Body Consciousness Scale; *The UE scale utilised by Rawlings (2002) contained an extra item that was removed from the present study, due to ethical concerns; **Previous work utilised the 29-item RTS, but only scored the 17-items.

Unusual Experiences Subscale (UE; Rawlings, 2002; from Hartmann's Boundary Questionnaire, 1991). The Unusual Experiences Scale is a 12-item subset of items from Hartmann's (1991) 145-item Boundary Questionnaire (BQ). The BQ assesses individual differences in the thinness or thickness of the mental boundaries that structure consciousness (Rawlings, 2002). Participants are encouraged to answer quickly and rate the accuracy of each item on a 5-point Likert scale from 0, *not at all true of me,* to 4, *very true of me*. The total measure evidenced good test-retest reliability in previous work ($r = .87$; Funkhouser, Würmle, Cornu, & Bahro, 2001).

Through factor analysis, Rawlings (2002) identified 7 factors within the BQ, including: Unusual experiences, need for order, childlikeness, perceived competence, trust, sensitivity, and mysticism. The Unusual Experiences (UE) subscale assesses unusual cognitive or sensory experiences, including synaesthesia, dreams, and fantasy. Example items include: "Things around me tend to change their size and shape" and "my dreams are so vivid that even later I can't tell them from waking reality". Total scores are calculated as the sum

of item scores, with higher scores indicating a greater tendency towards having unusual experiences, as a result of thinner mental boundaries. The item "I have dreams, daydreams, nightmares in which my body or someone else's body is being stabbed, injured, or torn apart" was omitted from the present study due to ethical concerns. The UE subscale evidenced good reliability in previous work (α = .80; Rawlings, 2002). Reliability in the present study was acceptable, α = .77.

Revised Transliminality Scale (RTS; Lange et al., 2000). The RTS is a 17-item dichotomous measure of transliminality, or the degree of separateness of mental processes. Higher transliminality scores indicate a greater tendency for psychological material to enter in and out of conscious awareness (Lange et al., 200). Example items include "Often I have a day when indoor lights seem so bright that they bother my eyes" and "I sometimes have a feeling of gaining or losing energy when certain people look at me or touch me". Participants are asked to indicate the truthfulness of each statement as either 1, *true* or 0, *false.* Total scores are calculated as the sum of item scores, producing a possible range between 0 and 17. In previous work, the RTS demonstrated good test-retest reliability (r = .88, p <.001; Thalbourne, 2000). In addition, the RTS evidenced good internal consistency in the present (α = .77) and previous work (α = .82; Lange et al., 2000).

Private Body Consciousness Subscale (PBCS; Subscale of the Body Consciousness Questionnaire; Miller, Murphy & Buss, 1981). The Private Body Consciousness Subscale (PBCS) is a 5-item subscale of the Body Consciousness Questionnaire (BCQ), assessing the tendency to focus on internal bodily sensations. Example items include "I am sensitive to internal bodily tensions" and "I can often feel my heart beating". Participants are asked to indicate how characteristic each statement is of them, on a 5-point Likert scale from 0, *extremely uncharacteristic* to 4, *extremely characteristic.* Total scores for the PBCS are calculated as the sum of item scores, with a possible range between 0 and 20. Higher scores

on the PBCS indicate a greater awareness of internal sensations. The PBCS has demonstrated good internal consistency in previous work (α = .70), and excellent test-retest reliability (*r* = .85; Fabbri, Kapur, Wells & Creed, 2001). Present work α = .70.

Trigger Preferences Questionnaire. Participants were asked to select their three most effective ASMR triggers from a list of 11 common triggers. It was specified that participants were only to select three triggers to better understand their "preferences", and did not intend to capture all of the stimuli that may be effective for them. In addition, given the frequency of dual-trigger delivery and preferences in ASMR stimuli (Barratt, Smith, & Davis., 2017), it may not have been ecologically valid to ask participants to individually rank triggers as discrete stimuli. The triggers were sourced from a study by Poerio, Blakey, Hostler and Veltri (2018). The common triggers included: soft speaking, whispering, close personal attention, having your hair played with or brushed, getting a haircut, simulated interaction with your face or head, tapping sounds, watching people do things in a careful way, water or fluid sounds, lip smacking, and eating sounds. Following this, an optional free response question was posed, inviting participants to name another particularly effective trigger that was not listed.

Procedure

This study was approved by, and conducted in accordance with the requirements of the Macquarie University Human Research Ethics Committee. The questionnaire was hosted through Qualtrics (https://mqedu.qualtrics.com), and when opened, participants were presented with an online Participation Information and Consent Form, the demographics items, the Autonomous Sensory Meridian Response Scale (ASMR-15), Mindful Attention and Awareness Scale (MAAS), Unusual Experiences Scale (UE), Revised Transliminality Scale (RTS), Private Body Consciousness Scale (PBCS), and Trigger Preferences Questionnaire, in that order. The ASMR-15 was included first to maximise the number of

completed cases in the event of participant attrition, so as to allow for confirmatory factor analysis and reliability analyses. The study employed a forced response format, with the selection of a minimum age of 18 required for progression through to survey items. The questionnaire was hosted on Reddit at *r/ASMR: Sounds That Feel Good* and the Facebook group *ASMR Discussion and Research Forum*. After 4 weeks, data collection ceased as sign-ups reduced to less than one per day.

Results

Quantitative Data Analysis

The data were downloaded from Qualtrics (https://mqedu.qualtrics.com) and analysed using the Statistical Package for Social Sciences (SPSS), Version 25.0. Prior to univariate analyses, a confirmatory factor analysis was undertaken in Amos (Version 25.0), to assess the replicability of the factor structure of the modified ASMR-15 measure, in a specialised sample. Following this, reliability and correlational analyses were performed on all scales and subscales. A regression analysis was performed to assess the extent to which ASMR scores could be accounted for by existing consciousness constructs. A series of *t*-tests and ANOVAs were performed to determine the mean differences in ASMR scores across demographic variables. Additionally, due to the exploratory nature of the work, the large sample size which awards high statistical power, and the large number of correlations, we have adopted a more conservative significance level for all correlations at $p = .01$.

Confirmatory Factor Analysis and Reliability

As the modified ASMR-15 had previously only been validated on non-specialised samples, a confirmatory factor analysis was undertaken in order to assess the replicability of the model fit among specialised participants. While the chi square statistic for the overall model was significant, all other model fit indices supported the fit of the model in the sample:

χ^2 (82, N = 384) = 177.983, p < .001, CFI = .97, TLI = .96), RMSEA = .05 (Hu & Bentler, 1999).

Reliability Analyses. Reliability statistics were considered in line with the recommendations of George and Mallery (2003), where an alpha of .70 demonstrates good internal consistency. The ASMR-15 and subscales all achieved good to excellent reliability. These values were improved from the last assessment utilising a specialised sample (Roberts et al., 2018).

Scale Means and Frequencies.

The distribution of ASMR-15 and subscale scores were examined alongside the existing measures. Only 1% of the sample (n = 4) had an ASMR-15 score of 1, indicating the selection of the lowest score across items. This proportion differed across the Affect (2.3%), Sensation (2.8%), Relaxation (1.8%) and Altered Consciousness (11.6%) subscales. The findings were comparable to those seen in previous work (Chapter 2). For a comparison of ASMR-15 and subscale means across samples, see Table 3. The means, standard deviations and ranges of scores on the RTS, MAAS, UE, and PBCS can be seen in Table 2.

Table 3

Study and Literature ASMR-15 and Subscale Means

	Study		Literature		
Instrument and Subscale	Range	Mean (*SD*)	Range	Mean (*SD*)	*d*
ASMR-15 total score	1.00 – 5.00	3.86 (0.70)	1.00 – 5.00	3.72 (0.53)	0.24
Sensation	1.00 – 5.00	4.10 (0.85)	1.00 – 5.00	4.06 (0.74)	0.05
Altered Consciousness	1.00 – 5.00	2.80 (1.17)	1.00 – 5.00	2.44 (1.02)	0.34
Relaxation	1.00 – 5.00	4.49 (0.76)	1.00 – 5.00	4.48 (0.63)	0.01
Affect	1.00 – 5.00	4.16 (0.89)	1.73 – 5.00	4.09 (0.79)	0.09

Note. $N = 384$ for present study; $N = 896$ for Literature. Literature analyses were conducted on a specialised ASMR sample (Roberts et al., 2018).

To assess the relative prevalence of higher levels of ASMR propensity, the frequency of '4' (*somewhat* true) or '5' (*completely* true) responses to ASMR-15 items were explored. In total, 85.6% of the sample selected '4' or '5' for more than half (8 out of 15) of the ASMR-15 items. However, differences were observed across subscales. The overwhelming majority of participants indicated substantial agreement with more than half of the Sensation (90.4%) and Relaxation (94.1%) items. A further 82% of the sample selected '4' or '5' for more than half of the Affect items, while only 29.4% indicated strong agreement with most of the Altered Consciousness items. See Tables 1 and 2 (Appendix A) for all frequencies.

Demographic Factors. Scores on the ASMR-15 did not correlate with age ($r = -.010$, $p = .850$), however, a significant, medium-sized gender difference was found, in that females scored significantly higher than males. There did not appear to be a significant difference in ASMR scores across levels of educational attainment. However, a significant main effect of region was found across ASMR scores, with the highest mean observed for participants from

the United Kingdom, and the lowest from Australia and New Zealand (M = 3.17; SD = 0.91). Bonferroni-adjusted post-hoc contrasts revealed mean ASMR scores were significantly lower in Australia and New Zealand compared to those from Canada (p = .007), Europe (p = .003), United Kingdom (p < .001) and the United States (p < .001).

A significant, medium-sized difference in ASMR scores was observed across website of recruitment, with participants from Reddit scoring lower than those from Facebook. Specifically, Facebook participants scores significantly higher than Reddit on Affect (t(393) = - 4.161, p < .001; d = -.41), Sensation (t(393) = - 3.082, p = .002; d = -.31), and Altered Consciousness (t(392) = - 6.310, p < .001; d = -.64). No significant differences were found in the Relaxation subscale (t(390) = - 1.921, p = .055; d = -.20).

In examining the demographic differences of each sample, it was found that Facebook participants (M = 32.64; SD = 9.82) were significantly older (t(393) = -7.211, p < .001; d = -.73) than those recruited through Reddit (M = 26.27; SD = 7.71). Further, Facebook participants scored significantly higher on body consciousness (M_{Reddit} = 17.58; SD = 3.65; $M_{Facebook}$ = 19.50; SD = 3.45; t(310) = - 4.757, p < .001; d = -.54), transliminality (M_{Reddit} = 6.40; SD = 3.32; $M_{Facebook}$ = 8.54; SD = 3.56; t(283) = - 5.234, p < .001; d = -.62), and were more prone to unusual experiences (M_{Reddit} = 24.51; SD = 8.13; $M_{Facebook}$ = 26.72; SD = 8.18; t(318) = - 2.413, p = .016; d = -.27), than Reddit participants. No significant difference in mindfulness scores were observed across websites (t(301) = .216, p = .829; M_{Reddit} = 3.81; SD = .77; $M_{Facebook}$ = 3.79; SD = .87). For mean ASMR-15 scores across demographic variables, see Table 4.

Table 4

Means and Frequencies of Demographic Variables for the ASMR-15

Variable	Frequency (%)	ASMR-15 Mean (*SD*)	*t*-statistic / *F* statistic	*d*
Gender			-4.74**	-0.50
Male	164 (42.7%)	3.66 (.75)		
Female	209 (54.4%)	4.00 (.63)		
Level of Education			1.16	
Some High School	9 (2.3%)	3.67 (.71)		
High School or Equivalent	36 (9.4%)	3.90 (.59)		
Some College	123 (32.0%)	3.92 (.72)		
Associate's Degree	18 (4.7%)	4.16 (.40)		
Bachelor's Degree	132 (34.4%)	3.77 (.75)		
Master's Degree	56 (14.6%)	3.80 (.68)		
Doctoral Degree	5 (1.3%)	4.05 (.52)		
Other	5 (1.3%)	3.89 (.42)		
Country of Residency			5.220**	
Australia and New Zealand	19 (4.9%)	3.17 (.91)		
Canada	22 (5.7%)	3.93 (.66)		
Europe	72 (18.8%)	3.83 (.52)		
United Kingdom	48 (12.5%)	4.03 (.55)		
United States	208 (54.2%)	3.90 (.71)		
Other	15 (3.9%)	3.58 (.98)		
Site			- 5.224**	-0.53
Reddit	204 (53.1%)	3.69 (.67)		
Facebook	180 (46.9%)	4.05 (.68)		

$N = 384$. ** $p < .001$.

Mindfulness, Unusual Experiences, Transliminality, and Body Consciousness. Correlational analyses were undertaken to explore the relationships between ASMR-15 and subscale scores, and consciousness correlates. Higher ASMR total scores were moderately correlated with transliminality, and weakly with a greater tendency towards unusual experiences. ASMR propensity also correlated weakly with significantly lower mindfulness, and higher body consciousness scores.

Of the ASMR-15 subscales, Affect was associated with significantly greater body consciousness, transliminality, and more unusual experiences. A relationship was found between scores on Sensation and body consciousness and also transliminality. Importantly, higher Altered Consciousness scores were significantly correlated with transliminality, body consciousness, and an increased tendency towards unusual experiences. A negative relationship was found between Altered Consciousness and mindfulness. No significant relationships were found between Relaxation and mindfulness, transliminality, unusual experiences, or body consciousness. For all correlations, see Table 5.

Partial Correlations. Due to the significant sample differences, partial correlations were run to assess the role of website on the relationships between ASMR-15 scores and consciousness correlates. Once website was controlled for, the relationships between the PBCS and ASMR-15 (r = .093, p = .147), Affect (r = .080, p = .213), Sensation (r = .079, p = .220), Relaxation (r = -.001, p = .990), and Altered Consciousness (r = .091, p = .155) subscales were nullified.

By contrast, Unusual Experiences remained significantly correlated with the ASMR-15 (r = .223, p < .001) and Altered Consciousness subscale (r = .290, p < .001). However, Affect (r = .137, p = .033) was no longer significantly correlated at the .01 level. Similarly, ASMR and the MAAS (r = -.221, p = .001) remained significantly negatively correlated when website was partialled out, while the negative relationship between mindfulness and

Altered Consciousness strengthened (r = -.239, p < .001). All relationships between the RTS and ASMR (r = .292, p < .001), Affect (r = .219, p = .001), Sensation (r = .204, p = .001), and Altered Consciousness (r = .331, p < .001) remained significant.

Additionally, the relationships between consciousness correlates were examined. Body Consciousness remained significantly correlated with Unusual Experiences (r = .199, p = .002), and Transliminality (r = .330, p < .001). Further, the correlations between the UES and MAAS (r = -.410, p < .001), UES and RTS (r = .506, p < .001), and MAAS and RTS (r = -.203, p = .001) were strengthened when website was partialled out.

Table 5

Correlations Between the ASMR-15, Subscales and Measures

Measure	AC	S	R	A	MAAS	UE	RTS	PBCS
ASMR-15	.774**	.782**	.577**	.802**	-.206**	.261**	.372**	.207**
AC		.309**	.292**	.458**	-.212**	.324**	.404**	.187**
S			.370**	.631**	-.106	.097	.244**	.168**
R				.417**	-.026	.079	.087	.021
A					-.139*	.166**	.289**	.166**
MAAS						-.408**	-.177**	-.054
UE							.497**	.205**
RTS								.395**

Note. N = 308. AC = Altered Consciousness; S = Sensation; R = Relaxation; A = Affect. **p =.01, *p =.05. MAAS = Mindful Attention and Awareness Scale; UE = Unusual Experiences Scale; RTS = Revised Transliminality Scale; PBCS = Private Body Consciousness Scale.

Regression Analysis. A regression model was fit to predict ASMR-15 total scores from the combination of individual differences measures (RTS, MAAS, PBCS, UE). The overall regression model was significant ($F(4, 239) = 10.904$, $p < .001$), an R^2 of 15.4%, which, although considered a medium sized effect (Cohen, 1988), demonstrates that the large majority of variance in ASMR scores is not captured by the combination of these existing consciousness measures. Only transliminality (*B* (SE) = .056 (.014), β = .299, $p < .001$) was found to be a significant independent predictor of ASMR, with a positive moderate effect. Body consciousness (*B* (SE) = .007 (.012), β = .038, $p = .558$), mindfulness (*B* (SE) = -.108 (.055), β = -.128, $p = .050$), and unusual experiences (*B* (SE) = .004 (.006), β = .047, $p = .530$) were non-significant independent predictors.

Due to the conceptual similarities between Altered Consciousness and existing consciousness constructs, an additional regression was run to predict the Altered Consciousness subscale. A significant overall regression model ($F(4, 244) = 14.010$, $p < .001$) was found for the explanatory value of existing consciousness constructs on Altered Consciousness scores. However, the proportion of variance was relatively small, but nevertheless represented a moderate effect ($R^2 = .187$). Transliminality (*B* = .096, *SE B* = .23, β = .297, $p < .001$) was found to be the only independently significant predictor of the altered conscious dimension of ASMR experiences, with a fairly weak effect.

Trigger Preferences. At the end of the questionnaire, participants were asked to select the three most effective triggers from a list of eleven common triggers (Poerio et al., 2018). “Close personal attention” was the most frequently endorsed, selected by almost half the sample, followed by “watching people do things in a careful way” and “whispering”. By contrast, “lip smacking” and “water or fluid sounds” were less popular, selected by approximately one tenth of participants, while “eating sounds” were the least favoured overall, endorsed by less than 5% of the sample. For all frequencies, see Table 6.

Table 6

Frequency of Trigger Preferences

Trigger	Frequency (%)
Close Personal Attention	158 (49.7%)
Watching People do Things in a Careful Way	137 (43.1%)
Whispering	126 (39.6%)
Soft Speaking	120 (37.7%)
Simulated Interaction with Your Face or Head	105 (33.0%)
Having Your Hair Played with or Brushed	91 (28.6%)
Tapping Sounds	87 (27.4%)
Getting a Haircut	45 (14.2%)
Lip Smacking	33 (10.4%)
Water or Fluid Sounds	28 (8.8%)
Eating Sounds	14 (4.4%)

Note: $N = 318$.

A free-text response was included for the nomination of any additional effective triggers. Nearly half of the sample provided at least one additional trigger ($n = 157$; 49.37%), including auditory, visual, tactile and non-sensory stimuli. Audio or audiovisual triggers were the most frequently reported, including scratching sounds ($n = 6$) and brushing sounds ($n = 5$). Additionally, specific auditory techniques were cited by participants, including ear techniques ($n = 10$) and binaural sounds ($n = 4$). Visual triggers were also prevalent, including light play ($n = 13$) and hand movements ($n = 5$). A smaller subset of the sample endorsed tactile triggers, such as massages ($n = 2$), while other participants nominated

triggers that did not require external input, including taking surveys (n = 4) and experiencing empathy (n = 1).

Correlational analyses were undertaken to assess the relationships between trigger preferences, ASMR and subscale scores, and consciousness correlates. No significant correlations were found between the ASMR-15 total score, body consciousness, and trigger preferences. Further, no significant relationships were found between Affect and Sensation scores and trigger preferences. A small, significant correlation was found between Altered Consciousness and a preference for close personal attention (r = .151, p = .007). For details on all trigger preferences listed, and correlations between trigger preferences and other study measures, see Appendix E.

Discussion

The aims of the present study were to: (i) assess the relationships between ASMR and a number of alterations of consciousness, and (ii) to understand the extent to which ASMR propensity may reflect thin mental boundaries and a tendency towards unusual experiences. Further aims of the work were to establish the replicability of the factor structure of the modified ASMR-15 when administered to a specialised ASMR sample, and to assess the relationships between trigger preferences and dimensions of ASMR experience. To achieve this, the ASMR-15, BQ, RTS, MAAS, PBC and a newly created trigger questionnaire were administered to ASMR participants on Reddit and Facebook. Despite substantial sample differences, greater ASMR propensity appears to reflect a tendency towards more permeable mental boundaries, unusual experiences, interoception, and greater mindlessness. Additionally, the ASMR-15 appears to be a valid and reliable measure of ASMR propensity.

Overall, ASMR appears to be related to, yet largely unaccounted for by several existing consciousness constructs. Specifically, regression analyses revealed that mindfulness, body consciousness, unusual experiences, and transliminality only account for

15% of variance in ASMR propensity. Nevertheless, there appears to be significant overlap between ASMR-15 total score and subscale scores with existing measures. Consistent with expectations, ASMR appears to be moderately, significantly related to transliminality, and weakly correlated with unusual experiences, and body consciousness. Additionally, ASMR appears to be weakly negatively related to trait mindfulness, diverging from the findings of Fredborg et al. (2018). As developed in the introduction, one possible explanation for this is a latent absorption tendency underlying ASMR experiences, which is seemingly incompatible with trait mindfulness. Alternatively, the discrepancy in findings may reflect the differences in the operationalisation of ASMR propensity across studies. In line with the expectations of Sherwood et al. (2004), Unusual Experiences was significantly, moderately related to transliminality, providing support for the common "thin" boundary hypothesis underlying both phenomena. Interestingly, mindfulness was also significantly, moderately and negatively correlated with unusual experiences. Taken together, these findings may provide further support for ASMR being an immersive experience reflective of mental interconnectedness, rather than a state of mindful, present awareness.

ASMR-15 subscales were also differentially related to consciousness correlates. Individuals with greater propensity to Sensory and Affective experiences also have a slight tendency towards unusual experiences. Additionally, higher scores on Affect were weakly, positively related to transliminality. Although these associations were relatively modest, greater affective experiences may be consistent with having permeable boundaries. For instance, Thalbourne and Maltby (2008) noted that affect may comprise the "psychological material" (p. 1618) that crosses the threshold of awareness. That is, affective stimuli may also permeate thinner mental boundaries more easily. It is therefore possible that individuals prone to transliminality would be more sensitive to affective material within ASMR stimuli.

Additionally, Affect was also weakly correlated with body consciousness, suggesting a tendency towards heightened bodily affective experience.

Surprisingly, Relaxation appeared unrelated to all consciousness correlates. While it is unclear whether Relaxation reflects a less atypical dimension of ASMR experiences, it would appear that high levels of Relaxation are a frequent experience among this sample. For instance, almost 80% of the sample indicated agreement or strong agreement with all Relaxation items. This lack of spread in scores may limit the conclusions able to be drawn. However, as Relaxation appears to be an almost universal facet of ASMR experiences, it may be difficult to assess through self-report alone. Future work employing physiological markers of arousal and relaxation, alongside the ASMR-15, may help to clarify the role of self-reported relaxation among ASMR experiencers.

Consistent with previous work (Roberts et al., 2018; Chapter 4), Altered Consciousness appears to be the least frequently endorsed dimension of ASMR experiences. In this study, less than a third of the sample indicated agreement with a substantial level of Altered Consciousness items, while Affect, Sensation and Relaxation subscales were all strongly endorsed by over 80-90% of participants. However, in comparing the present mean for Altered Consciousness (M = 2.80; SD = 1.17) to that found in previous work utilising a Reddit sample (Roberts et al., 2018; N = 896; M = 2.44; SD = 1.02), Altered Consciousness nevertheless appears to be a consistent and valid, albeit less common dimension of ASMR experiences. Further, and consistent with expectations, Altered Consciousness significantly correlated with all consciousness constructs. Specifically, body consciousness, transliminality, mindfulness, and unusual experiences accounted for 19% of variance in Altered Consciousness scores. Most notably, Altered Consciousness appears to share significant, moderate overlap with Transliminality and Unusual Experiences. This again

suggests that permeable mental boundaries may be particularly helpful for explaining the propensity towards altered consciousness seen in ASMR experiences.

Contrary to expectations, there were few significant relationships between ASMR subscales and trigger preferences. For instance, it was anticipated that higher scores on Affect may be related to more emotionally-laden or people-centric trigger preferences. However, only a small, significant relationship was found between Altered Consciousness and a preference for close personal attention. Close personal attention stimuli frequently feature direct interaction with the camera in a point-of-view fashion, creating an immersive experience by blending viewer and screen. It may be that individuals more prone to Altered Consciousness ASMR experiences achieve greater immersion, leading to a preference for such stimuli. Alternatively, given the correlational nature of the work (i.e. direction cannot be established), it may be that regular intentional ASMR encourages the tendency towards altered consciousness ASMR experiences. Surprisingly, Altered Consciousness was not related to simulated interaction with the face or head, nor was there a relationship between preferences for close personal attention and simulated interaction with the face or head. While unusual, there may be more of a nurturing component to close personal attention that distinguishes the otherwise very similar stimuli. As a result, future work may wish to explore the role of relationship-oriented variables such as attachment styles in ASMR propensity and stimulus preferences.

The modified ASMR-15 appears to be a reliable, valid, and robust measure of ASMR propensity. Reliability analyses indicated improved reliability from previous work (Roberts et al., 2018), which utilised an early version of the scale that necessitated an awareness of ASMR terminology. While research utilising self-identified participants has allowed for significant advances in our understanding of ASMR experiences, previous work (Chapter 3) has indicated that solely relying on self-identified ASMR experiencers would be

unnecessarily restrictive. Specifically, a reliance on prior awareness of ASMR terminology would have excluded a substantial proportion of the sample otherwise susceptible to some level of the phenomenon. Additionally, the modified ASMR-15 appears to have improved upon earlier iterations of the measure. For instance, the factor structure of the modified ASMR-15 was replicated, and even improved from previous assessments. This is a noted strength as it would suggest that the refined measure is suitable for use among specialised and non-specialised participants. As a result, the ASMR-15 may be particularly helpful for researchers interested in assessing levels of ASMR experiences in a variety of samples.

Nevertheless, there were some limitations in the present work that should be addressed. Firstly, decisions made regarding the presentation of measures may have had unintentional effects on participant responses. As discussed previously, the choice of phrasing in the preamble to the contextualised version of the ASMR-15 may have somewhat inflated scores on the measure, due to perceived demand characteristics. Future work may benefit from an examination of suggestibility effects through a direct manipulation of the description of ASMR provided, as well as an assessment of the test-retest reliability of the ASMR-15. A further issue concerned the presentation order of measures. For instance, while the ASMR-15 was prioritised to ensure enough useful data for assessment, future work would likely benefit from a counterbalanced presentation of measures to minimise potential order effects.

Moreover, some alternative items and measures may have been more suited to the aims of the study. Specifically, while the selection of the MAAS was partially influenced by previous work (Fredborg et al., 2018), and allowed for a comparison between operationalisations of ASMR, a more comprehensive mindfulness measure, such as the Five Facet Mindfulness Questionnaire (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006), may better explain the relationships between mindfulness and ASMR experiences. As

a result, future work could examine the role of other facets of mindfulness in ASMR experiences, beyond mindlessness. In addition, some measures and items may have benefitted from further contextualisation. For instance, some participants provided informal feedback indicating confusion as to whether items from the Unusual Experiences subscale of the Hartmann (1991) Boundary Questionnaire were assessing waking or dreaming experiences ("things around me seem to change their size and shape"). This ambiguity is likely attributable to the order of the items within the questionnaire, alternating between dream and waking experiences. A further issue was raised with respect to "daymares", where some participants provided feedback indicating unfamiliarity with the term. Future work may benefit from the addition of definitions of unusual terms in the Unusual Experiences subscale, or a re-ordering of the items, where appropriate.

Additional issues with context were raised for the trigger preferences scale. Specifically, some participants were unsure if the listed trigger preferences pertained to incidental triggers, or those found in online ASMR stimuli. In previous work (Roberts et al., 2018), some participants indicated that context was a crucial determinant in whether a stimulus was experienced as pleasurable or aversive. For example, exposure to incidental (everyday experiences) or intentional (online trigger stimulus) sounds made a difference as to whether the stimulus triggered ASMR. This distinction may possibly be attributable to an element of control over the volume and exposure to the stimulus when encountered online, or reflect an importance of expectation in determining the reactions to potentially polarising sounds. As a result, future work may benefit from the presentation of the trigger preferences scale twice, with one version pertaining only to deliberate online interaction, and the second referring to everyday experiences.

Unexpectedly, there were also substantial differences between samples encountered in the present study. For instance, Facebook participants appeared to demonstrate a greater level

of ASMR propensity and tendency towards atypical conscious experiences than Reddit participants. It is unclear why such sample differences would exist, and this issue warrants further investigation. Importantly, the Reddit sample ASMR-15 mean score was similar in the present study to that found in a previous Reddit sample (Roberts et al., 2018). However, the Facebook sample mean was considerably higher. A tentative explanation may lie in the nature of the online communities from which participants were sourced. For example, *r/ASMR* is a discussion forum, with members frequently posting videos and sharing new stimuli, whereas the Facebook *ASMR Discussion and Research Forum* focuses on the analysis of ASMR experiences, and advancement of ASMR research. It may be, therefore, that individuals on Facebook are more reflective on their ASMR experiences, or there may have been perceived demand characteristics that artificially inflated scores within the sample. Future work may benefit from a further exploration of differences in ASMR online samples to better understand such discrepancies.

An additional important finding of this study is the prevalence of non-auditory trigger preferences cited by the sample. While auditory and audiovisual triggers were the most commonly endorsed, visual and tactile triggers were also prevalent. Interestingly, almost half of the sample opted to nominate another trigger that was not listed, providing further support for ASMR preferences being fairly idiosyncratic. Moreover, a number of participants mentioned triggers that did not appear to feature audio input, such as “light play” and “massages”. While it is unclear if there are audio elements to these preferences, reports of non-auditory triggers may complicate the conception of ASMR as a primarily audiovisual experience. Rather, ASMR preferences may come to reflect distinct varieties of a complex sensory phenomenon. While significant work needs to be undertaken to explore differences in induction, evidence of visual and tactile triggers may necessitate future modification of the

ASMR-15. Specifically, such changes may involve the addition of non-auditory triggers into the broad contextualisation of ASMR phenomena.

However, possibly the most striking finding involved triggers that did not appear to require traditional external stimulation (e.g. taking surveys, experiencing empathy). At this time, it is unclear what underlies an appeal for such activities or events, although there may be an element of self-focus or reflection that makes these experiences emotionally salient. While the incidence of reflective-type ASMR induction has been discussed previously online (Richard, n.d.), little is currently known about this method of stimulation. While only a small proportion of the sample reported inducing ASMR without external input, and thus may represent an anomaly, an awareness of this peculiarity may be beneficial for researchers attempting to induce ASMR in a laboratory setting. Specifically, when selecting, presenting, and interpreting responses to "unlikely triggers" as control stimuli. Alternatively, it may be that there are subsets or variations of ASMR that are differentially related to other phenomena. For example, reflective induction may represent a somewhat different experience to audiovisual or tactile-induced ASMR.

In conclusion, the findings of this study suggest that ASMR is a distinct, idiosyncratic phenomenon, sharing features with a variety of unusual states of consciousness and experiences. While only a small proportion of ASMR can be explained by existing consciousness constructs, boundary permeability appears to be a significant contributor to ASMR propensity, suggesting that ASMR may reflect a relatively common, unusual experience. As a result, future work examining the function, mechanisms, and prevalence of ASMR experiences may further our understanding of consciousness more broadly. Consistent with previous work, the ASMR-15 also appears to be a reliable and valid measure of ASMR propensity, suitable for use in specialised and non-specialised samples. As a result,

researchers may find value in the ASMR-15 when exploring the role of individual differences in varieties and levels of ASMR experiences.

References

Aron, E. N., & Aron, A. (1997). Sensory-processing sensitivity and its relation to introversion and emotionality. *Journal of Personality and Social Psychology, 73*, 345-368.

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13,* 27–45.

Banissy, M. J., Holle, H., Cassell, J., Annett, L., Tsakanikos, E., Walsh, V., Spiller, M. J., & Ward, J. (2013). Personality traits in people with synaesthesia: Do synaesthetes have an atypical personality profile? *Personality and Individual Differences, 54,* 828-831.

Barratt, E. L. & Davis, N. J. (2015). Autonomous sensory meridian response (ASMR): A flow- like mental state. *PeerJ, 3*, 1-17.

Barratt, E. L., Spence, C., & Davis, N. J. (2017). Sensory determinants of the autonomous sensory meridian response (ASMR): Understanding the triggers. *PeerJ, 5*, 1-13.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*, 822-848.

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., . . . Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice, 11*, 230–241.

Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS Scales. *Journal of Personality and Social Psychology*, *67,* 319-333.

Colizoli, O., Murre, J. M. J., & Rouw, R. (2013). A taste for words and sounds: a case of lexical-gustatory and sound-gustatory synesthesia. *Frontiers in Psychology, 4*, 1-16.

Costa, P. T., Jr. and McCrae, R. R. (1985). *The N E O Personality Inventory Manual*,

Psychological Assessment Resources, Odessa, FL.

Cowen, D. & Levin, R. (1995). The use of the Hartmann boundary questionnaire with an adolescent population. *Dreaming, 5,* 105-114.

Davis, K. M., Lau, M. A., & Cairns, D. R. (2009). Development and preliminary validation of a trait version of the Toronto Mindfulness Scale. *Journal of Cognitive Psychotherapy, 23*, 185–197.

Dietrich, A. (2004). Neurocognitive mechanisms underlying the experience of flow. *Consciousness and Cognition, 13,* 746-761.

Evans, J., Lange, R., Houran, J., & Lynn, S. J. (2018, September 20). Further psychometric exploration of the transliminality construct. *Psychology of Consciousness: Theory, Research, and Practice*. Advance online publication. http://dx.doi.org/10.1037/cns0000163

Fabbri, S., Kapur, N., Wells, A., & Creed, F. (2001). Emotional, cognitive, and behavioral characteristics of medical outpatients. *Psychosomatics, 42,* 74-77.

Ferentzi, E., Köteles., F., Csala, B., Drew, R., Tihanyi, B. T., Pulay-Kottlár, G., & Doering, B. K. (2016). What makes sense in our body? Personality and sensory correlates of body awareness and somatosensory amplification. *Personality and Individual Differences, 104,* 75-81.

Fredborg, B., Clark, J., & Smith, S. D. (2017). An examination of personality traits associated with autonomous sensory meridian response (ASMR). *Frontiers in Psychology*, *8*, 1-9.

Fredborg, B. K., Clark, J. M., & Smith, S. D. (2018). Mindfulness and autonomous sensory meridian response (ASMR). PeerJ, 6, 1-13.

Funkhouser, A. T., Würmle, O., Cornu, C. M., & Bahro, M. (2001). Boundary Questionnaire results in the mentally healthy elderly. *Dreaming, 11,* 83-88.

George, D., & Mallery, P. (2003). Frequencies. *SPSS for Windows step by step: A simple guide and reference, 11.0 update (4th ed.).* Boston, MA: Allyn & Bacon.

Goldberg, L. R. (1999). The Curious Experiences Survey, a revised version of the Dissociative Experiences Scale: Factor structure, reliability, and relations to demographic and personality variables. *Psychological Assessment*, *11,* 134-145.

Hartmann, E. (1991). *Boundaries in the mind: a new psychology of personality.* New York: Basic Books.

Hartmann, E., Harrison, R., & Zborowski, M. (2001). Boundaries in the mind: Past research and future directions. *North American Journal of Psychology, 3*, 347-368.

Hassanali, N., Ruffell, T., Browning, S., Bracegirdle, K., Ames, C., Corrigall, R., Laurens., K. R., Hirsch, C., Kuipers, E., Maddox, L., & Jolley, S. (2015). Cognitive bias and unusual experiences in childhood. *European Child & Adolescent Psychiatry, 24,* 949-957.

Hu, L. & Bentler, P. M. (1999). Cuttoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*, 1-55.

John, O. P., Donahue, E. M., & Kentle, R. L. (1991). The Big Five Inventory--Versions 4a and 54. Berkeley, CA: University of California, Berkeley, Institute of Personality and Social Research.

Johnson, M. (2014, February). *50 cases of misophonia using the MMP*. Paper presented at the misophonia conference of the Tinnitus Practitioners Association, Atlanta, GA.

Lange, R., Thalbourne, M. A., Houran, J., & Storm, L. (2000). The Revised Transliminality Scale: Reliability and validity data from a Rasch top-down purification procedure.

Consciousness and Cognition, 9, 591-617.

MacKillop, J. & Anderson, E. J. (2007). Further psychometric validation of the mindful attention awareness scale (MAAS). *Journal of Psychopathology and Behavioural Assessment, 29,* 289-293.

McCrae, R. R. (1994). Openness to experience: Expanding the boundaries of factor V. *European Journal of Personality, 8,* 251–272.

McErlean, A. B. J., & Banissy, M. J. (2017). Assessing individual variation in personality and empathy traits in self-reported autonomous sensory meridian response. *Multisensory Research*, *30*, 601-613.

Miller, L. C., Murphy, R., & Buss, A. H. (1981). Consciousness of body: Private and public. *Journal of Personality and Social Psychology, 41,* 397-406.

Poerio, G. (2016). Could Insomnia Be Relieved with a YouTube Video? The Relaxation and Calm of ASMR. In *The Restless Compendium* (pp. 119-128). Palgrave Macmillan, Cham.

Poerio, G. L., Blakey, E. Hostler, T. J., & Veltri, T. (2018). More than a feeling: Autonomous sensory meridian response (ASMR) is characterized by reliable changes in affect and physiology. *Plos One,* 13, 1-18.

Rawlings, D. (2002). An exploratory factor analysis of Hartmann's boundary questionnaire and an empirically-derived short version. *Imagination, Cognition and Personality, 21,* 131-144.

Rheinberg, F., Vollmeyer, R., & Engeser, S. (2003). Die Erfassung des Flow-Erlebens [The assessment of flow experience]. In J. Stiensmeier-Pelster & F. Rheinberg (Eds.), Diagnostik von Selbstkonzept, Lernmotivation und Selbstregulation [Diagnosis of motivation and self-concept] (pp. 261–279). Gottingen, Germany: Hogrefe.

Richard, C. (n.d.) *What is ASMR?* Retrieved from: http://www.asmruniversity.com.

Roberts, N., Beath, A., & Boag, S. (2018, September 17). Autonomous sensory meridian response: Scale development and personality correlates. *Psychology of Consciousness: Theory, Research, and Practice*. Advance online publication. http://dx.doi.org/10.1037/cns0000168

Sheldon, K. M., Prentice, M., & Halusic, M. (2015). The experiential incompatibility of mindfulness and flow absorption. *Social Psychological and Personality Science, 6,* 276-283.

Sherwood, S. & Milner, M. E. (2004). The relationship between transliminality and boundary structure subscales. *Imagination, Cognition and Personality, 24,* 369-378.

Silvia, P. J., Fayn, K., Nusbaum, E. C., & Beaty, R. E. (2015). Openness to experience and awe in response to nature and music: Personality and profound aesthetic experiences. *Psychology of Aesthetics, Creativity, and the Arts*, *9*, 376-384.

Tellegen, A., & Atkinson, G. (1974). Openness to absorbing and self-altering experiences ("absorption"), a trait related to hypnotic susceptibility. *Journal of Abnormal Psychology, 83*, 268-277.

Thalbourne, M. A. (1996). An attempt to predict precognition scores using transliminality-relevant variables. *Journal of the Society for Psychical Research, 61*, 129-140.

Thalbourne, M. A. (2000). Transliminality and creativity. *The Journal of Creative Behavior, 34*, 193-202.

Thalbourne, M. A., Houran, J., Alias, A. G., & Brugger, P. (2001). Transliminality, brain function, and synesthesia. *The Journal of Nervous and Mental Disease, 189,* 190-192.

Thalbourne, M. A. & Maltby, J. (2008). Transliminality, think boundaries, unusual experiences, and temporal lobe lability. *Personality and Individual Differences, 44,* 1617-1623.

Appendix D

Table 1

Frequency of 4 or 5 Scores on ASMR-15

Number of Items	Frequency (*f*)	Percentage (%)	Cumulative (%)
0	8	2.0	2.0
1	1	0.3	2.3
2	1	0.3	2.5
3	5	1.3	3.8
4	4	1.0	4.8
5	5	1.3	6.1
6	13	3.3	9.4
7	20	5.1	14.4
8	20	5.1	19.5
9	41	10.4	29.9
10	44	11.1	41.0
11	68	17.2	58.2
12	56	14.2	72.4
13	39	9.9	82.3
14	45	11.4	93.7
15	25	6.3	100.0

Note. $N = 395$.

Table 2

Frequency of 4 or 5 Scores on Sensation, Relaxation, Affect, and Altered Consciousness

Subscale	Number of Items	Frequency (*f*)	Percentage (%)	Cumulative (%)
Sensation	0	16	4.1	4.1
	1	6	1.5	5.6
	2	16	4.1	9.6
	3	60	15.2	24.8
	4	117	29.6	54.4
	5	180	45.6	100.0
Relaxation	0	13	3.3	3.3
	1	10	2.5	5.8
	2	59	14.9	20.8
	3	313	79.2	100.0
Affect	0	25	6.3	6.3
	1	46	11.6	18.0
	2	92	23.3	41.3
	3	232	58.7	100.0
Altered Consciousness	0	138	34.9	34.9
	1	82	20.8	55.7
	2	59	14.9	70.6
	3	65	16.5	87.1
	4	51	12.9	100.0

Note. $N = 395$.

Appendix E

ASMR Trigger Preference Results

Trigger Preferences, ASMR and Consciousness Correlates. In addition to the results presented previously, a small, negative correlation was found between mindfulness and a preference for water or fluid sounds (r = -.187, p = .001). Enjoying hair brushing or hair play was associated with fewer unusual experiences (r = -.206, p = < .001). For all correlations, see Table 3.

Correlations Between Trigger Preferences. Significant correlations were also found between preferences. For instance, soft speaking was found to be significantly, negatively related to a preference for whispering (r = -.220, p < .001), getting a haircut (r = -.167, p = .003) and simulated interaction with your face or head (r = -.261, p < .001). Further, whispering was found to be significantly, negatively related to a preference for getting a haircut (r = -.152, p = .007).

Additionally, an enjoyment of watching people do things in a careful way was significantly negatively related to preferences for simulated interaction with your face or head (r = -.198., p < .001), whispering (r = -.214., p < .001), tapping sounds (r = -.242., p < .001), and lip smacking (r = -.150., p = .007). However, watching people do things in a careful way (r = .174., p = .002) was significantly positively correlated with a preference for soft speaking.

Moreover, a preference for close personal attention was found to be significantly, negatively correlated with preferences for having your hair played with or brushed (r = -.166, p = .003), getting a haircut (r = -.226, p < .001), tapping sounds (r = -.227, p < .001), lip smacking (r = -.196, p < .001), and eating sounds (r = -.153, p = .006). Preferences for lip smacking were also negatively related to enjoying having your hair played with or brushed (r = -.149, p = .008). For all correlations, see Table 4.

Other Effective Triggers. Participants were also asked to optionally list any additional triggers that were particularly effective for them, that were not previously mentioned. Triggers frequently comprised audio or audiovisual, visual and tactile stimulation.

Audio or audiovisual. Audio or audiovisual sounds were most frequently cited by participants. These preferences were found to group into three broad categories: human sounds, non-verbal or object sounds, and quality or location of sound.

Of the human sounds specified, participants frequently cited non-verbal triggers. For example, breathing sounds (*n* = 3), kissing sounds (*n* = 2) and mouth sounds (*n* = 2). However, most commonly, specific human sound preferences involved language. For example, accents (*n* = 4), repetition of words (*n* = 3), and roleplaying (*n* = 5). Additionally, some participants listed explanations, or having something explained to them (n = 3), and being asked, or receiving favours (*n* = 2) as particularly effective.

Non-verbal or object sounds were also frequently mentioned by participants. For example, hand sounds (*n* = 2), scratching sounds (*n* = 6), spray bottle sounds (*n* = 2), brushing sounds (*n* = 5), and crinkling or rustling sounds (*n* = 10). Some participants discussed page sounds (*n* = 4) and writing (*n* = 5) as being effective.

Beyond content, some participants indicated specific preferences for the delivery, or location of sounds. Most frequently, participants mentioned inaudible (*n* = 4), binaural (*n* = 4), and layered (*n* = 4) sounds as being particularly effective. A significant proportion of participants identified ear techniques (*n* = 10) as stimulating. For example, ear biting or licking (*n* = 2), ear touching or massage (*n* = 4), and ear cupping (*n* = 2).

Visual. A number of participants indicated preferences for primarily visual triggers. The most frequently cited visual trigger involved light play (*n* = 13), specifically following a light or flashlight (*n* = 5). Other participants indicated a preference for lights in

their eyes (*n* = 1) and tracing with lights (*n* = 2). Other common triggers were hand movements (*n* = 5), also frequently involving lights (*n* = 2), and watching massages (*n* = 2).

Tactile. Tactile triggers were relatively infrequent amongst the sample. Most prominently were a preference for massages (*n* = 2). Other participants mentioned breezes or blowing air (*n* = 2) and "people lightly tracing my back with their fingers" (*n* = 1).

Neither. Some participants identified triggers that did not appear to involve any one sensory modality, rather a reflection on the self or an identification with others. For example, one participant mentioned having an epiphany or experiencing empathy (*n* = 1) as being conducive to ASMR. Other participants mentioned taking surveys (*n* = 4) as being especially effective.

Table 3

Correlations Between the ASMR-15, Subscales, Trigger Preferences and Consciousness Constructs

Measure	S. S.	Wh.	P. Att.	H. P.	H. C.	F. I.	Tap	W. P.	Water	Lip	Eating
ASMR-15	.107	.062	.085	-.026	-.031	-.009	-.035	.086	.041	-.021	-.045
Affect	.058	.089	.066	-.011	-.087	-.039	-.030	.065	.061	.012	-.016
Sensation	.051	.040	-.033	.028	.024	-.016	.006	.056	.045	.000	-.029
Relaxation	.130*	.071	.012	-.067	-.081	.070	.056	.052	.057	-.011	-.059
Altered C.	.110	.046	.146**	-.031	.001	-.040	-.082	.099	-.003	-.110*	-.027
MAAS	-.039	-.004	.070	.011	.004	.040	-.012	-.053	-.187**	.041	-.021
UE	.112*	.046	.062	-.206**	-.051	-.064	.016	.133*	.087	-.040	-.026
RTS	.114	.058	.065	-.082	-.078	-.071	.007	.062	.064	-.013	-.049
PBCS	-.014	.088	-.023	.020	-.011	-.059	-.074	.002	.068	.041	-.031

Note. $N = 318$. $^{**}p = .01$, $^{*}p = .05$. S. S = Soft speaking; Wh = Whispering; P. Att = Close Personal attention; H. P. = Having your hair played with or brushed; H. C. = Getting a haircut; F. I. = Simulated interaction with your face or head; Tap = Tapping sounds; W. P. = Watching people do things in a careful way; Water = Water or fluid sounds; Lip = Lip smacking; Eating = Eating sounds. MAAS = Mindful Attention and Awareness Scale; UE = Unusual Experiences Scale; RTS = Revised Transliminality Scale; PBCS = Private Body Consciousness Scale

Table 4

Correlations Between Trigger Preferences

Trigger	Wh.	P. Att.	H. P.	H. C.	F. I.	Tap	W. P.	Water	Lip	Eating
Soft Speaking	-.201**	-.016	-.131*	-.165**	-.253**	-.053	.178**	-.034	-.050	-.071
Whispering		-.041	-.097	-.142*	-.073	-.061	-.193**	-.046	.042	.015
Close Personal Attention			-.151**	-.220**	.144	-.252**	-.033	-.107	-.191**	-.150**
Hair Play or Brushing				.064	-.086	-.058	-.125*	-.073	-.145**	.035
Getting a Haircut					-.053	.036	-.059	.002	.099	-.087
Face Interaction						-.038	-.188**	-.028	-.128*	-.084
Tapping Sounds							-.216**	-.040	.047	-.028
Watching Careful People								-.044	-.148**	-.062
Water or Fluid Sounds									-.032	-.012
Lip Smacking										.028

Note. $N = 318$. S. S = Soft speaking; Wh = Whispering; P. Att = Close Personal attention; H. P. = Having your hair played with or brushed; H. C. = Getting a haircut; F. I. = Simulated interaction with your face or head; Tap = Tapping sounds; W. P. = Watching people do things in a careful way; Water = Water or fluid sounds; Lip = Lip smacking; Eating = Eating sounds.

Chapter 6

General Discussion

Overview of the Thesis

The overall aim of this thesis was to explore the phenomenology of ASMR experiences, the extent to which they relate to other, existing individual differences, and whether propensity to experience ASMR is a unique factor not covered by existing individual difference constructs. A secondary aim concerned the continued development and refinement of the ASMR-15 self-report scale, to produce a reliable and valid measure of ASMR propensity. We attempted to address these questions through four studies, assessing the validity of the created ASMR-15 across specialised (self-identified ASMR experiencers) and non-specialised (general population) samples, and the relationships between ASMR-15 scores, personality measures, consciousness correlates, and responses to ASMR stimuli. As discussed in the introduction, altered states and alterations of consciousness are ubiquitous fixtures of human existence, characterised by a distinct deviation in conscious experience, and offering potentials otherwise inaccessible in the ordinary, waking state (Tart, 1972; Csikszentmihalyi & Nakamura, 2018; Cardeña, Lynn, & Krippner, 2017). While similar to frisson, flow, and peak experiences, ASMR appears to be a unique, multidimensional experience unaccounted for by existing constructs. Previous attempts at quantifying ASMR experiences have tended towards unidimensional conceptualisations of ASMR propensity, and a reliance on self-identifying participants (McErlean & Banissy, 2017; Fredborg, Clark & Smith, 2017). While valuable, particularly when research on a new phenomenon is first emerging in the literature, such methodology necessitates a prior awareness and understanding of ASMR experiences, potentially limiting the representativeness of findings. Moreover, operationalising ASMR as a primarily sensory experience, or a variation on flow arguably limits our understanding of the broad phenomenology of such experiences, and the unique benefits that ASMR induction may present. Consequently, it is imperative that a valid, reliable and multidimensional measure of ASMR propensity is established, in order to better

understand the phenomenology, antecedents, and potential therapeutic applications of ASMR experiences.

Overview of Findings

To address our broad research aims, Study 1 focussed on the refinement of an existing ASMR measure (ASMR-20; Roberts, 2015), to produce a reliable, valid and novel measure of ASMR propensity. Prior to assessment, the ASMR-20 was modified to include additional relaxation items, producing a 22-item ASMR scale. A secondary aim of the study was to explore the relationships between ASMR and similar, established experiences, including absorption, anxiety, and misophonia. To achieve these aims, the five-factor ASMR-22 was administered to 897 English-speaking adults from popular online ASMR forum, *ASMR: Sounds That Feel Good*, alongside measures of anxiety (Carver & White, 1994), absorption (Goldberg, 1999), and misophonia (Johnson, 2014; Dozier, 2015). It was anticipated that ASMR propensity would be positively correlated with absorption and anxiety, and demonstrate divergence from misophonia. The ASMR-22 was subject to exploratory and confirmatory factor analyses, producing two possible solutions. Superior model fit was found for a 15-item, four-factor version of the ASMR scale, which demonstrated good fit with respect to fit indices. Additionally, good reliability was observed for the ASMR-15 and subscales: *Sensation, Affect, Relaxation and Altered Consciousness*. Consistent with expectations, ASMR did not appear to be sufficiently accounted for by existing measures, with weak correlations found between ASMR, anxiety, and absorption. Further, ASMR appeared to be unrelated to misophonia, which somewhat diverged from expectations. These findings were supported by the results of a multiple linear regression, suggesting that a very small proportion of variance in ASMR scores can be explained by established measures. Taken together, it would appear that ASMR is a unique experience unaccounted for by this

set of existing constructs, and that the ASMR-15 is a reliable and valid means of assessing ASMR experiences among specialised participants.

Following the refinement of the ASMR-15, Chapter 3 sought to assess the distribution of ASMR experiences among undergraduate psychology students. There has been significant variation in the estimates of ASMR prevalence, from being a referred to as a relatively rare phenomenon (Morris, 2018, although without any empirical evidence to support this statement), to data showing ASMR experiences were endorsed by more than half of a convenience conference sample (Poerio, 2016). As a result, the broad aims of the study were to assess the prevalence of ASMR experiences among non-specialised participants, and to examine the degree of overlap with other individual difference measures. To achieve this, we administered a modified version of the ASMR-15 to 187 undergraduate psychology students, alongside the Big Five personality factors (John, Donahue & Kentle, 1991) and a measure of sensory-processing sensitivity (HSPS; Aron & Aron, 1997). Additional items asked participants about prior awareness of ASMR, and previous ASMR experiences. Due to potential unfamiliarity with ASMR terminology, the ASMR-15 was modified to include a contextual overview of synaesthetic experiences, appropriate for non-specialised participants. A total of 15.7% of the sample endorsed a substantial level of self-reported ASMR propensity, somewhat diverging from previous estimates (Morris, 2018; Poerio, 2016), and between one-quarter and one-third reported the lowest possible score on at least one of the four subscales. This suggests that ASMR is a relatively frequent phenomenon among undergraduate psychology students, with the majority of students experiencing *some* level of ASMR experiences. This finding is more noteworthy given that approximately two-thirds of the sample were unaware of ASMR prior to participation.

Higher ASMR scores were also positively correlated with sensory-processing sensitivity. In addition, and consistent with previous findings, ASMR was correlated with

greater Openness (McErlean & Banissy, 2017; Fredborg et al., 2017) and Neuroticism (Fredborg et al., 2017). However, these constructs only accounted for a small proportion of the variance in ASMR-15 scores. Reliability analyses further revealed an improved measure, when compared to the non-contextualised ASMR-15. Moreover, participants who had previous ASMR experiences scored significantly, moderately higher on the ASMR-15, providing early validation for the measure. Taken together, it would appear that ASMR is a relatively common experience among undergraduate students, and that the ASMR-15 is a reliable and valid measure of ASMR propensity. Further, while ASMR experiencers tend to be slightly more open, sensitive and neurotic, ASMR propensity appears to be largely unexplained by existing personality constructs.

Given the distribution of self-reported ASMR experiences seen in Chapter 3, and the relationship between prior experiences and ASMR-15 scores, it was imperative to assess the relationship between ASMR-15 scores and induced ASMR experiences in a controlled environment. To achieve this, non-specialised participants were presented with ASMR stimuli that appealed to a number of individualised trigger preferences. As a result, the aim of Study 3 was to identify effective ASMR stimuli, in order to assess whether ASMR-15 scores predicted greater self-reported ASMR induction in an experimental setting. An additional aim was to provide experimental evidence of the disputed divergence between ASMR and frisson experiences, beyond self-report (Del Campo & Kehle, 2016). To achieve this, a mixed-methods study was undertaken, in which 100 undergraduate psychology students completed the ASMR-15 and a self-report measure of frisson, before viewing five ASMR and five frisson stimuli in a laboratory environment. It was expected that higher ASMR-15 scores would be associated with qualitative descriptions of ASMR experiences. Moreover, it was anticipated that frisson scores would converge with descriptions of frisson experiences, while ASMR scores would diverge from frisson scores. Consistent with expectations, ASMR-15

scores demonstrated significant convergence with ASMR video responses. Additionally, while ASMR-15 and frisson scores were weakly correlated, consistent with previous findings (Roberts, 2015), frisson scores were unrelated to ASMR experiences. These findings provide further support for the independence of the constructs, and suggest that ASMR may be induced under controlled conditions. Additionally, ASMR-15 scores successfully accounted for a substantial proportion of ASMR propensity, when stimulated in an experimental environment. Accordingly, the findings of Study 3 provided support for the predictive validity of the ASMR-15.

In assessing ASMR as a multifaceted phenomenon, the Altered Consciousness dimensions of ASMR propensity appear to an important, but less commonly endorsed element of ASMR experiences. As a result, the aim of Study 4 was to explore the relationships between ASMR and altered states of consciousness, and specifically, the extent to which ASMR propensity may reflect permeable mental boundaries and a tendency towards unusual experiences. Additionally, as the first study to utilise the modified ASMR-15 on specialised ASMR participants, a secondary aim of the study was to assess the performance of the contextualised ASMR-15, when compared to previous iterations of the measure. To achieve this, the contextualised ASMR-15 was administered to 457 self-identified participants from Facebook (n = 201) and Reddit (n = 256), alongside measures of unusual experience, mindfulness, transliminality, and body consciousness. Participants were also briefly asked about their trigger preferences, from a list of established common triggers (Poerio, Blakey, Hostler & Veltri, 2018). It was anticipated that ASMR propensity would be positively correlated with transliminality, body consciousness, and a tendency towards unusual experiences. Diverging from previous work, it was hypothesised that ASMR would be negatively related to mindfulness (Del Campo & Kehle, 2016; Fredborg, Clark & Smith, 2018). Consistent with expectations, ASMR demonstrated convergence with transliminality,

body consciousness, and unusual experiences, and divergence from mindfulness. Additionally, the contextualised ASMR-15 demonstrated excellent reliability and validity, and improved model fit in confirmatory factor analysis, when administered to this specialised sample.

Taken together, the four studies in this thesis have demonstrated that ASMR appears to be a relatively common, unusual experience with unique features that distinguish the phenomenon from other desirable traits and experiences. Additionally, it would appear that the modified ASMR-15 reliably and validly assesses multidimensional ASMR experiences in both specialised and non-specialised samples, suggesting the creation of a robust measure of ASMR propensity.

Synthesis of Studies

Taken together, these studies provide new and interesting insights into ASMR, and ASMR experiencers. Firstly, ASMR appears to be a multidimensional construct, with distinctive sensory, affective, relaxation, and altered consciousness components. Across specialised and non-specialised samples, the ASMR-15 demonstrates early reliability as a measure of multidimensional ASMR experiences, even in individuals unfamiliar with ASMR terminology. For instance, in Study 2, the modified ASMR-15 captured levels of ASMR experiences in the majority of participants, despite almost two-thirds of the sample being unaware of ASMR prior to participation. Additionally, refinement of the ASMR-15 to include a contextual overview of ASMR experiences, both replicated and improved upon the model fit and reliability of the measure. As a result, across four diverse samples, the ASMR-15 has demonstrated early reliability and validity as a multidimensional measure of ASMR propensity.

Dimensions of ASMR Experiences

However, some facets of ASMR appear to be more frequent or accessible, within both specialised and non-specialised samples. Across studies, the sensory dimensions of ASMR were the most frequently endorsed. For example, approximately 90% of specialised participants, and over 30% of non-specialised participants endorsed a substantial level of sensory ASMR experiences. Comprising the sensory components of the experience, as well as the movement of sensation through the body, respondents endorsed ASMR as an unusual, tingly, and wave-like sensation akin to goosebumps. Across all four studies, sensory ASMR experiences appeared to be relatively unrelated to Big Five personality traits, anxiety, mindfulness, and unusual experiences. By contrast, greater sensory experiences were related to sensitivity, absorption, aesthetic experiences, and transliminality. This suggests that sensory ASMR experiences may be more closely related to mental boundaries and sensitivity to external stimuli, than personality traits. Importantly, sensory ASMR experiences were also found to deviate from both frisson and misophonia, providing further support for the independence of the constructs.

Across all samples, Relaxation was the next most frequently endorsed facet of ASMR experiences. These included descriptions of ASMR as calming, relaxing and sleep-inducing. Approximately 20% of non-specialised participants recalled experiencing relaxation upon ASMR induction, while almost 95% of ASMR participants endorsed a substantial level of relaxation items. It would appear that Relaxation is an almost universal component of ASMR experiences within ASMR communities, largely unexplained by personality and dispositional sensitivity. The prevalence of relaxation effects within ASMR communities is consistent with the reported benefits of ASMR induction, including relaxation, sleep promotion, and stress-reduction (Barratt & Davis, 2015). The potential benefits of ASMR and application possibilities are discussed further below. Additionally, Relaxation was found to be unrelated

to a number of states of consciousness and unusual experiences, including mindfulness, unusual experiences, transliminality, body consciousness, and misophonia. However, when examined in isolation, the Relaxation dimension of ASMR shares numerous similarities with other related phenomena, including greater tendencies towards anxiety (perhaps reflecting individuals' desire for relaxation), absorption (which might be necessary for individuals to experience the relaxation), aesthetic experiences, and frisson.

Affective ASMR experiences were considerably less common across all four studies. These included reports of bliss, euphoria, and intense pleasure. For example, only 1 in 8 non-specialised participants endorsed a substantial number of affective items, compared to 4 in 5 specialised participants. While unclear, the lower endorsement among undergraduate samples may reflect differences in expectations of ASMR experiences. Specifically, specialised participants may be more familiar with ASMR stimuli and experiences and consciously seek out alterations in affect. In terms of personality, greater Affective responses were related to absorption, openness, and transliminality, as well as tendencies towards mindlessness, frisson, and aesthetic and unusual experiences. By contrast, affective experiences were largely unrelated to sensory-processing sensitivity, anxiety, misophonia, and personality traits (extraversion, agreeableness, conscientiousness, neuroticism).

The least frequently endorsed components of ASMR were captured by the Altered Consciousness subscale. These experiences included feeling a sense of altered consciousness, akin to a trance-like state, and time distortions upon ASMR induction. Within ASMR communities, approximately 1 in 4 participants endorsed a substantial degree of altered consciousness, compared to only 1 in 10 non-specialised participants. Altered Consciousness was largely unrelated to personality and dispositional sensitivity, with the exception of openness. Unsurprisingly, the Altered Consciousness dimension of ASMR was related to other alterations of consciousness, including misophonia, mindlessness, absorption, and

anxiety, as well as unusual experiences, aesthetic experiences, and frisson. Additionally, Altered Consciousness was most strongly related to transliminality. This suggests that the tendency towards experiencing altered consciousness effects as a result of ASMR induction may be indicative of thinner mental boundaries. High levels of transliminality, and thinner mental boundaries appear to be relatively uncommon among undergraduate samples (Sherwood & Milner, 2005; Thalbourne, 2000). As a result, while Altered Consciousness experiences are less frequent, they are nonetheless an important facet of ASMR that may be more easily accessed by highly transliminal individuals.

Prevalence and Traits of ASMR Experiencers

Contrary to previous estimates (Morris, 2018; Connor, 2013), ASMR experiences are prevalent within and outside of ASMR communities, although to a different extent. For instance, approximately 5 in 6 specialised participants indicated substantial agreement with more than half of the ASMR-15 items, compared to only 1 in 5 non-specialised participants. Moreover, in Chapters 3 and 4, we found reports of ASMR experiences across six continents, suggesting an almost universal phenomenon. Additionally, ASMR propensity appears to be unrelated to demographic variables, including age and educational attainment. On the other hand, across three studies, ASMR appeared unrelated to gender, although, females scored significantly higher than males on the ASMR-15 in Chapter 5. Further exploration of this relationship is warranted in future work to better understand this discrepancy. Moreover, while significant variation in ASMR propensity was observed across regions, no clear pattern emerged.

While personality only explains a small proportion of variance in ASMR propensity, ASMR experiencers appear to share a number of similar traits, tendencies, and abilities. Overall, ASMR experiencers appear to be somewhat more anxious, sensitive and open, and more prone to absorption, aesthetic experiences, frisson, and unusual experiences. However,

these may potentially be an artefact of the relationships between ASMR, higher transliminality, and greater mindlessness.

A Common, Diverse Experience

ASMR is a common, yet diverse sensory-affective phenomenon. Across specialised and non-specialised samples, ASMR propensity appears to be fairly normally distributed. However, while many participants endorsed a similar cluster of sensory and relaxation effects, the experience does not appear to be entirely homogeneous. For instance, consistent with the findings of Poerio et al. (2018), significant variation in preferences and responses were observed across studies. For example, among ASMR-sensitive participants in Study 3, responses to audiovisual stimuli ranged from pleasure and relaxation to boredom and anger. This was further reflected in the findings of Chapter 5, where almost half of the sample nominated additional effective triggers, on top of a list of 11 common triggers (Poerio et al., 2018). However, it is also important to note that of the provided triggers, seven exclusively pertained to, or featured auditory stimulation. While the majority of additional, nominated triggers referenced audiovisual stimulation, a number of participants endorsed exclusively visual (e.g. lights) and tactile (e.g. massages) triggers, as well as internally-generated triggers (e.g. experiencing empathy). As a result, while ASMR appears to be characterised by a common cluster of sensory and relaxation effects, it is a highly individualised experience, with respect to both phenomenology and method of induction.

Strengths, Limitations and Future Directions

As an exploratory work, a number of strengths, limitations and promising directions for future research emerged across the four studies. In utilising a mixed-methods approach, we assessed ASMR as a multifaceted experience, gathering dimensional, qualitative and quantitative data. As a result, we were able to provide new insights into the phenomenology

of the experience, and expand the discussion of ASMR experiences into the realm of consciousness and altered states. Given scientific work in this area is still relatively uncommon, the studies presented here offer a significant step forward for the understanding of this new, but increasingly popular, phenomenon.

One notable strength of this thesis is in the continued refinement and validation of the only multifaceted, dimensional measure of ASMR propensity. Following a rigorous two-part factor analysis in Study 1, that substantially improved the reliability of the existing measure, we modified the ASMR-15 to suit non-specialised participants. In doing so, we were able to provide the first statistics on the prevalence of multidimensional ASMR experiences among non-specialised participants. Across Studies 2 and 3, we demonstrated that the modified ASMR-15 performed reliably as a measure of ASMR propensity, and demonstrated predictive validity with responses to ASMR stimuli. Finally, Study 4 provided further evidence for the robustness of the contextualised ASMR-15, by demonstrating the replication of the model fit and improved internal consistency, when the scale was re-administered to specialised ASMR participants.

Nevertheless, there are also a number of limitations that would be best addressed in future work. Firstly, there may have been some effect of suggestibility or perceived demand characteristics that influenced responding. For example, while both Studies 2 and 3 utilised undergraduate samples, the mean ASMR-15 score was significantly higher (d = .29) among Study 3 participants. This may reflect sample differences or be attributable to perceived demand characteristics associated with laboratory vs. online data collection. In addition, responses to ASMR stimuli in Study 3 may have been influenced by suggestibility, or reflect a difference in expectations and reward (Poerio et al., 2018). For instance, familiarity with ASMR stimuli may create expectations of reward upon exposure to ASMR stimuli, while participants unfamiliar with ASMR may not have positive expectations. However, this needs

to be explored more extensively. For example, in an experimental setting, participants with, and without, prior ASMR experience could be selected to watch a variety of ASMR stimuli, while recording their responses. In doing so, it would be useful to explore whether there is a mediating effect of familiarity and expectations in the receptiveness and response to ASMR triggers, alongside ASMR-15 scores. In addition, in Studies 1 and 4, participants within ASMR communities may have unknowingly responded in ways that would aid the researcher, or have been influenced by the comments or surrounding content on the host websites (Nichols & Maner, 2008). Future work may benefit from the inclusion of a measure of suggestibility or social desirability, particularly in experimental studies, and through the adoption of Modern Test Theory approaches to scale analysis, such as Rasch scaling (Lange, 2017). Such approaches may help to overcome response bias issues among specialised and non-specialised participants, in online and offline contexts (Lange, 2017).

Additionally, the samples employed across all studies were limited in a number of ways. Firstly, all four studies relied on English speaking participants from online and student populations. While over 44 countries were represented, an inconsistent effect of region was found on ASMR-15 scores. Given the recent increase in media discussion of ASMR experiences, it may be worthwhile examining the relationships between region, ASMR propensity and the prominence of ASMR discussion within the social consciousness (Poerio, 2016). In addition, across all studies, the online and student samples may have been somewhat homogenous in terms of their perception of ASMR, and with respect to demographic variables. For example, Studies 2 and 3 utilised first year psychology students, with limited variation in age and educational attainment. While no relationship was found between age, educational attainment, and ASMR propensity across all four studies, more diverse samples may increase the variation and generalisability of findings drawn from non-specialised participants. Additionally, with respect to regional differences in ASMR scores, it

may be of benefit to translate the ASMR-15 into a number of languages to allow for the assessment of ASMR experiences in more diverse, non-English speaking samples.

A similar issue may have been encountered online, whereby participants sourced from online ASMR interest groups may demonstrate a somewhat homogenous perception of ASMR as a whole. For instance, significant differences were observed between Facebook and Reddit participants across ASMR and consciousness measures in Study 4, suggesting some variation across online ASMR communities. While the ASMR-15 appears to be robust against differences in prior awareness of ASMR, there may still be limitations to relying on online communities. For example, in Study 4, there was very minimal variation in Relaxation scores across participants, suggesting minimal variability in ASMR experiences. Similarly, in Studies 2 and 3, Affect and Altered Consciousness items were not strongly endorsed, limiting the conclusions able to be drawn from the data for those subscales. To address these issues, future work may benefit from the administration of the ASMR-15 to more diverse, online and offline samples. Additionally, some exploration of differences across online ASMR communities may help explain differences in ASMR propensity across Facebook and Reddit samples.

Given that research into ASMR is still in its infancy, a number of exploratory choices were made in order to assess ASMR experiences in a laboratory setting. Specifically, in designing Study 3, little research was available to guide set-up, including room temperature, volume, and video selection. For instance, while it appears that a room temperature of 23°C is conducive to both frisson (Trappe & Voit, 2016) and ASMR induction, it would be worthwhile to assess the impact of temperature, headphone volume, and other environmental factors on ASMR experiences. Knowledge of these factors may assist future researchers to optimise conditions for manipulating and examining ASMR experience. In addition, in light of the findings of Study 4, while the selected stimuli (Videos 1 to 4) appeared to be effective

at inducing ASMR in a number of participants, there may have been a proportion of the sample unrepresented in the data due to the focus on audiovisual triggers. As a result, future work may benefit from the inclusion of non-auditory triggers, where appropriate, to best capture the diversity of ASMR preferences. This may be achieved through the thorough surveying of ASMR experiencers to create effective ASMR stimuli specifically for assessment purposes. Moreover, while the idiosyncratic nature of ASMR preferences would likely impede the development of a universal battery of stimuli, the creation of novel stimuli for research purposes may also overcome potential familiarity issues encountered when utilising popular ASMR YouTube videos.

In addition, given the wide variety of triggers cited as effective stimuli for ASMR induction, it is still unknown what underlies the appeal of common, identified triggers (e.g. whispering, tapping, close personal attention). Future work examining the sonic qualities of reliably effective audiovisual ASMR stimuli, may be useful in identifying whether there are common auditory features (e.g. frequencies) across ASMR triggers. Moreover, the identification of reliable, improbable triggers would be of significant benefit to experimental research in this area. As stated previously, while ASMR triggers appear to be fairly idiosyncratic, neutral to mildly unpleasant sounds such as squeaking (i.e. rubber toy), traffic sounds, and vacuum noises may be worthwhile investigating as potential control stimuli for experimental purposes.

A further issue encountered in Study 3 concerned the differences between affective "satisfaction" and "pleasure". While both terms denote enjoyment, it would appear that satisfaction pertains to vicarious, rather than stimulated pleasure. This issue was most pronounced when interpreting responses to Bob Ross (Video 5), where numerous participants expressed satisfaction and enjoyment, in the absence of heightened emotion or pleasure. Potentially indicative of aesthetic experiences, it is unclear if vicarious satisfaction reflects a

peak experience, or another phenomenon entirely. While it is unlikely that these phenomena are mutually exclusive, ASMR media may fall under the broad umbrella of 'satisfying content' (Alexander, 2017). For example, there has been explosive recent online interest in "satisfying" videos as a genre, including slime and pimple popping videos (Swannell, 2016; Alexander, 2017). Akin to ASMR, viewers of pimple popping videos, or 'popaholics' (Ferrara, 2016) have cited feelings of calm, relaxation and euphoria, through vicarious satisfaction (Swannell, 2016; Goins, 2016). Given the rapid recent increased interest in both ASMR and 'satisfying' videos (Poerio, 2016; Ferrara, 2016; Swannell, 2016), further exploration of this nuanced distinction may be particularly critical in future work. As a result, it may be necessary to explore the differences in responses to "satisfying" and "ASMR" stimuli, as well as the auditory and visual triggers that disambiguate these genres. Addressing the above issues would help to clarify and amplify the potential therapeutic benefits associated with ASMR, and improve our understanding of the phenomenology of the experience.

Another consideration for future work concerns the importance of context in assessing ASMR and other, idiosyncratic experiences. For instance, in Study 1, the findings for the modified misophonia questionnaire (MAQ; Johnson, 2014; Dozier, 2015) were substantially limited. Participant feedback indicated that it was difficult to complete the measure as it was unclear whether the items pertained to deliberate or incidental engagement with trigger sounds. For example, hearing chewing sounds in everyday life may produce misophonia, while chewing in an ASMR video stimulates pleasure. A similar issue was encountered in Study 4, concerning the trigger preferences questionnaire. While the trigger items were sourced from previous work (Poerio et al., 2018), it was unclear whether the preferences referred to real-life triggers, or those found within ASMR stimuli. To address this, future work would likely benefit from the specification of real-life or online contexts when

assessing responses to trigger preferences. In utilising the trigger preferences questionnaire, it may be of value to explore the role of context in determining the pleasantness or unpleasantness of ASMR stimuli. This could be achieved by administering the trigger preferences scale twice, with one version pertaining to offline, incidental triggers, and the other to online stimuli.

While not necessarily a limitation, given the broad scope of this thesis, a number of additional variables of interest emerged across the studies that are worthy of future exploration. For instance, it would be worthwhile to assess the potential relationships between other measures of personality, consciousness, and markers of psychopathology in ASMR experiences, including measures of fantasy proneness (CEQ; Merckelbach, Horselenberg, & Muris, 2001), shizotypy (MSS; Kwapil, Gross, Silvia, Raulin, & Barrantes-Vidal, 2018), state and trait dissociation (DES; Bernstein & Putnam, 1986), emotional regulation (DERS; Gratz & Roemer, 2004), symptom validity, and general psychopathology (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). Of particular interest is the Phenomenology of Consciousness Inventory (PCI; Pekala, 1991), which assesses the extent to which consciousness deviates from the ordinary waking state, when modified through exposure to particular stimulus conditions (i.e. hypnosis). Despite the identified difficulties associated with controlled ASMR induction, the demonstration of ASMR experiences in a laboratory setting (Chapter 4), suggests that the PCI may be a valuable tool for future studies investigating the extent to which ASMR deviates from ordinary consciousness.

Moreover, as ASMR and SPS, or dispositional sensitivity, were found to be positively related in Study 2, it may be worthwhile exploring the role of empathy and SPS in ASMR trigger preferences (specifically, the preferences for emotional and non-emotional content). By extension, it would be of value to explore the relationships between attachment styles, ASMR propensity and trigger preferences, particularly among individuals with preferences

for stimuli that feature simulated intimacy and close personal attention. In lieu of the findings of Study 4, where visual, tactile and non-sensory stimuli were endorsed as being effective triggers, it may be necessary to expand our working definition of ASMR. For example, while the majority of ASMR experiences may be captured by audiovisual stimuli, it may be of value to include non-auditory triggers in the stem of the contextualised ASMR-15. However, as the ASMR-15 appears to function reliably and validly in its current iteration, it may be premature to alter the scale, prior to a more fulsome exploration of the spectrum of ASMR triggers and preferences.

This notwithstanding, additional work is required to further confirm the validity and reliability of the ASMR construct, as well as the ASMR-15. Specifically, studies assessing the test-retest reliability of the ASMR-15 would be particularly valuable, and may allow for a direct manipulation, and examination, of the effects of suggestibility and context in the endorsement of ASMR experiences. Specifically, an assessment of responses to control stimuli (i.e. silence, improbable triggers), alongside ASMR videos, may help in the assessment of suggestibility effects, and provide further information as to the validity of the ASMR-15. In addition, future work exploring any associated physiological changes (e.g. heart rate, EEG, galvanic skin response, piloerection, etc.) would help to elucidate the relationship between self-reported ASMR propensity and biological effects. If undertaken, such work may help to further establish the validity of self-reported ASMR experiences, as captured by the ASMR-15, and elucidate the underlying physiological mechanisms implicated in ASMR. In addition, as it is presently unknown the order in which the facets of ASMR experience typically emerge (e.g. tingling, euphoria, relaxation), including a qualitative or descriptive component, alongside physiological measures, may also help to elucidate the general temporal presentation of ASMR experiences. As a result, an examination of physiological markers should be a priority in future ASMR investigations.

In addition, as an exploratory work, relationships between ASMR and other constructs were primarily established through correlations, within one testing session, across all studies. While this was an effective means of collecting data across different samples and testing environments, there may have been an influence of context effects on responses to the self-report measures. For instance, Council (1993) explained that completing personality measures in succession may create invalid responses, as the experience of completing one measure may influence responses to other measures. As a result, future work may benefit from assessing ASMR and other constructs across separate measurement contexts. This may be particularly important in experimental work, where the ASMR-15 may best be administered at least one day prior to attempted induction in a laboratory environment, to minimise situational influence. In addition, while not necessarily a limitation, given the nature of the phenomenon, future work may greatly benefit from assessing the incidence of ASMR experiences over time. For instance, it is currently unknown whether ASMR is a learned ability, if it typically emerges within a particular age range, or if it may be acquired after certain experiences (e.g. seizure activity, fever, sleep disturbances etc.). In addition to improving our understanding of the development of ASMR, such designs would allow for the exploration of direction, or causality, between ASMR and related constructs. These findings may be particularly helpful in understanding the impact of ASMR as a relaxation or stress-reduction strategy.

Implications

Across the four studies of this thesis, we found evidence to suggest that the ASMR-15 is a reliable and valid, multidimensional measure of ASMR propensity, suitable for use in both specialised and non-specialised samples. As a result, the ASMR-15 may be particularly useful to researchers wishing to assess ASMR experiences in naïve and specialist participants. This is particularly valuable given the limitations of existing approaches reliant

on self-identifying participants and unidimensional ASMR measures (Barratt & Davis, 2015; Fredborg et al., 2017; McErlean & Banissy, 2017). ASMR appears to be a relatively common, idiosyncratic experience, well represented across ages, genders, levels of educational attainment, and region. As a novel phenomenon and new area of research, these findings may help to establish the legitimacy of ASMR experiences, outside of online contexts and self-selected samples. Moreover, as a potential contribution to the range of identified alterations of consciousness and anomalous experiences, these findings may provide additional insights into the full spectrum of human experiences, more broadly (Cardeña et al., 2017).

The findings of these studies may also open new avenues of ASMR exploration, particularly in relation to consciousness and mental boundaries. Importantly, and in contrast to the findings of Fredborg et al. (2018), ASMR propensity was associated with lower trait mindfulness in Study 4. Shapiro, Brown, Thoresen and Plante (2011) found that individuals with higher levels of trait mindfulness received significantly greater benefits from mindfulness-based stress reduction techniques, than those low on trait mindfulness. Given the apparent therapeutic benefits associated with mindfulness training, ASMR promises to provide a good alternative where mindfulness is less easily achieved (Baer, 2003). As a result, within the array of stress reduction tools available, individuals low on trait mindfulness may find ASMR an easily accessible alternative. Additionally, in lieu of the results of Study 1, ASMR may be particularly salient for those endorsing, or experiencing higher levels of anxiety. For example, while the effects of ASMR induction on wellness are still to be determined, clinicians may be able to recommend ASMR stimuli as an additional tool for clients presenting with a variety of difficulties (i.e. insomnia, anxiety, stress etc.). Consistent with the findings of McErlean and Banissy (2017), ASMR stimuli are already accessed for anxiety-reduction and sleep-promotion purposes. In addition, the ASMR-15 may

be a useful screener in identifying who may benefit most from ASMR as a relaxation strategy.

Conclusions

In conclusion, the studies in this thesis have made a novel and original contribution to the literature, most notably in refining and validating the first multifaceted, dimensional measure of ASMR propensity. Across four studies, the ASMR-15 has been shown to be a reliable and valid measure of ASMR experiences, among specialised and non-specialised participants. As a result of these developments, we were able to demonstrate that ASMR is a relatively common, idiosyncratic experience, endorsed by approximately 1 in 5 undergraduate psychology students. Additionally, while ASMR appears to be unaccounted for by existing personality and consciousness constructs, greater ASMR propensity was associated with higher openness, sensitivity, and a tendency towards transliminality. However, the most promising development may be in the demonstration of ASMR induction among non-specialised participants in a laboratory setting. In conjunction with the ASMR-15, and personality findings, these developments offer promising insights into the accessibility of ASMR experiences, and potential therapeutic applications among those prone to mindlessness, anxiety, and stress. As a result, ASMR may be a useful, novel adjunct to existing stress management techniques, and researchers may find value in the ASMR-15 when assessing the potential benefits and outcomes of the phenomenon among specialised and generalised samples.

References

Alexander, L. (2017, May 31). *The slimy, technicolor world of satisfying YouTube videos.* Retrieved from https://medium.com/s/i-o/the-slimy-technicolor-world-of-satisfying-youtube-videos-63c3793b2738

Aron, E. N., & Aron, A. (1997). Sensory-processing sensitivity and its relation to introversion and emotionality. *Journal of Personality and Social Psychology, 73*, 345-368.

Baer, R. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice, 10,* 125-143.

Barratt, E. L. & Davis, N. J. (2015). Autonomous sensory meridian response (ASMR): A flow- like mental state. *PeerJ, 3*, 1-17.

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, *4*, 561-571.

Bernstein, E. M., & Putnam, F. W. (1986). Development, reliability, and validity of a dissociation scale. *Journal of Nervous and Mental Disease*, *174,* 727-735.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*, 822-848.

Cardeña, E., Lynn, S. J., & Krippner, S. (2017). The psychology of anomalous experiences: A rediscovery. *Psychology of Consciousness: Theory, Research, and Practice, 4,* 4-22.

Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS Scales. *Journal of Personality and Social Psychology*, *67,* 319-333.

Connor, M. (2013, May 8). *Notes on ASMR, Massumi and the joy of digital painting.* Retrieved from http://rhizome.org/editorial/2013/may/08/notes-asmr-massumi-and-joy-digital-painting/

Council, J. R. (1993). Context effects in personality research. *Current Directions in Psychological Science*, *2*, 31-34.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper & Row.

Del Campo, M. A., & Kehle, T. J. (2016). *Autonomous sensory meridian response (ASMR) and frisson: Mindfully induced sensory phenomena that promote happiness.* International Journal of School & Educational Psychology, 4, 99-105.

Dozier, T. H. (2015). Treating the initial physical reflex of misophonia with the neural repatterning technique: A counterconditioning procedure. *Psychological Thought*, *8*, 189-210.

Ferrara, L. (2016, May 4). FOX21's "popaholics" outed as pimple popping goes mainstream. Retrieved from https://www.fox21news.com/news/fox21s-popaholics-outed-as-pimple-popping-goes-mainstream_20171017110541196/837553002

Fredborg, B., Clark, J., & Smith, S. D. (2017). An examination of personality traits associated with autonomous sensory meridian response (ASMR). *Frontiers in Psychology*, *8*, 1-9.

Fredborg, B. K., Clark, J. M., & Smith, S. D. (2018). Mindfulness and autonomous sensory meridian response (ASMR). *PeerJ, 6*, 1-13.

Goins, L. (2016, June 11). Why are we so obsessed with pimple popping? Retrieved from https://www.refinery29.com/en-us/2016/06/112919/pimple-popping-psychology

Goldberg, L. R. (1999). The Curious Experiences Survey, a revised version of the Dissociative Experiences Scale: Factor structure, reliability, and relations to demographic and personality variables. *Psychological Assessment*, *11,* 134-145.

Gratz, K. L., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment*, *26*, 41-54.

John, O. P., Donahue, E. M., & Kentle, R. L. (1991). The Big Five Inventory--Versions 4a and 54. Berkeley, CA: University of California, Berkeley, Institute of Personality and Social Research.

Johnson, M. (2014, February). *50 cases of misophonia using the MMP*. Paper presented at the misophonia conference of the Tinnitus Practitioners Association, Atlanta, GA.

Kwapil, T. R., Gross, G. M., Silvia, P. J., Raulin, M. L., Barrantes-Vidal, N. (2018). Development and psychometric properties of the Multidimensional Schizotypy Scale: A new measure for assessing positive, negative, and disorganized shizotypy. *Schizophrenia Research, 193,* 209-217.

Lange, R. (2017). Rasch scaling and cumulative theory-building in consciousness research. *Psychology of Consciousness: Theory, Research and Practice, 4*, 135-160

McErlean, A. B. J., & Banissy, M. J. (2017). Assessing individual variation in personality and empathy traits in self-reported autonomous sensory meridian response. *Multisensory Research*, *30*, 601-613.

Merckelbach, H., Horselenberg, R., & Muris, P. (2001). The Creative Experiences Questionnaire (CEQ): A brief self-report measure of fantasy proneness. *Personality and Individual Differences*, *31*, 987-995.

Morris, M. (2018). A simply marvellous reaction: Autonomous sensory meridian response

and the desk tutorial. *Architectural Design*, *88*, 50-57.

Nichols, A. L., & Maner, J. K. (2008). The good-subject effect: Investigating participant demand characteristics. *The Journal of General Psychology*, *135*, 151-166.

Pekala, R. J. (1991). The phenomenology of consciousness inventory. In *Quantifying consciousness*. Springer, Boston, MA.

Poerio, G. (2016). Could Insomnia Be Relieved with a YouTube Video? The Relaxation and Calm of ASMR. In *The Restless Compendium*. Palgrave Macmillan, Cham.

Poerio, G. L., Blakey, E. Hostler, T. J., & Veltri, T. (2018). More than a feeling: Autonomous sensory meridian response (ASMR) is characterized by reliable changes in affect and physiology. *Plos One,* 13, 1-18.

Roberts, N. M. (2015). *Towards the development of an integrative measure of autonomous cephalocaudal paresthesia* (Unpublished master's thesis). Macquarie University, Sydney, Australia.

Shapiro, S. L., Brown, K. W., Thoresen, C., & Plante, T. G. (2011). The moderation of mindfulness-based stress reduction effects by trait mindfulness: results from a randomized controlled trial. *Journal of Clinical Psychology*, *67*, 267-277.

Sherwood, S. & Milner, M. E. (2005). The relationship between transliminality and boundary structure subscales. *Imagination, Cognition and Personality, 24,* 369-378.

Swannell, C. (2016). Pop, as in popular. *The Medical Journal of Australia*, *204,* 1-2.

Tart, C. T. (1972). States of consciousness and state-specific sciences. *Science*, *176*, 1203–1210.

Thalbourne, M. A. (2000). Transliminality and creativity. *The Journal of Creative Behavior*, *34*, 193-202.

Trappe, H. J., & Voit, G. (2016). The cardiovascular effect of musical genres. *Deutsches Ärzteblatt International*, 113, 347-352.

Appendix F: Ethics Approval for Study 3 in Chapter 2

Office of the Deputy Vice-Chancellor
(Research)

Research Office
Research Hub, Building C5C East
Macquarie University
NSW 2109 Australia
T: +61 (2) 9850 4459
http://www.research.mq.edu.au/
ABN 90 952 801 237

14 June 2016

Dear Dr Boag

Reference No: 5201600351

Title: *Developing the Autonomous Sensory Meridian Response Scale: A Revision of the Autonomous Cephalocaudal Paresthesia Scale (ACPS-21): Factor Structure, Reliability and Relations to Personality Variables*

Thank you for submitting the above application for ethical and scientific review. Your application was considered by the Macquarie University Human Research Ethics Committee (HREC (Human Sciences & Humanities)).

I am pleased to advise that ethical and scientific approval has been granted for this project to be conducted by:

- Macquarie University

This research meets the requirements set out in the *National Statement on Ethical Conduct in Human Research* (2007 – Updated May 2015) (the *National Statement*).

Standard Conditions of Approval:

1. Continuing compliance with the requirements of the *National Statement,* which is available at the following website:

http://www.nhmrc.gov.au/book/national-statement-ethical-conduct-human-research

2. This approval is valid for five (5) years, subject to the submission of annual reports. Please submit your reports on the anniversary of the approval for this protocol.

3. All adverse events, including events which might affect the continued ethical and scientific acceptability of the project, must be reported to the HREC within 72 hours.

4. Proposed changes to the protocol and associated documents must be submitted to the Committee for approval before implementation.

It is the responsibility of the Chief investigator to retain a copy of all documentation related to this project and to forward a copy of this approval letter to all personnel listed on the project.

Should you have any queries regarding your project, please contact the Ethics Secretariat on 9850 4194 or by email ethics.secretariat@mq.edu.au

The HREC (Human Sciences and Humanities) Terms of Reference and Standard Operating Procedures are available from the Research Office website at:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics

The HREC (Human Sciences and Humanities) wishes you every success in your research.

Yours sincerely

Dr Karolyn White
Director, Research Ethics & Integrity,
Chair, Human Research Ethics Committee (Human Sciences and Humanities)

This HREC is constituted and operates in accordance with the National Health and Medical Research Council's (NHMRC) *National Statement on Ethical Conduct in Human Research* (2007) and the *CPMP/ICH Note for Guidance on Good Clinical Practice*.

Appendix G: Ethics Approval for Chapter 3

Dear Associate Professor Boag,

Re: "The Autonomous Sensory Meridian Response Scale: Sensitivity and Personality Correlates" (5201700174)

Thank you very much for your response. Your response has addressed the issues raised by the Faculty of Human Sciences Human Research Ethics Sub-Committee and approval has been granted, effective 15th March 2017. This email constitutes ethical approval only.

This research meets the requirements of the National Statement on Ethical Conduct in Human Research (2007). The National Statement is available at the following web site:

https://www.nhmrc.gov.au/book/national-statement-ethical-conduct-human-research

The following personnel are authorised to conduct this research:

Associate Professor Simon Boag
Dr Alissa Beath
Miss Natalie Michelle Roberts

Please note the following standard requirements of approval:

1. The approval of this project is conditional upon your continuing compliance with the National Statement on Ethical Conduct in Human Research (2007).

2. Approval will be for a period of five (5) years subject to the provision of annual reports.

Progress Report 1 Due: 15th March 2018
Progress Report 2 Due: 15th March 2019
Progress Report 3 Due: 15th March 2020
Progress Report 4 Due: 15th March 2021
Final Report Due: 15th March 2022

NB. If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. If the project has been discontinued or not commenced for any reason, you are also required to submit a Final Report for the project.

Progress reports and Final Reports are available at the following website:

http://www.research.mq.edu.au/current_research_staff/human_research_ethics/resources

3. If the project has run for more than five (5) years you cannot renew approval for the project. You will need to complete and submit a Final Report and submit a new application for the project. (The five year limit on renewal of approvals allows the Sub-Committee to fully re-review research in an environment where legislation, guidelines and requirements are continually changing, for example, new child protection and privacy laws).

4. All amendments to the project must be reviewed and approved by the Sub-Committee before implementation. Please complete and submit a Request for Amendment Form available at the following website:

http://www.research.mq.edu.au/current_research_staff/human_research_ethics/managing_approved_research_projects

5. Please notify the Sub-Committee immediately in the event of any adverse effects on participants or of any unforeseen events that affect the continued ethical acceptability of the project.

6. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University. This information is available at the following websites:

http://www.mq.edu.au/policy

http://www.research.mq.edu.au/current_research_staff/human_research_ethics/managing_approved_research_projects

If you will be applying for or have applied for internal or external funding for the above project it is your responsibility to provide the Macquarie University's Research Grants Management Assistant with a copy of this email as soon as possible. Internal and External funding agencies will not be informed that you have approval for your project and funds will not be released until the Research Grants Management Assistant has received a copy of this email.

If you need to provide a hard copy letter of approval to an external organisation as evidence that you have approval, please do not hesitate to contact the Ethics Secretariat at the address below.

http://www.research.mq.edu.au/current_research_staff/human_research_ethics/managing_approved_research_projects

If you will be applying for or have applied for internal or external funding for the above project it is your responsibility to provide the Macquarie University's Research Grants Management Assistant with a copy of this email as soon as possible. Internal and External funding agencies will not be informed that you have approval for your project and funds will not be released until the Research Grants Management Assistant has received a copy of this email.

If you need to provide a hard copy letter of approval to an external organisation as evidence that you have approval, please do not hesitate to contact the Ethics Secretariat at the address below.

Please retain a copy of this email as this is your official notification of ethics approval.

Yours sincerely,

Dr Naomi Sweller
Chair
Faculty of Human Sciences
Human Research Ethics Sub-Committee

FHS Ethics

Faculty of Human Sciences Ethics
C5C-17 Wallys Walk L3
Macquarie University, NSW 2109, Australia
T: +61 2 9850 4197 | http://www.research.mq.edu.au/
Ethics Forms and Templates
http://www.research.mq.edu.au/current_research_staff/human_research_ethics/resources
The Faculty of Human Sciences acknowledges the traditional custodians of the Macquarie University Land, the Wattamattageal clan of the Darug nation, whose cultures and customs have nurtured and continue to nurture this land since the Dreamtime. We pay our respects to Elders past, present and future.

Appendix H: Ethics Approval for Chapter 4

Dear Associate Professor Boag,

Re: "Autonomous Sensory Meridian Response: Induction and Relationship to Frisson" (5201701123)

Thank you very much for your response. Your response has addressed the issues raised by the Faculty of Human Sciences Human Research Ethics Sub-Committee and approval has been granted, effective 19th December 2017. This email constitutes ethical approval only.

This research meets the requirements of the National Statement on Ethical Conduct in Human Research (2007). The National Statement is available at the following web site:

https://www.nhmrc.gov.au/book/national-statement-ethical-conduct-human-research

The following personnel are authorised to conduct this research:

Associate Professor Simon Boag
Miss Natalie Michelle Roberts

Please note the following standard requirements of approval:

1. The approval of this project is conditional upon your continuing compliance with the National Statement on Ethical Conduct in Human Research (2007).

2. Approval will be for a period of five (5) years subject to the provision of annual reports.

Progress Report 1 Due: 19th December 2018
Progress Report 2 Due: 19th December 2019
Progress Report 3 Due: 19th December 2020
Progress Report 4 Due: 19th December 2021
Final Report Due: 19th December 2022

NB. If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. If the project has been discontinued or not commenced for any reason, you are also required to submit a Final Report for the project.

Progress reports and Final Reports are available at the following website:

http://www.research.mq.edu.au/current_research_staff/human_research_ethics/application_resources

3. If the project has run for more than five (5) years you cannot renew approval for the project. You will need to complete and submit a Final Report and submit a new application for the project. (The five year limit on renewal of approvals allows the Sub-Committee to fully re-review research in an environment where legislation, guidelines and requirements are continually changing, for example, new child protection and privacy laws).

4. All amendments to the project must be reviewed and approved by the Sub-Committee before implementation. Please complete and submit a Request for Amendment Form available at the following website:

https://www.mq.edu.au/research/ethics-integrity-and-policies/ethics/human-ethics/post-approval

5. Please notify the Sub-Committee immediately in the event of any adverse effects on participants or of any unforeseen events that affect the continued ethical acceptability of the project.

6. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University. This information is available at the following websites:

http://www.mq.edu.au/policy
https://www.mq.edu.au/research/ethics-integrity-and-policies/ethics/human-ethics/post-approval

If you will be applying for or have applied for internal or external funding for the above project it is your responsibility to provide the Macquarie University's Research Grants Management Assistant with a copy of this email as soon as possible. Internal and External funding agencies will not be informed that you have approval for your project and funds will not be released until the Research Grants Management Assistant has received a copy of this email.

If you need to provide a hard copy letter of approval to an external organisation as evidence that you have approval, please do not hesitate to contact the Ethics Secretariat at the address below.

Please retain a copy of this email as this is your official notification of ethics approval.

Yours sincerely,

Dr Naomi Sweller
Chair
Faculty of Human Sciences
Human Research Ethics Sub-Committee

Appendix I: Ethics Approval for Amendment for Chapter 4

Dear Associate Professor Boag,

Project ID: 2655
RE: 5201826554048 - Autonomous Sensory Meridian Response: Induction and Relationship to Frisson

The above amendment for your application has been approved.

You may access the application by logging into the Human Research Ethics Management system at https://ethics-and-biosafety-form.mq.edu.au.

Kind regards,

Faculty Ethics Officer
Macquarie University | North Ryde
NSW 2109, Australia

Human Ethics contacts

Human Ethics wiki

MACQUARIE University
SYDNEY·AUSTRALIA

Appendix J: Ethics Approval for Chapter 5

Human Sciences Ethics Sub-Committee
Macquarie University, North Ryde
NSW 2109, Australia

MACQUARIE University

04/09/2018

Dear Associate Professor Boag,

Reference No: 5201832673869
Project ID: 3267
Title: Autonomous Sensory Meridian Response: Altered States and Consciousness Correlates

Thank you for submitting the above application for ethical review. The Human Sciences Ethics Sub-Committee has considered your application.

I am pleased to advise that ethical approval has been granted for this project to be conducted by Associate Professor Simon Boag.

This research meets the requirements set out in the National Statement on Ethical Conduct in Human Research 2007 (Updated July 2018).

Standard Conditions of Approval:

1. Continuing compliance with the requirements of the National Statement, available from the following website: https://www.nhmrc.gov.au/_files_nhmrc/file/publications/national-statement-2018.pdf.
2. This approval is valid for five (5) years, subject to the submission of annual reports. Please submit your reports on the anniversary of the approval for this protocol. You will be sent an automatic reminder email one week from the due date to remind you of your reporting responsibilities.
3. All adverse events, including unforeseen events, which might affect the continued ethical acceptability of the project, must be reported to the subcommittee within 72 hours.
4. All proposed changes to the project and associated documents must be submitted to the subcommittee for review and approval before implementation. Changes can be made via the Human Research Ethics Management System.

The HREC Terms of Reference and Standard Operating Procedures are available from the Research Services website: https://www.mq.edu.au/research/ethics-integrity-and-policies/ethics/human-ethics.

It is the responsibility of the Chief Investigator to retain a copy of all documentation related to this project and to forward a copy of this approval letter to all personnel listed on the project.

Should you have any queries regarding your project, please contact the Faculty Ethics Officer.

The Human Sciences Sub-Committee wishes you every success in your research.

Yours sincerely,

Dr Naomi Sweller

Chair, Human Sciences Ethics Sub-Committee

The Faculty Ethics Subcommittees at Macquarie University operate in accordance with the National Statement on Ethical Conduct in Human Research 2007 (updated July 2018), [Section 5.2.22].

Appendix K: Ethics Approval for Amendment for Chapter 5

Dear Associate Professor Boag,

Project ID: 3267
RE: 5201832674482 - Autonomous Sensory Meridian Response: Altered States and Consciousness Correlates

The above amendment for your application has been approved.

You may access the application by logging into the Human Research Ethics Management system at https://ethics-and-biosafety-form.mq.edu.au.

Kind regards,

Faculty Ethics Officer
Macquarie University | North Ryde
NSW 2109, Australia

Human Ethics contacts

Human Ethics wiki

MACQUARIE University
SYDNEY·AUSTRALIA