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Autonomous Sensory Meridian Response self-reporters showed higher scores for cognitive reappraisal as an emotion regulation strategy

Ricardo Morales [1], **Daniela Ramírez-Benavides** [1], **Mario Villena-Gonzalez** [Corresp. 1, 2]

[1] Escuela de Psicología, Pontificia Universidad Católica de Chile, Santiago, RM, Chile

[2] Centro de Estudios en Neurociencia Humana y Neuropsicología. Facultad de Psicología, Universidad Diego Portales, Santiago, RM, Chile

Corresponding Author: Mario Villena-Gonzalez
Email address: mvillena@ug.uchile.cl

Background: Autonomous Sensory Meridian Response (ASMR) describes the experience of a pleasant tingling sensation along the back of the head, accompanied with a feeling of well-being and relaxation, in response to specific audio-visual stimuli, such as whispers, soft sounds, and personal attention. Previous works have assessed individual variations in personality traits associated with ASMR, but no research to date has explored differences in emotion regulation associated with ASMR. This omission occurred even when ASMR has been proposed to be located in a sound sensitivity spectrum as the opposite end of misophonia, a phenomenon associated with difficulties regulating emotions. The present work aimed to assess group differences between ASMR self-reporters and non-ASMR controls associated with emotion regulation strategies. **Methods:** We used the validated Spanish version of the Emotion Regulation Questionnaire to assess individual differences in the use of cognitive reappraisal and expressive suppression. **Results:** Our results showed that participants who experience ASMR had higher scores in the cognitive reappraisal subscale of the emotion regulation questionnaire than the non-ASMR group. **Conclusions:** Individuals who experience ASMR reported higher cognitive reappraisal use, suggesting more effectiveness in regulating emotions. Our finding further elucidates individual differences related to this experience, supporting that ASMR is a real psychophysiological phenomenon associated with other psychological constructs and has remarkable consequences in affective/emotional dimensions and general well-being.

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Ricardo Morales[1], Daniela Ramírez-Benavides[1], Mario Villena-Gonzalez[1,2*]

[1] Escuela de Psicología, Pontificia Universidad Católica de Chile, Santiago, RM, Chile

[2] Centro de Estudios en Neurociencia Humana y Neuropsicología. Facultad de Psicología, Universidad Diego Portales, Santiago, RM, Chile.

Corresponding Author:

Mario Villena-Gonzalez*

Vicuña Mackenna 4860, Santiago, RM, CP: 7820436, Chile

Email address: mvillena@ug.uchile.cl

Abstract

Background: Autonomous Sensory Meridian Response (ASMR) describes the experience of a pleasant tingling sensation along the back of the head, accompanied with a feeling of well-being and relaxation, in response to specific audio-visual stimuli, such as whispers, soft sounds, and personal attention. Previous works have assessed individual variations in personality traits associated with ASMR, but no research to date has explored differences in emotion regulation associated with ASMR. This omission occurred even when ASMR has been proposed to be located in a sound sensitivity spectrum as the opposite end of misophonia, a phenomenon associated with difficulties regulating emotions. The present work aimed to assess group differences between ASMR self-reporters and non-ASMR controls associated with emotion regulation strategies.

Methods: We used the validated Spanish version of the Emotion Regulation Questionnaire to assess individual differences in the use of cognitive reappraisal and expressive suppression.

Results: Our results showed that participants who experience ASMR had higher scores in the cognitive reappraisal subscale of the emotion regulation questionnaire than the non-ASMR group.

Conclusions: Individuals who experience ASMR reported higher cognitive reappraisal use, suggesting more effectiveness in regulating emotions. Our finding further elucidates individual differences related to this experience, supporting that ASMR is a real psychophysiological phenomenon associated with other psychological constructs and has remarkable consequences in affective/emotional dimensions and general well-being.

1 Introduction

Autonomous Sensory Meridian Response (ASMR) describes the experience of a pleasant tingling sensation along the back of the head and neck region, at times spreading to other areas of the body, in response to specific visual and auditory stimuli. Usually, ASMR is triggered by whispers, soft sounds made with the fingers on a surface, and personal attention from someone with an affectionate disposition (Barratt, Spence, & Davis, 2017; Fredborg, Clark, & Smith, 2017; Poerio, Blakey, Hostler, & Veltri, 2018)

This non-scientific term "ASMR" was coined just in 2010. During the last decade, social networks have made it possible to publicize this phenomenon and quickly disseminate different personal reports on this experience, along with the creation of videos ("ASMR videos") that simulate or accentuate the stimuli to trigger the sensation in people who watch/listen to them (del Campo & Kehle, 2016). Anecdotal accounts and early research have shown that ASMR seems to be experienced by only part of the population, and therefore some individuals do not experience it (Barratt & Davis, 2015; del Campo & Kehle, 2016). There are no studies to date about the prevalence of ASMR-capability in the general population, but ASMR's popularity on the internet suggests it might be widespread.

Scientific investigation about this experience started even more recently, with the first peer-reviewed paper on the topic published in 2015 (Barratt & Davis, 2015). Since then, there has been a growing interest in deciphering this phenomenon's underlying psychological and biological basis.

Some previous works have assessed individual variations in personality traits associated with ASMR. These works have shown that, compared with non-ASMR controls, ASMR self-reporters scored higher on openness to experience (Fredborg et al., 2017; McErlean & Banissy, 2017), which is associated with curiosity about the world around them and propensity to have vivid fantasies or daydreams (John, Naumann, & Soto, 2008). In line with these results, other works have shown ASMR self-reporters score higher on Fantasizing (McErlean & Banissy, 2017) which reflects an ability to immerse oneself in a fictional reality (Davis, 1983). They also produced higher scores on the Curiosity subscale of the Toronto Mindfulness Scale (TMS), suggesting a greater interest in and openness to their own conscious experiences (Fredborg, Clark, & Smith, 2018). Finally, ASMR self-reporters have shown to score higher on absorption (McErlean & Osborne-Ford, 2020; Roberts, Beath, & Boag, 2019) which is the ability to get deeply immersed with the current experience accompanied by loss of reflective awareness and it has been previously linked to imagery, daydreaming, and openness to experience (Glisky, Tataryn, Tobias, Kihlstrom, & et al, 1991). All these results together suggest that an increased

tendency to have openness to conscious experience, fantasize and imaginatively transposing oneself into a virtual reality may be a key feature of ASMR responders.

Despite the notorious and growing interest in the subject, no research has explored the individual variations of emotional-related traits associated with ASMR. This omission has occurred even when the literature is continuously emphasizing that ASMR is a sensory-emotional experience rather than just a sensory one (Fredborg et al., 2018; Smith, Fredborg, & Kornelsen, 2019; Smith, Katherine Fredborg, & Kornelsen, 2017).

For instance, according to the first study on the topic, 80% of the participants reported watching ASMR videos because it positively affects their mood, usually accompanied by a pleasant feeling of well-being and relaxation (Barratt & Davis, 2015). The neuroimaging approach has shown activation in regions related to emotional arousal using fMRI during tingling sensations (Lochte, Guillory, Richard, & Kelley, 2018). Another study measured physiological responses comparing ASMR self-reporters and non-ASMR controls while watching ASMR videos. The results showed a significant reduction in heart rate and increased skin conductance levels in ASMR self-reporters compared with non-ASMR controls suggesting that ASMR is a complex emotional experience blending different emotional components such as relaxation and arousal (Poerio et al., 2018).

On the other hand, ASMR has been suggested to be related to another underreported condition known as misophonia, where familiar repetitive sounds, mostly sound produced by humans, may trigger negative physiological, emotional, and behavioral responses (Rouw & Erfanian, 2018).

Previous works have suggested that misophonia and ASMR might represent two ends of the same spectrum of sound sensitivity where human-generated sounds elicit pleasurable tingling sensation in case of ASMR and negative physical and emotional responses in case of misophonia (Barratt & Davis, 2015; J. McErlean & Banissy, 2018).

Previous works have shown that individual variations in the severity of misophonia symptoms positively correlates with difficulties in emotional regulation (Cassiello-Robbins et al., 2020). Neuroimaging approaches to misophonia revealed abnormal functional connectivity between the anterior insular cortex (a hub of the salience network critical for interoception and emotion processing) and brain regions responsible for the regulation of emotions (Kumar et al., 2017).

Taking this evidence into account, It would be logical to assume that the ability to feel ASMR could be associated with differences in some facet of emotional regulation, such as the strategy deployed. However, there is no evidence about ASMR/non-ASMR group differences related to the emotional regulation abilities to date.

Individual differences in emotion regulation mechanisms can be investigated by studying the most common strategies: suppression and reappraisal (Gross & John, 2003). Suppression is a

form of response modulation in which the ongoing emotion-expressive behavior becomes inhibited. Reappraisal involves a cognitive reevaluation of the emotionally arousing situation to alter its emotional impact. Research on this topic has shown that using reappraisal is more effective and related positively to well-being, whereas using suppression is negatively related (Gross & John, 2003; Morawetz, Alexandrowicz, & Heekeren, 2017). Previous studies demonstrated an association between reappraisal use and personality traits such as neuroticism and openness to experience (Morawetz et al., 2017; Wang, Shi, & Li, 2009). These same traits have also been strongly associated with people who experience ASMR (Fredborg et al., 2017; McErlean & Banissy, 2017).

The present work aims to assess group differences between ASMR self-reporters and non-ASMR groups associated with emotional regulation strategies. We hypothesized that people who experience ASMR, in the same way they seek to listen/watch ASMR stimuli to improve their positive affect and well-being, use an emotional regulation strategy that better provides effectiveness regarding well-being in different situations. We predicted that being the opposite extreme of misophonia (which is a condition related to difficulties in emotional regulation), people who experience ASMR will show greater cognitive reappraisal use than non-ASMR self-reported controls. This strategy has been positively associated with well-being and used by people who share personality traits common to ASMR groups. Finally, this prediction is also supported by the ASMR self-reporters' known capabilities regarding fantasy/absorption, which could facilitate the propensity to change the way they think about emotional situations.

We used the validated Spanish version of the Emotion Regulation Questionnaire (Cabello, Salguero, Fernández-Berrocal, & Gross, 2013) to assess individual differences in the use of cognitive reappraisal and expressive suppression in ASMR self-reporters participants and non-ASMR controls.

This is the first study aimed to examine whether ASMR self-reporters show differences associated with emotional regulation strategies compared with non-ASMR controls. Therefore, this work further elucidates individual differences related to this phenomenon and its remarkable consequences in affective/emotional dimensions and well-being.

2 Materials & Methods

2.1 Participants

The total number of participants who responded to the online survey was 177. From this total, only 69 reported not to experience ASMR. Due to the high proportion of ASMR responders, we randomly subsample 69 participants, from the total of 108 who declared to experience ASMR, to match the sample size of both groups (ASMR and non-ASMR). The matched samples consisted

of 138 volunteers; 69 participants in the ASMR group (52 female, mean age =22.36, *SD* = 3.31) and 69 participants in the non-ASMR group (52 female, mean age =23.77, *SD* = 5.47). Groups did not differ in age ($t(136) = 1.83$, $p = .07$) nor in the proportion of male to female participants (χ^2 (1) = 0.01, $p = .91$). Analysis with all of the participants can be found in the supplementary materials.

The protocol was approved by the Ethics Committee of Pontificia Universidad Católica de Chile (approval reference number: 190325015). All participants gave electronic informed consent following the Declaration of Helsinki. This study was conducted online, and participants completed the questionnaires in their own time in one sitting

2.2 Procedure

Participants were recruited by an online invitation to participate in the present work. This invitation was spread through social media, specifically through Instagram and Facebook, posted in different groups, either ASMR and non-ASMR related. The invitation explained the study without giving away information related to ASMR to avoid bias towards people who might know and were interested exclusively in ASMR.

Participants were asked to complete a survey hosted in google forms. This online survey included questions about personal information (age and gender) followed by the Spanish version of the Emotion Regulation Questionnaire (Cabello et al., 2013).

Afterward, participants were asked if they knew what Autonomous Sensory Meridian Response is. Regardless of the answer, they then were provided with a description and question about experiencing ASMR. Specifically, participants were provided with the following statement: "ASMR is defined as a pleasant sensation of 'tingles' across the back of the head and neck in response to specific visual and auditory stimuli." Then, participants were asked to answer the following question, "would you defined yourself as someone who experiences ASMR?" with a Yes or No response. We divided the ASMR self-reporters and non-ASMR groups based on this response. Additionally, we further asked the ASMR group to provide their favorite ASMR video link/channel and answer some additional questions about the frequency of watching ASMR videos/content and the main reason for watching them if that was the case (see supplementary material).

2.3 Materials

Emotion Regulation Questionnaire (ERQ)

The ERQ is a self-report questionnaire that consists of 10 items assessing two different regulation strategies. The first one is called cognitive reappraisal based on six items, and the second one is called expressive suppression based on four items. Cognitive reappraisal focuses on the person's attempts to change the emotional impact by changing how they think of the situation. Expressive suppression focuses on the person's attempts to hide or inhibit the expression of their emotions.

Both subscales are measured with simple questions answered on a Likert scale ranging from 1 (totally disagree) to 7 (totally agree). The higher scores signify more usage of the strategy they are referring to in that specific question. In this case, the questionnaire used was the Spanish adaptation of the ERQ, which has been translated and validated for Spanish-speaking users (Cabello et al., 2013).

2.4 Statistics

All the data analysis, processing, basic descriptive statistics, testing of assumptions, and comparison between means were performed using the R and RStudio software (Allaire, 2012). Reliability analysis of the subscales of the ERQ was made with the psych package (Revelle & Revelle, 2015) and plots with the ggplot2 package (Valero-Mora, 2010).

To test if the ASMR and non-ASMR groups differ in age or male to female participants, we performed a t-test and a chi-square test, respectively. Subsequently, we used the Cronbach alpha coefficient to measure the internal consistency of the subscales of the ERQ. We used a t-test to compare the ASMR and non-ASMR groups' mean in both subscales.

3 Results

The emotion regulation questionnaire consisted of two subscales, cognitive reappraisal (Cronbach's alpha = 0.76) and expressive suppression (Cronbach's alpha = 0.79). Both subscales showed good internal consistency.

Our main aim was to assess whether ASMR self-reporters show differences in emotional regulation strategies compared to the non-ASMR group. We performed individual comparisons between each of the subscales of the questionnaire. To maintain the experiment-wise error rate to 5%, we set an alpha value of 2.5% (a significant p-value of .025).

To test the assumptions of normality and homogeneity of variance, we use the Shapiro-Wilk and Levene tests, respectively. In the Expressive suppression subscale, data from the ASMR group showed a normal distribution (W =0.98, p = .32), and data from the non-ASMR group was non normally distributed (W =0.97, p = .05). In the Cognitive reappraisal subscale, both the ASMR

group (W =0.97, p = .13) and the non-ASMR group (W =0.98, p = .33) showed a normal distribution. The variance between the ASMR and non-ASMR groups were similar in both the Expressive Suppression subscale (F(1,136) = 2.22, p = .14) and in the Cognitive Reappraisal subscale (F(1,136) = 0.02, p = .89). In neither group, participants with z scores bigger than 3 or lesser than -3 were detected; accordingly, we didn't reject any case.

As most of the data followed a normal distribution and had equal variances, we used an independent t-test to compare groups. We applied a one-tailed t-test for the cognitive reappraisal subscale, as we predicted higher scores for the ASMR group. We used a two-tailed t-test for the expressive suppression subscale because we had no directional prediction for group differences.

The ASMR group showed significantly higher scores in the cognitive reappraisal subscale than the non-ASMR group (t(136) = 2.4, p = .01, Cohen's d = 0.41) (see *Table 1*). There were no significant differences between ASMR and non-ASMR groups for the expressive suppression subscale (t(136) = -1.12, p = .26). These results can be observed in *Figure 1*.

We also performed the same analysis using all the sample and after including the sex of the participants as a predictor, obtaining similar results (see supplementary material)

Table 1: **ASMR and Non-ASMR scores in the Emotion Regulation Questionnaire.**

Figure 1: **Plot of ASMR and Non-ASMR scores in the Emotion Regulation Questionnaire.** Box-plot shows the scores of the two Emotional Regulation Questionnaire' subscales for the ASMR (N = 69) and non-ASMR (N = 69) groups. Jittered points are individual subjects.

4 Discussion

The present study investigated group differences between ASMR self-reporters and non-ASMR groups associated with emotional regulation strategies. Our results showed that participants who experience ASMR had higher scores in the cognitive reappraisal subscale of the emotion regulation questionnaire than the non-ASMR group. On the other hand, both groups showed similar scores in the other subscale of the same questionnaire, suggesting no group differences for expressive suppression strategy.

Our finding supports the notion that ASMR is also associated with an emotional dimension, besides only a sensory one. As we mentioned before, a growing body of studies has explored how ASMR elicit emotional arousal, which can be observed at different levels, such as psychological/behavioral (Barratt & Davis, 2015), hemodynamical (Lochte et al., 2018), and electrophysiological (Poerio et al., 2018). Interestingly, ASMR has been widely associated with another related sensory-emotional phenomenon known as frisson or music chills (del Campo & Kehle, 2016). Frisson is a chill down the spine sensation that occurs while engaged in enjoyable

music and is generally described as a pleasant sensation with an emotional load; Tears, gooseflesh, or piloerection could accompany it (Harrison & Loui, 2014). Neuroimaging studies have shown that brain activation during ASMR showed similarities to patterns previously observed in music chills, associated with the striatal reward pathway and emotional arousal regions (Lochte et al., 2018; Salimpoor, Benovoy, Larcher, Dagher, & Zatorre, 2011). These similarities can also be found in electrophysiological measures, in which both phenomena elicit an increase in skin conductance (Poerio et al., 2018; Salimpoor et al., 2011).

Nonetheless, essential differences have been observed between these phenomena involving activation of the medial prefrontal cortex (mPFC). This region showed increased activation during ASMR tingling sensation, which has not been observed for music chills (Lochte et al., 2018). Activation of mPFC has been associated with higher scores in empathy and emotional regulation capabilities (Esménio et al., 2019; Tang, Tang, & Posner, 2016), especially for reappraisal (Nelson, Fitzgerald, Klumpp, Shankman, & Phan, 2015). In line with this, previous research has shown that ASMR self-reporters have higher Empathic Concern levels (McErlean & Banissy, 2017). This trait has been previously associated with higher scores in cognitive reappraisal (Laghi, Lonigro, Pallini, & Baiocco, 2018; Lockwood, Seara-Cardoso, & Viding, 2014).

We predicted that people who experience ASMR would show more significant use of cognitive reappraisal, compared with non-ASMR self-reported controls. Our results confirmed our prediction, showing that the ASMR group uses the reappraisal strategy to regulate emotions to a greater extent than the non-ASMR group.

This finding provides further evidence supporting the notion that misophonia and ASMR represent two ends of the same spectrum of sound sensitivity. On the one hand, they have been suggested to be opposite poles regarding the negative or positive mood/affect elicited by human-generated sounds (Barratt & Davis, 2015; McErlean & Banissy, 2018). We now show that regarding emotional regulation, people who experience ASMR use the reappraisal strategy to a greater extent than other people. Reappraisal has been shown to be more effective and related positively to well-being (Gross & John, 2003; Morawetz et al., 2017). This contrasts with what has been shown for misophonia, in which people have noticeable difficulties regulating emotions (Cassiello-Robbins et al., 2020).

We can speculate that the individual variations on reappraisal preferences might be associated with connectivity of brain networks associated with reappraisal, involving the orbitofrontal cortex selectively (Kanske, Heissler, Schönfelder, Bongers, & Wessa, 2011). Studies in resting-state functional connectivity have reported that people who experience ASMR show the recruitment of the orbitofrontal cortex by sensory-motor networks, suggesting this is one neural substrate of ASMR's underlying emotional aspect. However, the differences reported in the

present study may also be mediated by personality traits that have been independently related to ASMR and emotional regulation, such as neuroticism and openness to experience (Fredborg et al., 2017; McErlean & Banissy, 2017; Morawetz et al., 2017; Wang et al., 2009). As we did not measure these traits in our sample, future investigations may explore the specific relations between ASMR, personality traits, and emotional regulation.

We also showed that gender does not play an essential role in ASMR self-reporters getting higher cognitive reappraisal scores (see supplementary material). Nonetheless, we had a limited capacity to assess the indirect effect of gender on the results due to the sample was composed mostly of women (in the ASMR and non-ASMR, women made 75.36% of each group). This unbalance is a limitation of the present study reducing our capacity to reach a more informed conclusion about the potential gender effects. Curiously, this more extensive representation of women seems common in other ASMR studies with self-reporting subjects. In a study by McErlean & Banissy (2017), the percentage of women in the ASMR group was 69.88% and 80% in the non-ASMR group; in McErlean & Banissy (2018), the percentage of women was 62.5% in the ASMR group and 72.47% in the non-ASMR group. Finally, in the study by McErlean & Osborne-Ford (2020), the percentage of women was 74.19% in both groups. We believe that future studies on ASMR need to explore this tendency and also balance the amount of female/male participants to precisely determine gender effects and potential gender differences in the experience of ASMR.

While we showed that ASMR self-reporters obtained higher cognitive reappraisal scores, our study cannot shed light on the mechanisms responsible for this association. Follow up studies should aim to specify the relationship between experiencing ASMR and cognitive reappraisal strategies to regulate one's emotional states. We hypothesize that the higher tendency of ASMR self-reporters to deploy cognitive reappraisal strategies is mediated by their capacity to be able to immerse themselves in different types of experiences (McErlean & Banissy, 2017; Roberts et al., 2019), a capacity that might give them greater flexibility to change the way they think about and re-appraise emotional situations. If this hypothesis is correct, constructs related to the capacity to be absorbed by imagery, such as fantasizing capabilities and daydreaming (Fox, Nijeboer, Solomonova, Domhoff, & Christoff, 2013; Glisky et al., 1991), should mediate the relationship between ASMR and cognitive reappraisal. Future studies are needed to shed light on this point

5 Conclusions

This is the first study aimed to examine whether ASMR self-reporters show differences associated with emotional regulation strategies compared with non-ASMR controls. We showed that people who experience ASMR use the cognitive reappraisal strategy to a greater extent than non-ASMR people, suggesting more effectiveness in regulating emotions. The relevance of this

finding relies on the fact that emotion regulation is fundamental for well-being, and this relationship between ASMR and emotional regulation may open the way to future research exploring the causal relationship between these features and also opening the possibility to use ASMR videos/triggers as tools to promote emotion regulation strategies, similar to how it is used to induce sleep.

Finally, our finding further elucidates individual differences related to this experience, supporting that ASMR is a real psychophysiological phenomenon associated with other psychological constructs and has remarkable consequences in affective/emotional dimensions and general well-being.

Acknowledgements

This research was supported by FONDECYT POSTDOCTORADO No. 3180295 to MVG. We also want to thank Pilar Fajardo for her significant help in setting the online questionnaires and organizing data. Finally, we would like to thank Gisse ASMR and Abi ASMR for their help in spreading the study's information, which helped recruit participants.

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Figure 1

Plot of ASMR and Non-ASMR scores in the Emotion Regulation Questionnaire.

Box-plot shows the scores of the two Emotional Regulation Questionnaire' subscales for the ASMR (N = 69) and non-ASMR (N = 69) groups. Jittered points are individual subjects.

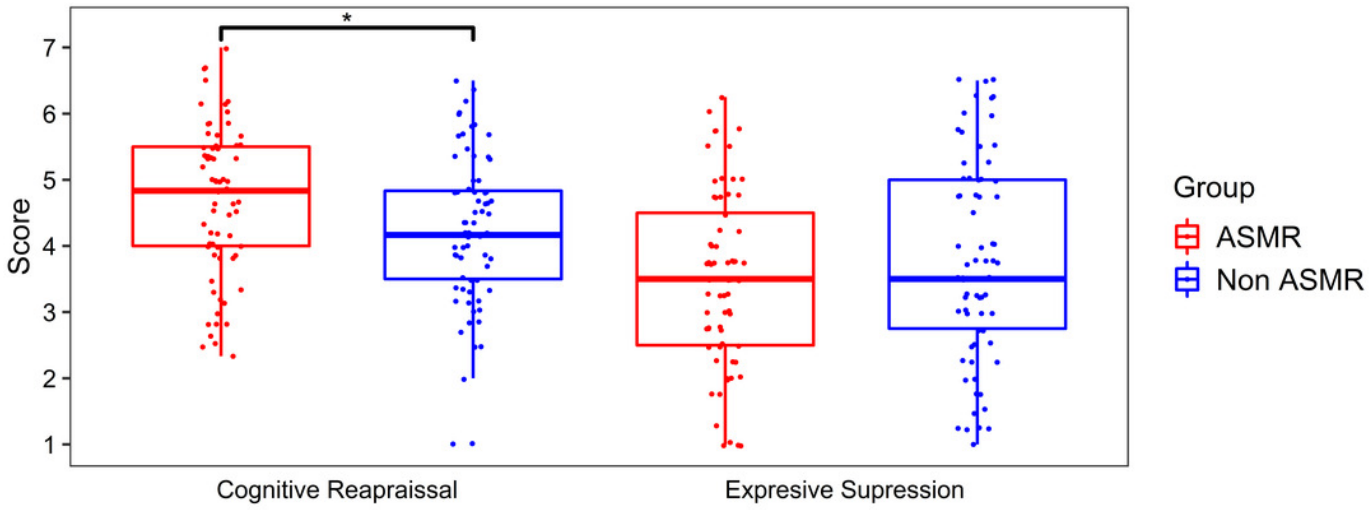

Table 1(on next page)

ASMR and Non-ASMR scores in the Emotion Regulation Questionnaire.

Table 1: **ASMR and Non-ASMR scores in the Emotion Regulation Questionnaire.**

	Group					
Scale	ASMR			Non-ASMR		
	Mean	Median	SD	Mean	Median	SD
Cognitive Reappraisal	4.69	4.83	1.14	4.22	4.17	1.17
Expressive Suppression	3.49	3.50	1.31	3.76	3.5	1.53