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ASMR EFFECT

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Contents

Introduction

In September last year, I saw a documentary on Netflix about ASMR (Autonomous Sensory Meridian Response): videos-movies recorded with binaural microphones, by people (*ASMRtists*) who create specific sounds called "triggers". ASMR contents have the purpose to relax the viewers such as an extent that they feel "tingles": pleasurable physiological sensations that can form on the scalp and emanate down the body that are triggered by this kind of stimuli. Those "tingles" are the "ASMR Effect" that users aim to achieve.

This dissertation comprises three parts. The first part is an analytical description of the phenomenon and the state of the art regarding the present scientific literature. The second part is experimental: it describes the experiment conducted and reports and explains the results obtained. The third part, "ASMR*Effect* App Project", concerns the design of an app and its devices. This third section starts from what emerges from the first two parts: the current scenario, the experimental results and the process that led to these results. It is a design thinking approach, in which the user experience is an integral part of the whole process.
The framework is that of cognitive ergonomics:

"Cognitive ergonomics is concerned with mental processes, such as perception, memory, reasoning, and motor response, as they affect interactions among humans and other elements of a system" International Ergonomics Association (IEA, 2014).

According to David Kelley (2005), founder of the product design company IDEO, design has three activities:

1) UNDERSTAND (chaos, "the mess")

2) OBSERVE (how the product will be used, which means users and use of the product),

3) VISUALIZE (they visualize which is the act of deciding what the product is).

Without prejudice to these theoretical premises with respect to the process that leads to the development of a new product, the designer (me, in this case!) must, first of all, be a man of his time. ASMR is one of the phenomena that are having a big impact on contemporary society, but which is still almost unknown to the scientific community.

The main interest of this work is to better understand ASMR, a phenomenon that is undoubtedly curious: but there is so much more to that.
ASMR videos collect millions of views on the web, so much so that they have become a marketing tool for some of the most important companies in the world. The hashtag #asmr appears on *Instagram* nearly 7.5 million times. Creating ASMR content has also become a profession for many *YouTubers* who, thanks to the number of views, could easily monetise their efforts. The example of *Gentle Whispering,* perhaps the most famous *ASMRtist,* is emblematic: her case will be discussed in the third part of this dissertation.
Even the academic world has started to look closely at this phenomenon, questioning, at various levels, its characteristics and its therapeutic potential.

Whispers, keys pressed on the keyboard, paper crumpled, nails drumming on a glass bottle, the sound of brushed hair and in general all the sounds derived from touching objects of different materials can be the pivotal "themes" of an ASMR video, which often lasts several hours. Many of these videos, especially those focused on whispers, revolve around the theme of "taking care of the listener": The video makers whisper personal questions to the viewers, or repeat that they want to take care of them (like the videos by *Gentle Whispering*), in order to amplify the relaxing effect.

But maybe the most interesting aspect of this strange phenomenon is its dichotomy. These videos are able to give some individuals what medic Nitin Ahuja already defined in 2013 "a reliable low-grade euphoria in response to specific interpersonal triggers, accompanied by a distinct sensation of 'tingling' in the head and spine." (Ahuja, 2013, p. 443); whereas those who do not experience it, often find the videos painful (e.g., misophonic or offensive in other ways) to endure.

People who do not feel ASMR and watch this kind of content, can easily trace the phenomenon back to a sexual drift, but as the community wants to emphasize: "There's no sexual satisfaction. It feels great when It is experienced, but it is not arousing. […] More women produce ASMR content than men, but here's where it gets frustrating — most of the new content from women [and not just them, it must be said] is highly sexualized. This might work for people who want to stare at beautiful people mouthing noises at them, but for the majority of us who watch, ASMR is not a fetish" wrote @EmmaPrice on blog medium.com (1).

Although the content, or at least the formal purpose of the ASMR videos is not sexual (or rather of triggering sexual desire) some points in common with a certain type of fetishism can be

found in the exchange of roles it initiates between the subject acting and the object acted upon: "When ASMR succeeds, the beholder is not physically or emotionally satisfied, but instead is 'triggered' at the level of drive, like a binary switch or sensor. At this moment of release, one physically senses desire being unseated by drive, as the subject assumes the status of a nonhuman object." (Manon, 2018, p. 229)

Perhaps the dichotomous reactions to the ASMR can be read also according to these words.

"ASMR videos divide their audience into two groups: drive-seekers, who may find bodily enjoyment in ASMR sounds; and desire-seekers, who will experience a suffocating anxiety, and wish they could close their ears." (Manon, 2018, p. 231)

Is it possible, as professor Manon asks in his analyses, "to have a pleasurable uncanny experience? Because ASMR seems to be just that." (Manon, 2018, p. 230)

Manon refers back to Freud's 1919 essay, The Uncanny, in which he theorizes this feeling as "intellectual uncertainty whether an object is alive or not, and when an inanimate object becomes too much like an animate one." Freud continues "children […] are especially fond of treating their dolls like live people. So that here, too, it is not difficult to discover a factor from childhood; […] the child had no fear of its doll coming to life, it may even have desired it. The source of the feeling of an uncanny thing would not, therefore, be an infantile fear in this case, but rather an infantile wish or even only an infantile belief." (Freud, 1919, p. 9)

This is not the place to conduct a sociological analysis of the phenomenon, nor to give psychoanalytical interpretations, but it seems that the aspect of infantilisation of the user has a role in causing an effect. However, the ASMR seems to go even further: "ASMR is a reverse arrangement in which real people have the uncanny sense that they are being treated like dolls; or, more specifically, like children treat dolls: by combing their hair, speaking quietly to them, and devoting excessive care to what is obviously a nonhuman toy." (Manon, 2018, p. 236)

In light of all this, noting that only few scientific studies have been conducted so far on ASMR, it has been decided to analyse the phenomenon and to conduct an experiment (the "ASMR Effect Experiment") in order to acquire a better understanding thereof.

1. UNDERSTAND

Understanding means trying to make order in the chaos (Kelley, 2005). ASMR is a multifaceted phenomenon. Many and different are the characteristics of the videos created as different people find effective some triggers and not others. An attempt to make order in the chaos will be made in this chapter, describing what ASMR is, what its history is, what are the sensations it elicits (or should elicit), what are the triggers that cause these sensations and what science has said so far about this.

1.1. ASMR phenomenon

ASMR - Autonomous Sensory Meridian Response - is the term coined in 2010 by Jennifer Allen to indicate a pleasant tingling sensation on the head, behind the nape, on the neck and shoulders that would be triggered by a combination of specific visual, auditory, tactile stimuli. To the uninitiated, *YouTube* autonomous sensory meridian response (ASMR) videos are either pleasurably or painfully excessive.

The term, although it has pseudo-scientific sounds (namely the purpose of who coined it), has no real evidence in this sense. To date, very few studies have been published on scientific journals and even fewer have collected empirical data on the matter. In recent years, ASMR has become a real global phenomenon in the world wide web and even more recently a marketing lever for the promotion of many brands.

ASMR moreover is claimed to have some therapeutic potentials: users find ASMR content (videos or services that use ASMR triggers) relaxing, quite helpful for falling asleep and for to deal with stress (Barratt & Davis, 2015). Some individuals with clinical diagnoses of medical disorders report that these videos are helpful to their insomnia, anxiety, panic disorders and/or depression (2).

The evidence of the potential benefit of ASMR for stress disorders, sleep disorders, mood disorders and more, is slowly growing and has been presented in studies like the one conducted by Poerio et.al. (2018) of the University of Sheffield. The creators of this investigation prove that the abatement of pulse amid ASMR is essentially identical to the diminished pulse detected in clinical preliminaries, including music-based pressure decrease for cardiovascular diseases. Moreover, the reduction in pulse amid ASMR is more noteworthy than the diminished pulse

identified in mindfulness interventions to decrease tension. An fMRI study (Lochte, Guillory, Richard, & Kelley, 2018), shows that ASMR videos activate brain regions previously observed to be activated during encounters like social bonding and may include dopamine, oxytocin, endorphins, and different neurochemicals related with affiliative practices. The study by Fredborg, Clark, & Smith (2017), underlines that mindfulness and ASMR are related. The creators state that these discoveries bolster the likelihood that mindfulness training could upgrade the impacts of ASMR and therefore improve the potential advantages of ASMR for relaxation, low mood, sleep and related clinical conditions.

There is still a lot to learn about the physiology of ASMR and the true effectiveness of ASMR for medical disorders, but most of the (few) researches conducted since now seem to point out that ASMR has potential in this sense. All the peer reviewed studies published so far will be presented further on in this discussion.

1.2. What is ASMR

The tingling sensation on the scalp, in the back-head, that branches towards the shoulders and runs along the back, during a session at the hairdresser's, when listening to someone speaking in a soft, gentle manner, leafing through a magazine or watching some sort of hypnotic teleshopping: that is the Autonomous Sensory Meridian Response (ASMR). The subjective experience of ASMR tingles, sometimes anecdotally referred to as `brain tingles' or `brain orgasms' (3), is often accompanied by feelings of calmness and relaxation.

A driving factor of the increased popularity of this phenomenon is that it seems, among most of the users, to be very helpful to reduce stress and fall asleep. Not to mention that in the last few months, even in Italy, it has exploded as a trend on the most popular social networks, including on newspapers and television.

A common way to experience ASMR is to watch ASMR videos. These videos may be either made explicitly in order to trigger a reaction in the viewer, or with other and disparate goals, but somehow contain a combination of sounds and images that stimulate those tingles of an ASMR response. In the first case we talk about *ASMRtists*, that is a large group of *YouTubers* who, in a more-or-less professional way, create weekly or monthly new content designed to trigger the much-coveted tingling sensation in those who watch them; or at least to create a pleasant

feeling of relaxation. In the second case we speak of unintentional ASMR: multimedia and non-multimedia products, created for other purposes than to cause feelings of relaxation and / or brain tingles. Unintentional ASMR can be elicited by unboxing videos, expert demonstrations as well as by the monotonous talking of some teachers or by the attention of hairdressers, cosmeticians, and clinicians.

Individuals who intentionally or unintentionally elicit ASMR in others tend to have the following dispositions: kindness, caring attitudes, empathy, attentiveness, focused attention on the viewer, trustworthiness and a calm vocal tone.

1.2.1. Sensations and Stimuli

The Autonomous Sensory Meridian Response ASMR indicates a tingling sensation in various parts of the body, mainly on the back head, mostly accompanied by a state of mental relaxation of the person experiencing it. Numerous stimuli contribute to provoke this sensation: cerebral (thoughts or ideas) or of visual, auditory or tactile nature (e.g. whispering, soft talking, light touches, methodical sounds), perceived by a subject in a basically passive way.

According to "ASMR University", an online worldwide hub for ASMR research and researchers other than for amateurs, created by Prof. Craig Richard (perhaps the most authoritative expert of ASMR) and Jennifer Allen (whom coined the term), the ASMR sensations can be categorized into (4):
Physical sensations: light and pleasurable tingles, sparkles, fuzziness, or waves in the head, neck, spine, and throughout the rest of the body.

Psychological sensations: deep and soothing feelings of relaxation, calmness, comfort, peacefulness, restfulness, or sleepiness.

The ASMR stimuli (often called "ASMR triggers") can be either Externally initiated or Internally initiated. The externally initiated stimuli could be direct, all the ways ASMR may occur in the presence of another person (e.g. getting a haircut, someone whispering to you) and transmitted (e.g. ASMR videos).

Direct ASMR may be accidental or purposeful, one-to-one or one-to-several; in the four combinations:

1. accidental, one-to-one (visit with a hairdresser, examination by a clinician, personal attention from a teacher);
2. accidental, one-to-several (a teacher talking to a class, a person demonstrating a task to a group of people);
3. purposeful, one-to-one (a mother using ASMR triggers to soothe an infant, a friend using ASMR triggers with another friend, ASMR practitioner offering expert ASMR sessions, ASMR triggers being used as a form of potential therapy);
4. purposeful, one-to-several (someone creating ASMR triggers in front of an audience).

The Internally initiated ASMR stimuli could be Self-stimulated (Examples: focused thinking, meditation) or spontaneous.

1.2.2. Triggers

The stimuli for ASMR (often called "triggers") mostly fall into three main categories.

Tactile (felt): light touch, massage, hair touching, grooming, physical examination
Visual (seen): eye contact, observing hand movements
Auditory (heard):
Spoken sounds: soft, whispering, slow, gentle, increased pitch, caring, monotone
Oral sounds: mouth sounds, chewing sounds, blowing sounds
Objects sound: tapping, scratching, cutting, crinkling, stroking, handling of objects

The common theme to ASMR triggers is that they possess the universal patterns of non-threatening stimuli. This may be the key to their ability to induce relaxation.

These sounds may recall sounds uttered by loved ones and, in particular, by caregivers when in proximity of infants. These sounds may have been deliberately created as a sort of "white noise" in the case of new-borns struggling to sleep (the noise of the hair dryer is used by many mothers as an aid in making babies sleep); or they may have been the result of the mere presence of someone around us.
There is a huge variety of ASMR triggers, they tend to be repetitive, methodical, gentle, steady, and at low. These characteristics are also typical of cantilenas and lullabies which, in fact, accompanied by the visual stimulus (the presence of the caregiver) and, often, tactile (in the form of caresses or delicate contact), are part of the "cultural background" of the figure of the mother, through historical eras and across cultures. Trehub, Unyk, & Trainor, 1993, paired

excerpts of lullabies and comparison songs from different areas of the world and present those to Western adult listeners, who were required to identify the lullaby in each pair. Subjects successfully differentiated the lullabies from the other songs. In addition, feedback about correct performance failed to improve the accuracy of lullaby identification. Furthermore, adults successfully identified the lullabies even when all songs were electronically filtered to remove the words. Parallels between infant-directed music and infant-directed speech are also noted.

Boisterous and brutal sounds rarely stimulate ASMR in individuals. So delicate and methodical sounds may enact the bonding pathways by giving solace that a loved one is close-by dependent on the hints of leaves stirring, little twigs popping, hints of chewing and breathing, scratching and tapping, or even the hints of another person adjacent being prepped. For any length of time that these sounds are not unexpected, uproarious, or inconsistent then they may flag wellbeing and relief by telling us that a friendly individual is close, and this might be the reason they elicit ASMR (5).
The individuals that create ASMR stimuli give the idea that they are caring for the viewer wellbeing; they are trustworthy, dedicated, and sort of expert in the role that they play.

1.2.3. Scenarios and role-plays

ASMR scenarios combine dispositions with multiple stimuli to result in strong ASMR reactions (6). ASMR scenarios incorporate instructional showings, efficient assignment fruition, personal attention, and interviews. These situations may include the individual as a participant or as a spectator.

On the off chance that the situations are made intentionally to elicit ASMR, at that point they are classified "ASMR role-plays". These are ordinarily performed by *ASMRtists* on *YouTube*.

Clinical role plays in general are among the most performing and appreciated role play genre.

“Some *ASMRtists* are well practiced in the proper pronunciation of anatomical landmarks, while others smirk self-consciously as they stumble through jargon. Some performers are all business, confidently executing a full history and physical, while others take long pauses between manoeuvres, tapping thoughtfully on their instruments as they dwell for a while on the viewer’s eyes, the ears, the thorax envisioned just below the camera lens. In even the crudest clinical

pantomimes, however, the attention paid to the viewer-as-patient is deliberate" (Ahuja & Ahuja 2019, p. 1336).

There is no limit to the imagination of *ASMRtists* as far as video content is concerned, and every day new scenarios and related role-plays are created. What follows is a non-exhaustive list of the most performed (and displayed).

Book Club Role Play: Involves the *ASMRtists* being the main speaker at a book club. He/she could suggest books, leaf through them, provide a short review of a book, or read short excerpts of it (7).

Book Collection: The *ASMRtists* could go through the book collection describing each book, why he/she likes it; he/she could leaf through the pages and scrape and scratch the bindings to create sounds (8).

Book Reading: The reading could be done in a soft voice, not necessarily whispered; the voice is kept slow and steady to create a relaxing pace. It could be a newspaper, comic, book, website and so on (9).

Brushing/Stroking the Camera/Microphone: Involves using makeup brushes and/or hands to brush or stroke the camera and/or microphone. This is slightly different to a makeup role play as there is not the whole makeup script. The *ASMRtist* could be completely silent whilst brushing or just ramble on, in a softly spoken or whispering voice (10).

Cranial Nerve Exam: One of the most common ASMR role plays involves the *ASMRtist* working as a medical professional in order to assess the cranial nerves of a patient (11).

Doctor/Nurse Role Play: Involves the *ASMRtist* playing the role of a doctor or nurse and providing a general examination or focusing on a specific ailment (12).

"Draw my life" script: Involves the *ASMRtist* drawing the stages of his/her life on a whiteboard, blackboard or electronic device. Not only who has drawing skills perform this kind of role-play (13).

Lego: This kind of videos could be pure sound videos or could involve directly the *ASMRtist* building something with Lego (14).

School/Career Counsellor Role Play: The *ASMRtist* is a school counsellor giving advice to a student (15).

Spa Role Play: Involves the *ASMRtist* providing a variety of different services at a day spa. Can include facial treatment, massage, make-up, manicure, foot massage - pretty much anything that could be done at a day spa (16).

Tarot Card Reading: Involves a role play in which the *ASMRtist* is providing a card reading for a client. Dark lighting and lit candles create the mood. He/she is not necessarily in front of the camera, sometimes he/she can just video cards and hands (17).

Therapist Role Play: the *ASMRtist* is the therapist treating his/her patient. There are lots of possibilities with this kind of role-play as there are plenty of psychological problems that need solving. It could be done also with specific techniques as EMDR, involving mimic eye movement desensitisation and reprocessing (18).

Zombie Role Play: Involves being a 'normal' person in a world of zombies. Need to set a very dark gloomy scene to provide the best effect (19).

1.3. ASMR History

The first post in which something like what will be called an ASMR sensation made its outset on the web on October 2007 and it appeared as forum thread started by *okay whatever* on steadyhealth.com (20).

The comment, titled "weird sensation feels good" recite:

"i get this sensation sometimes. there's no real trigger for it. it just happens randomly. it's been happening since i was a kid and I'm 21 now. some examples of what it seems has caused it to happen before are as a child while watching a puppet show and when i was being read a story to. as a teenager when a classmate did me a favour and when a friend drew on the palm of my hand with markers. sometimes it happens for no reason at all that i can tell, though. I'll just be sitting or whatever doing whatever and it happens. it's like in my head and all over my body. if i get an itch when I'm experiencing the sensation i won't scratch it cause the itch helps intensify it. i also like to trace my fingers along my skin because it feels good when experiencing the sensation. sometimes my eyes will water. when the sensation is over i will sometimes feel nauseous, but not that bad. just a slight hint of nausea. what is it?? I'm not complaining cause i love it, but I'm just wondering what it might be… help."

In 2008 the term Attention Induced Head Orgasm (AIHO) was coined by *tingle* in a comment within the forum thread cited below:

"I have had this "Attention Induced Head Orgasm" (AIHO) for as long as I can remember. I got it once really good when I was getting knobbed but I think it was the attention that mattered not the sexual stuff. I think I get his when someone is paying direct attention to me. I have not noticed a correlation with it being from older people, but come to think of it I do not think it has ever happened from being around a kid.
I just had it happen when reading an email from a friend who has a yoga/wellnes center. He has helped me in the past with direct attention so this was really weird to get it from reading the email. The email was not even to me, just a braodcast about his wellness business. I would love to know how to make this happen more often.
In Serach of AIHO!" (21).

Later on, in December 2008, *Society of Sensationalists* was formed as a Yahoo! group. Its description mentions the following:

"This group is being formed in hopes of finding people who experience the same sensation. All we have right now are questions and we need answers. We need help, not in the sense that we want to solve or cure this sensation but rather instead to learn what causes this and whatever else may be concerning to us."

In 2009 the first whisper channel on *YouTube* is created: *WhisperingLife*. In the description of the first video "Whisper 1-Hello!", the author posted the following:

"I know this might sound really weird to some, but i love hearing people whisper! So i though i would make a whispering channel. No haters please. If you don't like it then get off my channel…simple as 🙂 For those of you who love to hear people whisper too…i hope you like my whispers!! xx"

In 2010 the term Autonomous Sensory Meridian Response is coined by Jennifer Allen, under the nickname of Envelope Nomia. As Jennifer Allen explain to Prof. Craigh Richard during an interview, "Autonomous refers to the individualistic nature of the triggers, and the capacity in many to facilitate or completely create the sensation at will; sensory and response are fairly obvious, and meridian, is a more polite term for orgasm" (she also commented: "Try explaining why you want money to study 'goose looping' or 'brain orgasms"). In the same year, Allen formed the first *Facebook* ASMR Group and the website dedicated to ASMR Research &

Support www.asmr-research.org, but the site is not online anymore.

1.4. Peer reviewed study on ASMR

Since there are less than a dozen peer reviewed articles published so far, it is worth reviewing them all briefly. The article by Poerio and colleagues is described in more detail than the others, hence it will be the main reference for the experiment that has been conducted as part of this dissertation.

The first peer-reviewed paper about ASMR was published in 2015. The paper is titled, "Autonomous Sensory Meridian Response (ASMR): a flow-like mental state" and it is a qualitative study authored by Emma Barratt and Nick Davis. The data provided by the publication were collected from an online survey completed by 475 individuals who reported ASMR experiences and actively sought out online trigger videos, as well as subjective accounts of pain and mood management after viewing ASMR media. The results of the study report that most people watching ASMR videos do so to relax. Among the strongest triggers are (i) whispering, (ii) personal attention, (iii) slow and repetitive movement. 81% watch ASMR videos before sleeping, and they need specific conditions in order to achieve ASMR effects (e.g. familiar, dark, silent places). 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.

In 2016 Smith, Fredborg, and Kornelsen conducted the first neuroimaging research study about ASMR. Participants were 11 individuals who experienced ASMR (ASMR-sensitive group) and 11 individuals who did not experience ASMR (control group). Both groups underwent functional magnetic resonance imaging (fMRI). The collected data drove the authors to hypothesize that ASMR-sensitive individuals may have a "reduced ability to inhibit sensory-emotional experiences that are suppressed in most individuals" (p. 364).

The same authors published in 2017 "An Examination of Personality Traits Associated with Autonomous Sensory Meridian Response (ASMR)". The study included two groups; 290 individuals who experienced ASMR and 290 individuals who did not experience ASMR. ASMR experiencers scored higher than Non-ASMR experiencers for Openness-to-experience and Neuroticism; while the same group scored lower than Non-ASMR experiencers for Conscientiousness, Extraversion and Agreeableness.

The fourth peer-reviewed research study about ASMR, "Assessing individual variation in personality and empathy traits in self-Reported Autonomous Sensory Meridian Response", was published in 2017. The authors are McErlean and Banissy. The study involved an online survey administered to two groups of participants with an average age of 26 years. The first group were 83 ASMR-responders recruited from an ASMR *Facebook* Group who self-reported experiencing ASMR. The second group were 85 ASMR-nonresponders recruited from local university students who self-reported not experiencing ASMR. The Big Five Inventory was used to measure the big five personality traits. The ASMR-responders showed significantly higher scores for Openness and significantly lower scores for conscientiousness than ASMR-nonresponders. For assessment of empathy the Inter-Personal Reactivity Index. For assessment of empathy, the researchers used the Inter-Personal Reactivity Index. ASMR-responders scored significantly higher for Fantasizing and Empathic Concern than ASMR-nonresponders, and both groups scored the same for Perspective Taking and Personal Distress. Main motivation for watching ASMR videos was to relax or trigger ASMR (86%), To help fall asleep (41%), To reduce anxiety (11%). Top ASMR triggers reported to induce ASMR were Whisper (41%), Crisp sounds (36%), Personal attention (35%). The main triggers reported to have unpleasant/uncomfortable effect was Eating sounds (25%).

"Sensory determinants of the autonomous sensory meridian response (ASMR): understanding the triggers" was published in 2017 by Barratt, Spence, and Davis. An online survey was used to collect responses from 130 individuals; all of them were ASMR experiencers. The collected data return these results: 43% experience misophonia, 68% report that the optimal duration of the triggers is between 1 and 10 minutes, the ideal atmosphere should be relaxed an inviting. Sounds manipulation is extremely important as well as pitch of the triggers (lower pitched sounds are preferred). The majority disagree with the affirmation *Only objects in view (on screen) can elicit tingles*; participants also confirm that music should be avoided in order to induce the ASMR response.

The first study to report physiological changes while individuals experience ASMR is titled "More than a feeling: ASMR is characterized by reliable changes in affect and physiology" and is authored by Poerio, Blakey, Veltri and Hostler. The research was published in 2018 in the journal PLOS ONE. The publication reported the results of two studies. The first study included 1002 participants that completed an online survey and watched one randomly selected video from each of the 3 types of video proposed: control (non ASMR), ASMR speaking, ASMR no speaking. Main results of the first study are: ASMR videos increase tingles, excitement, and

calmness; decrease stress and sadness; do not affect sexual arousal. Spoken ASMR videos stimulate stronger responses than No spoken ASMR videos.
The second study included 110 participants, 50% experienced ASMR (self-determined). The results between an ASMR group (n=55) and a non-ASMR group (n=55) were compared. An online survey was filled, and physiological responses were measured while subjects watched 3 videos (Non ASMR, Standard ASMR, self-selected ASMR). The ASMR group was asked to abstain from watching ASMR videos 3 days prior to the study to increase ASMR sensitivity. Physiological responses were measured as Heart rate and Skin conductance.

One of the key findings of the study is the decreased heart rate in response to ASMR videos due to an achieved relaxation. Authors discussed also how ASMR and music/aesthetic chills are different since heart rates tend to increase during chills. Furthermore, authors explain that the decrease in heart rate during ASMR is greater than the decreased heart rate observed in mindfulness interventions to reduce anxiety: this evidence would support a potential clinical value for ASMR.

Considering that the non-ASMR group also reported increased calmness and decreased stress to ASMR videos in study 1 and had decreased heart rates in response to ASMR videos in study 2, the authors highlight that ASMR videos had a relaxing effect also on people who didn't experience ASMR.

Study 2 showed that the self-selected videos were better at stimulating tingles and increasing skin conductance, but not at decreasing heart rate. The results are explained as follows: a video that stimulates stronger tingles (self-selected videos) may stimulate stronger excitement/euphoria, and a video that mildly stimulates tingles (standard videos) may induce stronger relaxation.

Disclaimer: ASMR group reported in study 2 that their ASMR was decreased in this study condition compared to daily life. Therefore, the effects of ASMR out of a laboratory environment may be even stronger.

In 2018, McErlean and Banissy published another study: "Increased misophonia in self-reported ASMR". While some people greatly enjoy ASMR trigger sounds like whispering, mouth sounds, and chewing, others will respond to those same sounds with annoyance, anger, or anxiety (misophonia). Interestingly, some people who report experiencing ASMR to some triggers also report experiencing misophonia to other. Are there some relation between ASMR and

misophonia? This study enlightens that Individuals who experience ASMR do show a tendency of being more likely than non-ASMR-responders to experience misophonia.

In 2018, Fredborg, Clark and Smith "Mindfulness and ASMR" study was published. Are there some relationships between ASMR and mindfulness? This research underline how individuals who experience ASMR are more likely to possess the attentional component of mindfulness (Mindful Attention Awareness Scale) and have a greater interest in their own conscious experiences (Toronto Mindfulness Scale, curiosity subscale). The authors highlight that these findings support the possibility that mindfulness training could enhance the effects of ASMR and its potential benefits for relaxation, sleep, low mood, and associated clinical conditions.

Cash, Heisick and Papesh have published in 2018 a research titled "Expectancy effects in the ASMR". The study included 102 ASMR-consumers who regularly watch ASMR videos and 107 ASMR-naive individuals who don't normally watch ASMR videos. The two groups were further divided into sub-groups and encouraging instructions (positive ASMR response expectations) or discouraging instructions (negative ASMR response expectations) were read to them. Each sub-group listened to 3 audio files of 3 categories: ASMR audio (expected to stimulate ASMR), foil audio (not expected to stimulate ASMR), control audio (expected to stimulate frisson). Positive expectations significantly influenced the ASMR-naive group, but not the ASMR-consumer group, to have a stronger ASMR response. Every sub-group showed a higher ASMR rating (not always significant) to all audio types when the audio was preceded by a positive expectation. The ASMR naive group, but not the ASMR-consumer group, reported stronger ASMR to music than to ASMR audio when given encouragement to experience ASMR. The ASMR-consumers consistently gave music the lowest ASMR ratings. Among the proposed ASMR audios, the highest ranking was assigned to the whispered one: when asking the ASMR group subjects which was the trigger that mostly prompted the ASMR response while watching the videos, the majority answered "personal attention". According to the authors this may demonstrate that visual aspects of personal attention significantly contribute to ASMR. However, this comparison is hard to make due to the different measurement parameter.

In 2018 "An fMRI investigation of the neural correlates underlying the ASMR" was published by Lochte, Guillory, Richard and Kelley. This is the first (and only, to date) published study to show brain activity during ASMR. Ten participants who reported brain tingling while watching ASMR videos were recruited. Participants previewed and selected video clips which strongly stimulated their ASMR and then they abstained from ASMR videos for 48 hours prior to the brain scans.

The results suggest that ASMR videos are activating brain regions previously observed to be activated during experiences like social bonding and may involve dopamine, oxytocin, endorphins, and other neurochemicals associated with affiliative behaviours.

“Two Studies of ASMR: The Relationship between ASMR and Music-Induced Frisson” and was published in 2018 by Kovacevich and Huron. The authors suggest in their discussion that ASMR might be a type of frisson. The authors do acknowledge differences between the two responses, but at the same time point out some similarities. ASMR and frisson may have some overlapping aspects but establishing a clear line between ASMR and frisson needs a lot more research.

2. OBSERVE

Once the social relevance of the ASMR phenomenon is understood, it is reasonable to think that the research will be increasingly more interested in its analysis, in order to comprehend not only its causes but also its potential in therapeutic terms. Currently, the scenario for those wishing to conduct research on ASMR has several constraints which the "ASMR*Effect* App Project" aims to overcome. The "ASMR*Effect* App Project" is thought in order to overcome the limits that the future research on ASMR could encounter; it consists of a mock-up for an app and its related devices. The "ASMR*Effect* App Project" will be discussed in detail in the third part of this dissertation. In this second part the results of a focus group on ASMR will be discussed and the "ASMR Effect Experiment" will be presented, after having briefly described the current scenario in which a research like this can be conducted nowadays.

2.1. The Focus Group

After learning about the ASMR and being better informed about it, the aim was to understand how and to what extent this phenomenon has penetrated the younger generations. A focus group on ASMR topic was conducted with this purpose in a high school.

The meeting was attended by 13 students of a technical institute near Milan. Nothing was anticipated to them except the subject of the discussion. Only three people did not know ASMR, even if, after having talked about it for a while, they confirmed that they had already watched that kind of content without associating it to the acronym. The main channels are *Instagram* (more passive) or *YouTube* (more active). Individuals with an *Instagram* profile (and who are teenagers) seem to have somehow come across ASMR videos. This evidence will also be confirmed in the second meeting with other adolescents of the same institute. This second informal chat with other students will be discussed in the third part of the dissertation. *Instagram* is the main sharing medium of such contents, which are therefore spread to a vast public. Those who want to broaden their knowledge move on to watching videos on *YouTube*.

Among the participants, one person has known and watched these videos for about four years, another couple of people for at least two, the others for less than a year (since ASMR began to spread across the Italian media).

The most appreciated ASMR videos (in this sample) were of two types:

videos with objects generally containing liquid or slime (for example tablets of detergent) that are being crushed, and those in which the protagonists eat any type of food. In the latter case Asians are particularly rated (when they eat sushi, especially fish eggs that break-patent analogy with the dash tablets that explode) and Americans (because they eat junk food).

Watching this kind of video generates satisfaction, "as if I were eating it". This comment comes from a person who has suffered serious anorexia problems, but the feeling was widespread among participants who, being teenage girls, claim to be "perpetually on a diet". Other mentioned videos are the "mukbang" ones in which the protagonist eats large amounts of food while interacting with his/her audience.

The videos by Italian *ASMRtists* are not that popular because they are considered a bit too much artificial. However, one of the people who loves the "personal attention" genre, perhaps the most purist with respect to the definition of "ASMR lover", is a fan of "Chiara ASMR", one of the most viewed Italian *ASMRtist*. The same person also confirms to have positively commented some of the videos of Chiara ASMR. This is also one of the two people who claims to have experienced tingles.

"For viewers who 'get' ASMR, the videos' staging of aural proximity is self-evidently not a full arrival, with the visual barrier imposed by the screen denying the very sorts of haptic connection that the videos' soundtracks consistently foreground. […] This ever-present lack, or gap, in the process of attainment is what lends ASMR an alleged therapeutic value that is frequently touted by both users and content-producers." (Manon, 2018, p. 232)

The discussion then shifted to comments on ASMR videos, which in general are always positive. The participants confirmed, "no negative comments, if you don't like a video you just don't watch it" (Except for the ASMR trash drifts - see "chiara dalessandro" or "follettina" on *YouTube*).

Videos made by women are generally preferred to those made by men, with the exception of "eating" videos because men eat with more eagerness than women. Women in general are preferred because they are "more beautiful to see". Video and audio component are deemed equally important. Even those who say they fall asleep just listening to the sound, reiterate that they do so only after watching the video, so "when you close your eyes you continue to imagine the person who produces it".

The participants were asked the following question: "Do you happen to watch videos with sounds of nature to get a relaxing effect?" Many of the girls confirmed that they had watched them, but without consistency, while ASMR videos are viewed regularly, some people also watch them every day up to two hours a day, mainly in the evening. "What's the difference between these videos and ASMR videos?"

The difference between ASMR videos and relaxing new age videos - in which the noises of nature are generally the protagonists - has emerged to be the human component: "what [*ASMRtists*] do in the video I can do too and/or I identify with whom receives the attention". The second person who claims to have experienced tingles says in fact to feel them with food videos because "I identify with those who eat". Food videos, in particular, seem to have a cathartic effect. One of the participants adds that ASMR videos generate physical sensations. The difference with listening to music seems to be that music generates memories, emotions; ASMR videos cause just physical sensations. The sensations triggered by ASMR videos are felt as pleasant, unlike noises such as nails on the blackboard that cause unpleasant shivers. Some people perceive the same pleasant sounds as unbearable sensations.

The facets are many, and the original effect ASMR is diluted in spurious elements that capture many different people for a variety of reasons. Those who watch ASMR videos, however, are looking for the right trigger.

"ASMR trigger-chasing must be understood as symptomatic of broader digital–millennial trends in its repudiation of the lack of lack itself. […] ASMR videos exist in a context in which the trusted reliability and lossless plenitude of digital technology have become problems in themselves. In pointed ways, digital culture lacks the lack on which desire is founded: It delivers too much, too quickly, too easily, and too dependably." (Manon, 2018, p. 232)

At the end of the discussion the participants were asked if they knew the app *Tingles*. None of them knew it. At that point it's functioning has been explained, and some stated that "it would be interesting to download it", though they would continue to use *YouTube* (This was the opinion of those who only watched one genre of food videos), while others considered it interesting especially for its ability to search for videos based on the types of triggers. They were asked if it would be interesting for them to see their physical reaction when watching these videos. The idea of having feedback in this sense generated widespread support. A film presenting the reactions of those who watched videos with different emotional content was mentioned as an interesting example.

The discussion took place in a rather open way, without any particular intervention on behalf of the researcher. The participants discussed a subject that they didn't regard as popular. Watching ASMR videos is in fact considered a "weird" thing, and this is also one of the reasons why it is often enjoyed in private. "If my mother saw me watching these videos, she would be worried, she would think that there is something wrong, therefore I close myself in the room when I do it. And they add "you feel pleasure watching them but feeling pleasure in front of others bothers you".

"Functioning for many as a do-it-yourself form of therapy, ASMR is not a matter of regularizing or standardizing triggers. Rather, the point of the genre is to perpetuate the notion that some triggers work for some people and not others. As Rob Gallagher notes: 'In [*Reddit*] forums like r/asmr, questions of provenance, content, meaning and intention are irrelevant. Debates over symbolism, subtext and irony are abandoned. Only one question matters: does it trigger you or not?' "(Manon, 2018, p. 244).

Many of the views that ASMR videos continue to collect seem to be the result of curiosity about a phenomenon that has become viral also because "strange". The line with the sexual component is very blurred. Empirical data obtained from the experiment conducted and described here will provide further evidence regarding the complexity of ASMR phenomenon.

2.2. Doing ASMR research: A current scenario

Bicocca University in Milan provides students with spaces and equipment for conducting experiments. There are many laboratories (e.g. psychophysiology Lab, developmental psychology Lab, colour and perception Lab, eye tracking Lab, and more) and research machineries are in most cases up to date (e.g. GSR/HR BioPac machine). Laboratories are managed by professors and researchers with specific and profound expertise (e.g. psychophysiology researchers, developmental psychology researchers, virtual reality researchers, and so on and so forth).

The access to the expertise of several Lab professionists has been fundamental while working on this dissertation (e.g. the psychophysiology Lab team, the developmental psychology Lab team, the IT technicians and others). Their individual expertise and practical guidance have been crucial for the successful completion of the "ASMR Effect Experiment".

Nevertheless, some criticalities have emerged while working on this study given its *avant-garde* nature (it is noted that no other ASMR studies have ever been conducted before at Milano Bicocca University). Gaps and criticalities are mentioned below in this paragraph. The development of the "ASMR*Effect* App Project" is a first attempt at solving these challenges. "ASMR*Effect* App Project" and proposed solutions are discussed in more details in the third part.

The high number of users during the "peak season" of research causes overbooking of the laboratories, even if, in the summer period, the facilities were not overcrowded (the problem at that point could be to find participants for the experiments).
It is difficult, given the lack of a single institutional communication channel, to find the right information regarding, for example, what kind of equipment and how many machines (and for doing what) are made available by the structure, or where they are located among the different laboratories. Other issues are related to the management of the laboratories, that is in many cases hyper layered. Example in this sense is that there are no official instructions about where to find the keys of the different laboratories, there is no unique system, but each laboratory has its own rules and policies. The problem occurs especially for experiments which take place on Saturdays, considering that Universities are pretty much deserted on those days.

For all the reasons mentioned above, the time needed to run an experiment could expand, causing a chain of scheduling issues to all the users of laboratories and machinery. In running the "ASMR Effect Experiment" the main problem has been related to the delay caused by the

"searching operation" for a GSR machine that was more up to date, hence more reliable, than the "UFI Machine". "UFI" was the first GSR machine that has been showed to me in order to measure skin conductance during the "ASMR Effect experiment".

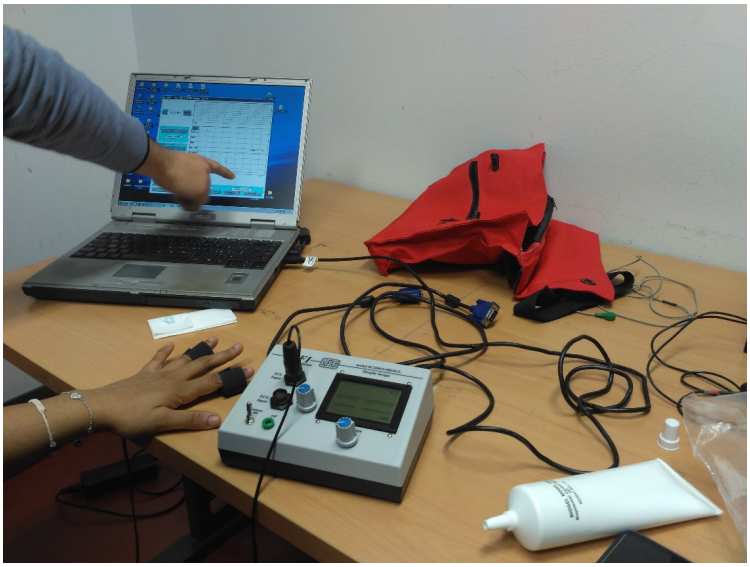


Fig.1 The GSR/HR "UFI" kit.

Fig.2 The photography that appears on the university website: it shows the "perception, attention and space" laboratory

Other critical issues, unrelated to specific laboratories and equipments but connected to the conduction of experiments in the laboratory *per se*, pertain to the difficulty in bringing subjects into the universities (the subjects of many experiments are the students of the universities themselves, which generates an upstream sampling bias). Concerning the conduction of experiments related to the use of ASMR contents, which are viewed mainly in evening hours, in familiar places (such as the bedroom) and in conditions of intimacy and quiet, "forcing" the viewing at predetermined times and in an unfriendly and aseptic place, leads to other bias.

Thinking about the overall context for doing research on ASMR and its physiological correlates, and the scenario of a sample university such as the Bicocca University of Milan, the "ASMR*Effect* App Project" idea aroused. A first version of "ASMR*Effect* App Project" is thought to address these critical issues, and a subsequent one, yet not less important, has a commercial scope (given the potential inherently carried by the ASMR phenomenon).

2.3. The "ASMR Effect Experiment"

"Is ASMR a genuine feeling in those who claim to experience it? Does it produce reliable changes in affection and physiology?"

This is the question posed by Poerio and colleagues that had led their research on ASMR. Their study, published on Plos One on June 2018, is the first and only (to date) published work on ASMR in which electrodermal activity (EDA), also called galvanic skin response (GSR) is used to collect physiological parameter in an ASMR study.

Starting from the evidence emerged from the study by Poerio and colleagues (2018), this research was aimed at investigating the behavioural reactions and physiological correlates in a non-pre-selected population. The questions that led to the implementation of this experiment are different, and the attempt was to give an answer to all of them.

The aims of the study were therefore:

1- To find out whether there is an ASMR physiological effect or not.

2- Measure the incidence of people, among a naïve population, who actually experience the ASMR effect.

3- Compare the results of this study with the results obtained by Poerio and colleagues (2018) in relation to the arousal of people who feel the tingles.

4- Understand the reaction to ASMR stimuli of people who do not like this kind of video.

5- Understand if there is a difference in the perception of ASMR stimulus, by definition multisensory, and the same stimulus proposed in a unisensory modality.

6- Understand if there are differences in the perception of ASMR stimuli created by men or women also in relation to the gender of the user.

2.3.1. Participants

30 individuals participated to the study (16 males and 14 females, Mage = 30.5 years, SD = 11.5, Range = 20±68). Participants were recruited mainly by word of mouth and Sona System University portal. No kind of a priori selection was made as one of the objectives was to test the incidence of any effects on a naïve sample.

2.3.2. Methods

2.3.2.1. Stimuli

a. Video/audio clips. Video/audio clips were edited so to last each six minutes in length as a maximum duration time. This length was chosen based on results of the study by Barratt, Spence, Davis (2017) in which participants most often reported that their favourite online ASMR content lasting for between 1 and 5 min (38%), or 6–10 min (30%). As they suggest

"The ideal length to focus on each trigger was rated as between 1 and 10 min. The spread of data in the current study seems to indicate that around 5–7 min would be palatable to the largest number of viewers" (p. 11).

In order to maximize the possibility to eliciting the ASMR effect while avoiding to bore participants with content they don't like, the option to skip to the subsequent stimulus was given after 2 minutes, hence each stimulus was presented for at least 2 minutes.

The six stimuli included: two ASMR videos, a woman and a man ear massage (Fig. 3-4), one control video, a car washing machine in action (Fig. 5) and the three respective audios. ASMR videos were taken from *YouTube* and were selected according to the following criteria:

-The content of the videos was typical of the ASMR genre and the videos were selected on the basis that they contained multiple ASMR triggers like delicate hand movements, close personal attention. Previous studies (eg. Cash et al. 2018; Fredborgh et al. 2017) report personal attention and slow and repetitive movement among the most effective ASMR triggers. Whispering videos are the most effective in eliciting ASMR response, but this kind of videos have been excluded in order to avoid spurious component that could bring confounding elements.

- In ratings of characteristics associated with an effective ASMR video, relaxed atmosphere was the most associated with the idea of an effective ASMR video by the participants (N = 124) to Barratt and colleagues (2017) study, hence I've focused my attention over massage performances.

- The popularity of the chosen typology (ear massage, no speaking).

- The position of the camera. As found out by Barratt et. Al (2017) larger actions that can be better seen further away (an ear massage, in this case) are best viewed from a distance of 60 cm to 1 m away from the trigger object (the 3-Dio Microphone).

- The presence of a manipulated object, as its importance emerged also in Barratt et al. (2017) study. Participants (N = 127) most strongly indicated that sounds made from the manipulation and use of objects was an important stimulus, with 51.2% of the sample rating it as 'extremely important'.

-The presence of the binaural 3-Dio Microphone, typical of most ASMR performances. As found out by Barratt and colleagues (2017), about 58% of the participants in their study said they felt binaural recording was more effective than regularly recorded audio for ASMR media consumption. Further enquiries revealed that 61% of the participants felt that binaural recording made the associated tingling sensation more intense.

- The popularity of the selected performer.
The male performer, *ASMR Just Tingles*, has about 32,000 subscribers to the channel with videos that reach 300,000 views. The female performer, *ASMRmagic*, has more than a million subscribers to the channel with videos that reach 80 million views. The gap of views between male and female performers (in favour of women) is common for this kind of videos.

- The situation balance created by the two performers (man and woman) since one of the experimental questions was whether there were differences in the perception of stimuli in this sense.

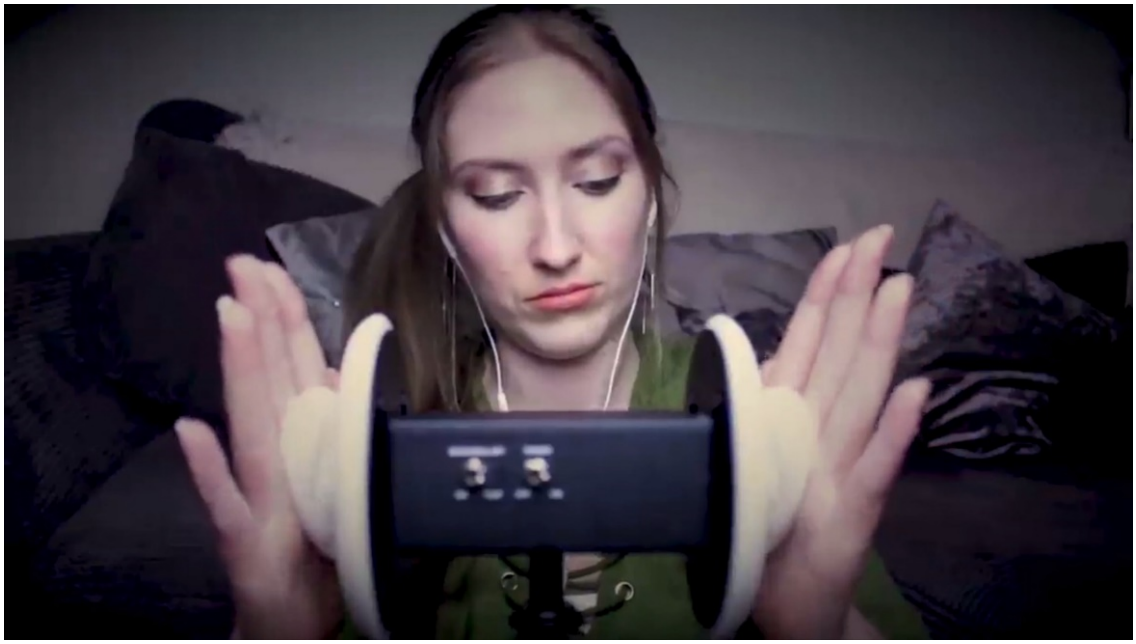


Fig.3 Woman Video

Fig.4 Man Video

Control (non-ASMR video) was also selected from *YouTube*. This mimicked the content of ASMR videos however it did not contain ASMR triggers and was not deemed to be potentially ASMR-inducing. The video selected as control is a car washing video showing the potentiality of a car washing machine. The choice of the control video was made based on the fact that it could match the experimental ones for several reasons:

- It has a fixed centred pointed camera as the ASMR videos

- The car, filmed from behind, resembled in a way a face, and the "arm" of the car washing machine resembled the arm of the performer massaging the microphone in ASMR videos.

- Movements are slow and repetitive, not finalized. No expectation was created as in ASMR videos.

- The audio component is a constant, white, non-human, noise.

All the stimuli have also been edited in such a way as to:

-eliminate graphics and overprinting from the videos
-balance the videos as much as possible in terms of framing width, colour shades and volume.

Adobe Premiere Pro CC 2018 audio/video editing software was used.

Fig.5 Control Video

b. Affective measures. A short questionnaire has been constructed, to test affective and subjective reactions to ASMR experience. A first question was aimed at testing previous knowledge on ASMR. If the answer was "yes", 7 items were presented to better understand the whole ASMR experience (for example, by asking "which triggers are more effective in order to elicit ASMR effect?"). All participants have then been asked to answer other 18 items. Five items related to personality traits/moods were proposed in line with some items proposed in the study by Fredborgh et al. (2017) and borrowed from the survey (still online) posted on the reference site for the study of the ASMR phenomenon: asmruniversity.com. Two questions were also asked about memories/situations related to childhood. The whole questionnaire is reported in the Appendix.

2.3.2.2. Apparatus

All videos were presented trough a personal computer Asus VivoBook Flip on a 14" display. Audio were provided with a pair of Sony headphones through the Realtek high definition speakers installed on the Asus pc, at 90% of the volume capacity. The experimental trial was built with the software Millisecond Inquisit 4 Lab Version 4.0.10.0. The physiological signals were recorded, sampled, and stored in a personal computer by the BioPac MP 150 system (BioPac System Inc., CA, USA) and its companion software (AcqKnowledge 4.2.3).

All sensors have a sampling rate of 200 samples/s. The equipment measure skin conductance level during the baseline period and when fruiting each of the six content. Each recording period lasted for the whole presentations of the six stimuli, the duration was variable, depending on how long the participants decided to look to each stimulus. Skin conductance level was recorded via two Ag-AgCl electrodes that were wrapped around the index and ring finger (of the same hand) at the distal phalanges. Skin conductance level data was acquired by applying a small exosomatic direct current (0.5 V) through these two electrodes (Roth wt. 2012). This established an electric circuit and allowed the participant to act as a resistor. From these data the AcqKnowledge software calculated skin conductance level and automatically provides these values in microseimens (μS). Prior to analyses the data was checked for outliers.

2.3.2.3. Procedure

The experiment has been conducted in a quiet and dimly illuminated room (Lab 3102 in Milano Bicocca University). Each participant seated at an approximate distance from the computer of 70 cm. Participants provided informed consent, after which the physiological sensors were attached. Participants were left to acclimatize to the experimental situation and were provided with the instructions both by voice and written (see Appendix). No physiological data was recorded during this period and it was assured that the participants were comfortable with wearing the physiological equipment. Next, it was asked to take a deep breath in order to control for the machinery effective recording capabilities and it was waited about a minute in order to let the parameters returning to a baseline before starting the experiment. Participants then perceived each of the six stimuli in a randomized order. For each stimulus, participants have been told that they could press the L and J keys while perceiving. The pressing of the L key corresponded to particularly pleasant sensations, the pressing of the J key to particularly unpleasant sensations. The two keys could be pressed at any time during the vision for as many times as the subject wanted. In addition, participants could interrupt the viewing/listening to the stimulus in any moment after two minutes, if they were bored or annoyed, by pressing the space bar, the participants could switch to the vision/listening of the successive stimuli.

Physiological responses were recorded during the whole stimuli presentations. Between one stimulus and the other, a white screen appeared for 4 seconds. At the end of the stimuli presentations, participants have been asked to answer the questionnaire (see Appendix). The whole experimental session lasted approximately 30 minutes. At the end of the experience

participants were thanked and sweets were offered while debriefed. Participants who joined the study through Sona System gained credits for their participation.

2.3.2.4. Design

The presentation of the videos was randomized among the subjects. Thus, the experimental design was within subjects, with each subject viewing/listening all stimuli (i.e. 3 videos and the corresponding three audios, respectively two ASMR stimuli – one performed by a male and one by a female – and a control one).

The dependent variables were self-reported changes in affect experienced during stimuli fruition and changes in number of peaks (NS-SCR) for each of the stimuli.

2.3.2.5. The EDA measurement technique

Electrodermal activity (EDA) is the umbrella term utilized for characterizing autonomic changes in the electrical properties of the skin. The most broadly examined property is the skin conductance, which can be evaluated by applying an electrical potential between two points of skin contact and estimating the subsequent flow stream between them. The EDA complex incorporates both foundation tonic (skin conductance level: SCL) and fast phasic segments (Skin Conductance Responses: SCRs) that outcome from sympathetic neuronal activity (Fig. 6). EDA is ostensibly the most helpful record of changes in sympathetic arousal that are tractable to emotional and cognitive states as it is the main autonomic psychophysiological variable that isn't tainted by parasympathetic movement. EDA has been closely linked to autonomic emotional and cognitive processing and is a widely used as a sensitive index of emotional processing and sympathetic activity. The typical units of electrodermal activity are the microsiemens (μS) or the micromho (μmho). Both units are equivalent (Braithwaite et al. 2013).

There are two main components to the overall complex referred to as EDA; one is the Skin Conductance Level (SCL), the other is the Skin Conductance Response (SCR). While changes in the SCL are thought to reflect general changes in autonomic arousal, SCR is the phasic component it refers to the faster changing elements of the signal. Recent evidence suggests that both components are important and may rely on different neural mechanisms (Dawson et al., 2001; Nagai et al., 2004).

The tonic EDA (also known as the SCL) generates a constantly moving baseline. In other terms, the background Tonic SCL is constantly changing within an individual. Since SCL can differ markedly between individuals, some researchers arrived to the conclusion that the actual SCL level is not, on its own, that informative or even that easy to derive (Boucsein, 2012).

"Simply averaging across the whole signal is woefully inadequate as a measure of SCL because it likely to over-estimate the true-SCL as such averages will also contain SCRs (thus artificially elevating the measure). In addition, it is not clear if any given overall SCL measured in this way can be seen as being 'high' or 'low' for that individual". (Braithwaite et al., 2013, p. 5)

Further measures of background tonic skin conductance, more straightforward to compute, have been suggested - namely the frequency (*peaks count*) of NS-SCRs (Boucsein, 2012). The term 'Frequency' refers to the number (count) of SCR peaks elicited either as a function of a given time period (NS-SCRs). There is some debate as to whether a measure of more traditional SCL can be directly replaced by counting the frequency of NS-SCRs (Boucsein, 2012). This debate is based primarily on some observations that SCL can drop as the frequency of NS-SCRs increases.

"However, significant increases in the frequency of NS-SCRs are also commonly seen in high arousal situations and as such can be seen, at the very least, as one indicator of background arousal" (Braithwaite et al., 2013, p. 5)

The most reliable data obtained from the measurement of skin conductance on which it was decided to base mainly the analysis is therefore the frequency data of the peaks of conductance NS-SCR (*peaks count*).

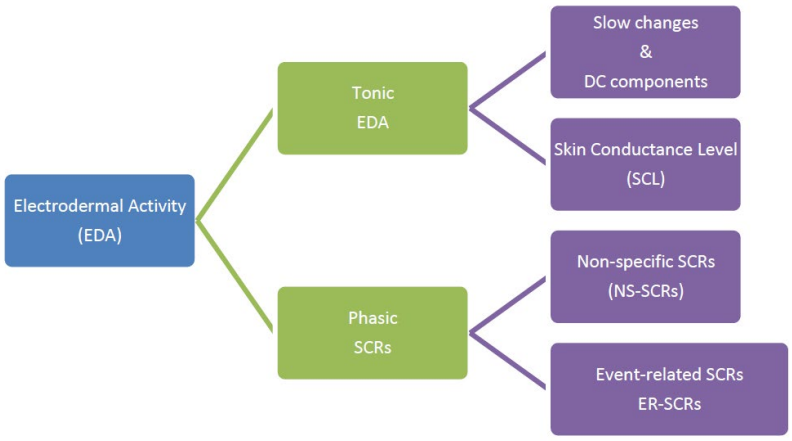


Fig.6 EDA components scheme (Braithwaite et al. 2013)

2.3.2.6. Parameter construction and normalization

The first step was to smooth-out the signal on all the tracks as some of them were noisy. The smoothing factor applied was 50 samples on a sample rate of 200 samples/sec. To obtain the SCR (Phasic EDA) parameter, a High Pass filter was applied at 0.05 Hz, setting the rejection rate to 0%.

Two parameters of galvanic skin response, the SCL and the NS-SCRs, were computed. The SCL level was defined as the mean amplitude of the GSR signal in a given period (from a minimum of 2 minutes to a maximum of 6 minutes). Similarly to Treister et al. (2012) skin conductance fluctuations were defined as the peaks of minimum amplitude of 0.02 μS, with a slope rate <2 μS/s. Fluctuations were detected by an automatic algorithm, and the number (count) of SCR peaks elicited as a function of a given time period (NS-SCRs) was calculated.

NS-SCR *(peaks count).* Among the methods commonly used to exclude peak disturbance data is the proportion of maximal response (Braithwaite et al. 2013). With a data driven through a visual inspection approach, peaks clearly out of the middle range of the individual (outlier) were excluded.

"This method only corrects values in terms of a maximal response. This range can be computed either from values in the main measurements themselves or from measurements gleaned from a startle response procedure. Typical startle stimuli include a handclap, balloon pop, and / or taking deep breaths. These can be used to represent a theoretical maximum response with which all other SCRs are compared to as a proportion of this maximum for that given individual. One problem here is that these startle responses may also contain psychological processes that are additional to those present in the main experimental conditions and as such might not always be a true raw 'startle' response. It is also difficult to ensure that the startle response is indeed a reliable indicator of maximum response". (Braithwaite et al., 2013, p. 10)

The startle response procedure was also possible to implement since it was asked to all the subjects to take a deep breath before starting but keeping that peak as a reference point for exclusion would have the above counter indications. In addition, the use of startle responses has been, historically at least, controversial (Braithwaite et al. 2013). However, this appears to be due, at least in part, to the somewhat informal presentation of startle responses. Recent developments have seen startle stimuli delivered under more controlled computer-based situations which might include the delivery of an auditory stimulus through headphones /

speakers, or the presentation of salient visual stimuli on a computer screen (Braithwaite et al. 2013). Theoretical maximum stimuli can come from the real signal (taking the maximum SCR from the experiment) or these startle stimuli - but if the latter is to be used one suggestion is to ensure the startle stimuli are in the same sensory domain as the main experiment. Nevertheless, this is not always the case in the literature (Braithwaite et al. 2013).

Also excluded were the peaks tagged as disturbance by the experimenter himself during the experiment (evident movements of the subject, peaks following slamming doors, etc.).

SCL measure *(Mean).* The procedure followed in order to normalize for the SCL measure *(Mean)* was to subtract control conditions means from the mean of the actual experimental conditions - so that the resultant SCL measure is a relative difference across manipulations (within the individual), and not based on the absolute numbers, which, as noted above - might not be that informative. The subtraction procedure acts as a form of normalization for the participant's EDA data. In particular, the mean of the control video (car washing) was subtracted from the two ASMR videos (man massage, woman massage) and the mean of the control audio from the two ASMR audios.

2.3.3. Statistical analysis

Analyses were conducted using Jamovi version 0.9.2.3.

Physiological responses. Values are presented as *peaks count* (peaks count/time of the presentation). Parameter distributions in different categories were tested assessing the value of skewness and kurtosis and testing for the assumptions with the Shapiro-Wilk p test. Kurtosis values are not above |1| and skewness values are slightly above |1| for just two variables (peaks for woman audio and video). The test was significant for all the *peaks count* variables, but formal tests are very sensitive to sample size (21). To dispel doubts about the effectiveness of the F-test obtained from an ANOVA within with reference to the sample under analysis, also the nonparametric Friedman test with Pairwise Comparisons (Durbin-Conover) tests were performed to assess the differences between the different stimuli.

Also *Mean* (mean of control conditions subtracted from the experimental conditions) has been considered as a DV for further analysis.

Affective responses. Chi-squared tests are used to determine whether there is a significant difference between the expected frequencies and the observed frequencies, to attempt rejection of the null hypothesis that the data are independent.

2.3.4. Results

Analytical approach. The aim was to determine whether participants showed differences in affect and physiology after watching ASMR videos. A series of difference scores have been calculated that reflected affective and physiological changes in ASMR stimuli and from the control video in order to: (i) obtain a meaningful index of the effect of the ASMR videos on participants' affective and physiological responses and (ii) reduce noise related to individual variation in physiological reactivity using the *peaks count* parameter.

Knowledge about ASMR. The study by Cash and colleagues (2018) assessed whether ASMR is affected by individuals' expectations or if the phenomenon emerges regardless of expectations. They found that ASMR users were immune to their expectation manipulation, but naïve users experienced ASMR when they were told to expect it and did not experience ASMR when told not to expect it.

Concerning this study, no previous information or instruction about what to expect were given to the participants. Only after having seen / listened all the six stimuli some questions about ASMR were asked. Table 1a display the resulting frequencies for the questions "Did you know ASMR" and "How long did you know about ASMR for".

Table 1a Frequencies of HOW LONG DID YOU KNOW ASMR

Levels	Counts	% of Total	Cumulative %
DIDN'T KNOW ASMR	15	50.0 %	50.0 %
FOR LESS THAN 1 YEAR	3	10.0 %	60.0 %
ABOUT 1 YEAR	10	33.3 %	93.3 %
FOR MORE THAN 1 YEAR	2	6.7 %	100.0 %

Among whom who know something about ASMR (50%) just 2 are habitual users, as shown in Table 1b.

Table 1b Frequencies of ASMR FRUITION

Levels	Counts	% of Total	Cumulative %
NEVER SEEN	3	20.0 %	20.0 %
JUST ONCE OR OCCASIONALLY	10	66.7 %	86.7 %
USUALLY	2	13.3 %	100.0 %

Among those who felt tingles, 3 (37.5%) did not know about ASMR. The two people (25%) who usually watch this type of video both reported having felt tingles. 3 people who sensed tingles knew about ASMR but were not used to it. No significant difference from expected values has been found of ASMR knowledge and fruition on having felt tingles χ^2 (3, N=30) =6.99, p=.07 (Table 1c). The null hypothesis that the data are independent cannot be rejected. Seems that capability of feeling tingles is not related to knowledge about ASMR but is a sort of individual characteristic. In this study also naïve individuals were able to sense tingles without any previous knowledge of the phenomenon or influence by the experimenter.

Table 1c Contingency Tables

		TINGLES_YN		
ASMR FRUITION		**0 NO-DON'T KNOW**	**1 YES**	**Total**
DIDN'T KNOW ASMR	Observed	12	3	15
	Expected	11.00	4.000	
NEVER	Observed	3	0	3
	Expected	2.20	0.800	
JUST ONCE OR OCCASIONALLY	Observed	7	3	10
	Expected	7.33	2.667	
USUALLY	Observed	0	2	2
	Expected	1.47	0.533	
Total	Observed	22	8	30
	Expected	22.00	8.000	

When asked if participants preferred any specific environmental conditions for viewing, 100% responded 'yes'. Submitted comments, like the comments reported by Cash et al. (2018) suggested that individuals preferred quiet, relaxed conditions in order to achieve ASMR from online media.

"I use to watch ASMR videos when I'm in bed, before sleeping"

"In order to enjoy ASMR videos I need to be in a dark room (usually my own), with the lights turned off and no other people around; but I enjoy just some specific ASMR videos". They also specified preference for headphones while watching.

Physiological responses

Repeated Measures ANOVA within subjects

An a priori analysis computing the required sample size with the software G*Power 3.1.9.4 was carried out (Fig. 7) returning a needed sample size of 28 subjects in order to run an ANOVA (F test) Repeated measures within 1 group with 6 repeated measurements (Effect size f = .25, **α** = .05, Power = .95).

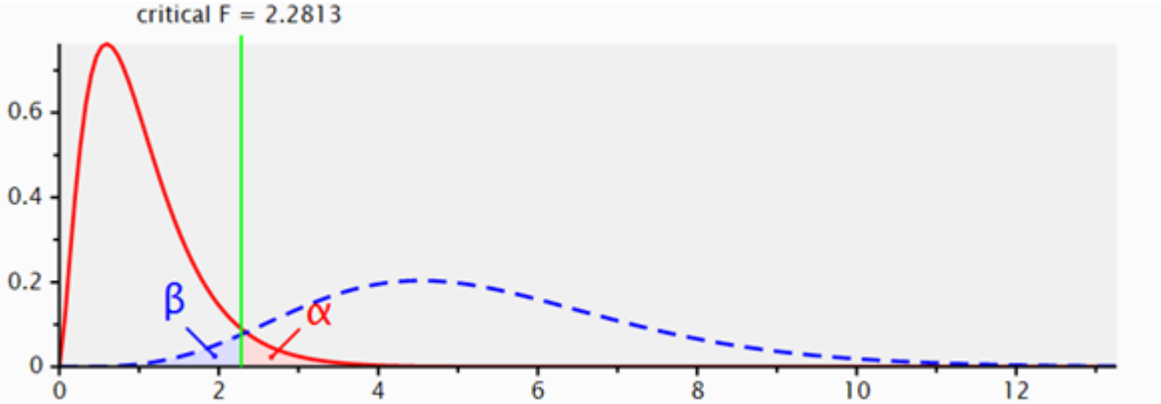
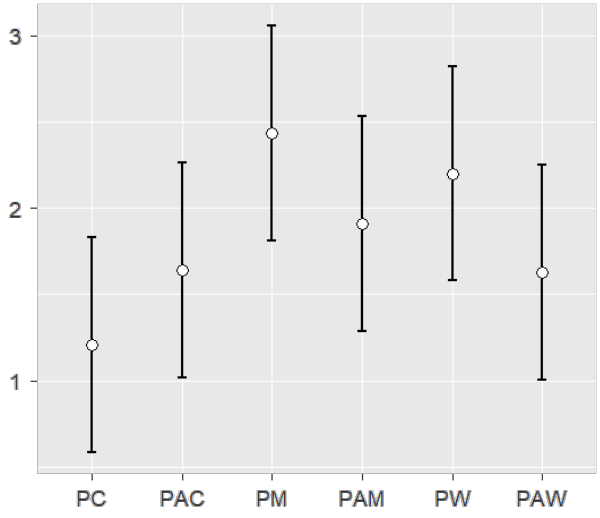


*Fig.7 G*Power graph for the Repeated Measures ANOVA Within*

ANOVA Repeated Measures were performed with the *peaks count* calculated for each stimulus as levels of the repeated measurement within. Given the significance of the Shapiro-Wilk p test also a nonparametric ANOVA (Friedman test) was conducted with the same variables.

The Repeated Measure ANOVA within subject (Test of Sphericity, Mauchly's W=.55 p=.32) shows a significant main effect overall respect to the different *stimuli* $F(5, 145) = 6.28$, $p = <.001$, $\eta 2\ p = .178$ (Graph 1).



Graph 1 ***peaks count***

KEY

PC=*Peaks Control*

PAC= *Peaks Audio Control*

PM=*Peaks Man*

PAM= *Peaks Audio Man*

PW=*Peaks Woman*

PAW=*Peaks Audio Woman*

Non-Parametric ANOVA (Friedman Test)

The results were confirmed by a Non-Parametric ANOVA (Friedman Test). The Friedman test χ^2 (5, N=30) =29.1, p<.001 is significant overall the variables. The Pairwise Comparisons (Dubin-Conover test) revealed significant differences (P < .001 to 0.01) across *stimuli* for video control condition and both experimental (ASMR) conditions (man video and woman video) with both P < .001. There are also significant differences between the two ASMR videos and the corresponding audios as shown and emphasize with bold font in Table 2. No significant differences were shown across *stimuli* between control video and the corresponding audio as well as between control audio and ASMR audios (P=.22 to .61). Table 2a shows the means for the six variables.

Table 2 Pairwise Comparisons (Durbin-Conover)

			Statistic	p
PC	-	PAC	1.211	0.228
PC	**-**	**PM**	**4.923**	**< .001**
PC	-	PAM	2.423	0.017
PC	**-**	**PW**	**4.259**	**< .001**
PC	-	PAW	1.719	0.088
PAC	-	PM	3.712	< .001
PAC	-	PAM	1.211	0.228
PAC	-	PW	3.048	0.003
PAC	-	PAW	0.508	0.612
PM	**-**	**PAM**	**2.501**	**0.014**
PM	-	PW	0.664	0.508
PM	-	PAW	3.204	0.002
PAM	-	PW	1.836	0.068
PAM	-	PAW	0.703	0.483
PW	**-**	**PAW**	**2.540**	**0.012**

Table 2a Descriptives

	Mean	Median
PC	1.21	0.725
PAC	1.64	1.660
PM	2.44	2.045
PAM	1.91	1.445
PW	2.20	1.795
PAW	1.62	1.070

Although the Friedman test of ASMR video and audio overall revealed no significant differences across *Means* χ^2 (3, N=30) =7.39, p=.06, the same trend as the *peaks count* is shown, with *Means* higher for the two videos than for the two audios (Table 3a). Moreover, the Pairwise Comparisons (Dubin-Conover test) revealed significant differences (P = .02, P= .01) between ASMR man video mean and the two ASMR audios (Table 3).

Table 3 Pairwise Comparisons (Durbin-Conover)

			Statistic	p
MW	-	MM	1.133	0.261
MW	-	MAW	1.189	0.238
MW	-	MAM	1.303	0.197
MM	**-**	**MAW**	**2.322**	**0.023**
MM	**-**	**MAM**	**2.435**	**0.017**
MAW	-	MAM	0.113	0.910

Table 3a Descriptives

	Mean	Median
MW	**0.237**	0.140
MM	**0.238**	0.400
MAW	**-0.432**	-0.290
MAM	**-0.392**	-0.190

The two analysis (parametric and non parametric ANOVA) showed that ASMR videos are more arousing than control video, but also more arousing than ASMR audios. Those evidences suggest that ASMR videos could have a strongest arousing effect than ASMR audios, hence ASMR effect could be characterized by the need for multisensorial components. This measured arousal could be the physiological correlates of the presence of ASMR tingles, i.e. the "ASMR Effect".

In order to better understand the underpinnings of these evidences, several ANOVA within-between subjects were conducted among two groups. The groups were identified a-posteriori based on the information obtained from the survey. In order to ensure enough statistical power a new analysis of the sample size has been computed with G*Power.

Repeated Measures ANOVA within-between subjects

An a-priori analysis computing the required sample size with the software G*Power 3.1.9.4 was carried out (Fig. 8) returning a needed sample size of 6 subjects in order to run an ANOVA (F test) Repeated measures within-between interaction, 2 groups with 6 repeated measurements (Effect size f = .6, α = .05, Power = .8).

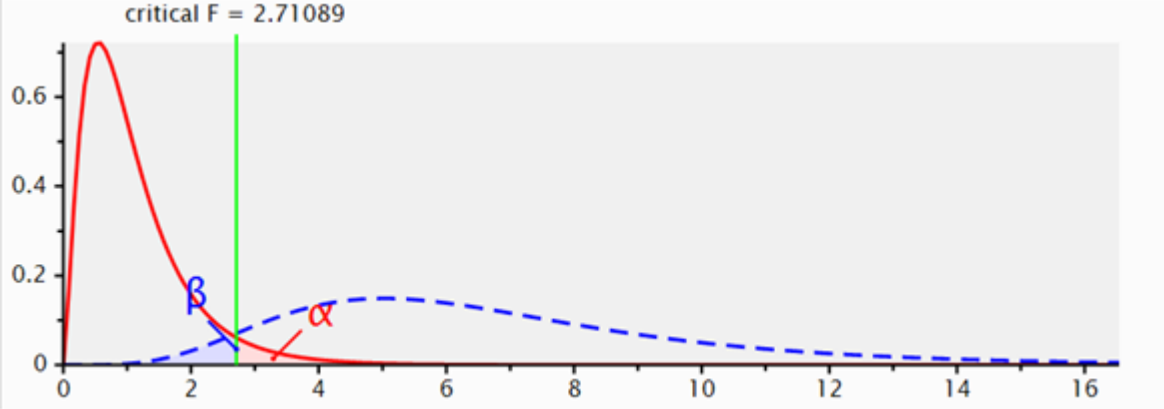


*Fig.8 G*Power Repeated Measures ANOVA Within-Between Analysis*

Tingles vs No-Tingles. The first differentiation was made between those who claimed they felt it and those who said they didn't (curiously, some subjects who claimed to have experienced tingles reported it also happened while watching/listening to audio/video control). Frequencies are shown in Table 4.

Table 4 Frequencies of TINGLES_YN

Levels	Counts	% of Total	Cumulative %
0 NO-DON'T KNOW	22	73.3 %	73.3 %
1 YES	8	26.7 %	100.0 %

A Repeated Measures ANOVA within-between subjects (Test of Sphericity, Mauchly's W=.58 p=.45) indicated that there were significant differences between the group that claimed having felt tingles and participants who did not.

The main effect found with the ANOVA within is confirmed $F(5, 140) = 6.46$, $p < .001$, $\eta 2\ p = .187$. There was a significant effect overall between subjects of *Tingles* group on changes in

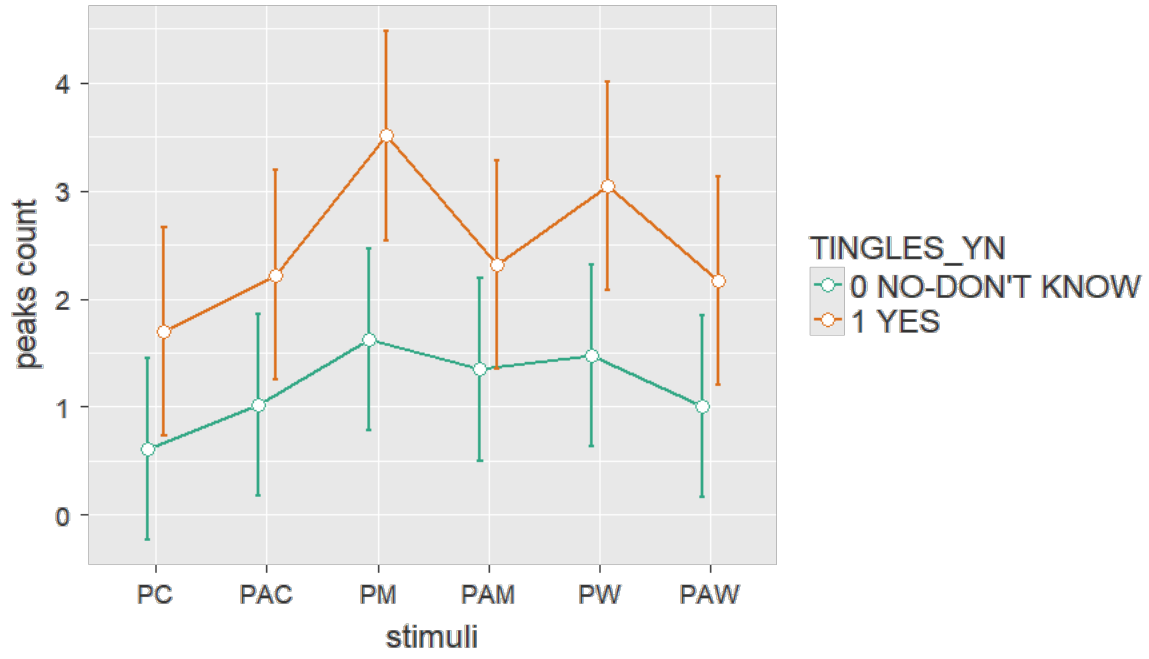
skin conductance responses *(peaks count),* F(1, 28) = 5.53, p = .026, η2 p = .165. Participants who claimed to feel tingles showed significantly greater increases in SCR during the fruition of the stimuli compared to whom who did not (Graph 2). Interactions between *stimuli* and *Tingles* group were non-significant F(5, 140) = 0.75, p .58, η2 p = .026.

Post hoc comparisons using the Tukey HSD test for *stimuli*TINGLES_YN* group indicated that:

- There is a statistically significant difference between the *No-Tingles* group and the *Tingles* group regarding, respectively, the control video compared to ASMR man video t(55)=-4.35, p=.003.
- There is a statistically significant difference between the *No-Tingles* group and the *Tingles* group regarding, respectively, the control video compared to ASMR woman video t(55)=-3.65, p=.02.
- There is a significant difference in terms of *peaks count* for who didn't felt tingles between the control video condition and the ASMR man video t(140)=-3.47, p=.03.
- There is a significant difference in terms of *peaks count* for who felt tingles between the control video condition and the ASMR man video t(140)=-3.75, p=.01.
- There is a significant difference in terms of *peaks count* between who felt tingles and who didn't across the ASMR man video and the control audio condition t(55)=-3.74, p=.02.
- There is a significant difference in terms of *peaks count* between who did felt tingles and who didn't across the ASMR man video and the woman audio condition and t(55)=-3.75, p=.02.

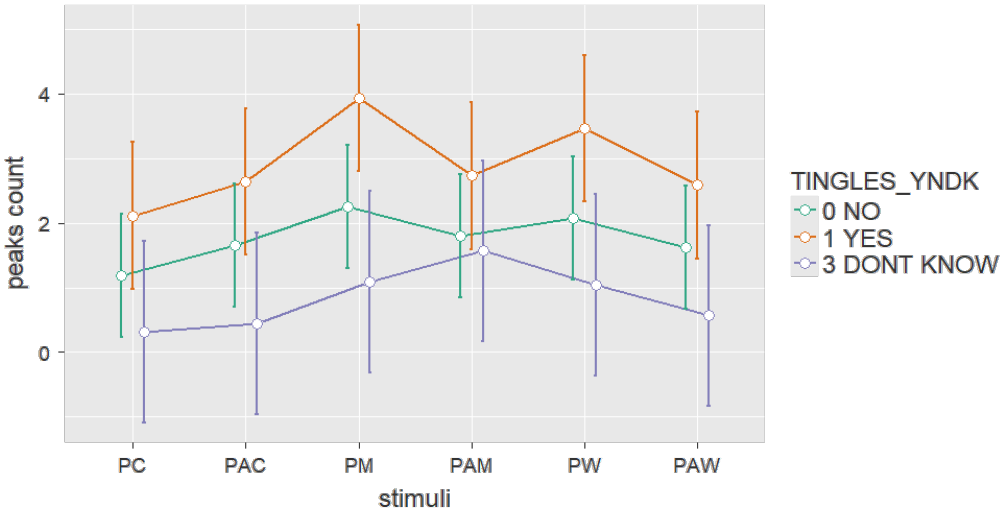
A hypothesis that could be formulated is that among the subjects who didn't feel tingles, the majority was bothered by ASMR contents to the extent of having conductivity responses, although with an opposite value. This means that the average difference in terms of *peaks count* between those who have and have not felt tingles from ASMR videos has been minimized by the ASMR effect that can be pleasant for some and unbearable for others, causing a physiological activation (arousal) in both instances.

Graph 2 *stimuli* ✻ TINGLES_YN



The group of those who answered "I don't know" to the question "Have you experienced tingles?" was initially kept separate as a third group compared to those who answered Yes or No. Although the difference between the groups was still significant $F(5, 140) = 3.61$, $p=.04$, $\eta 2\ p = .21$, the group "I don't know" was later incorporated into the group of "No" because the averages of this third group were in line with those of those who answered "No", as shown by the relative graph below (Graph 3). If you feel the "brain orgasm", you know!

Graph 3 *stimuli* ✻ TINGLES_YNDK



Annoyed vs Not Annoyed. The second Repeated Measures ANOVA within-between subjects was made among those who claimed to have been annoyed by watching/listening the stimuli and those who did not. Frequencies are shown in Table 5.

Table 5 Frequencies of ANNOYED_YN

Levels	Counts	% of Total	Cumulative %
0 NO	10	33.3 %	33.3 %
1 YES	20	66.7 %	100.0 %

The Repeated Measures ANOVA within-between subjects (Test of Sphericity, Mauchly's W=.55 p=.34) indicated that there were not significant differences between the group that claimed being annoyed and participants who did not.

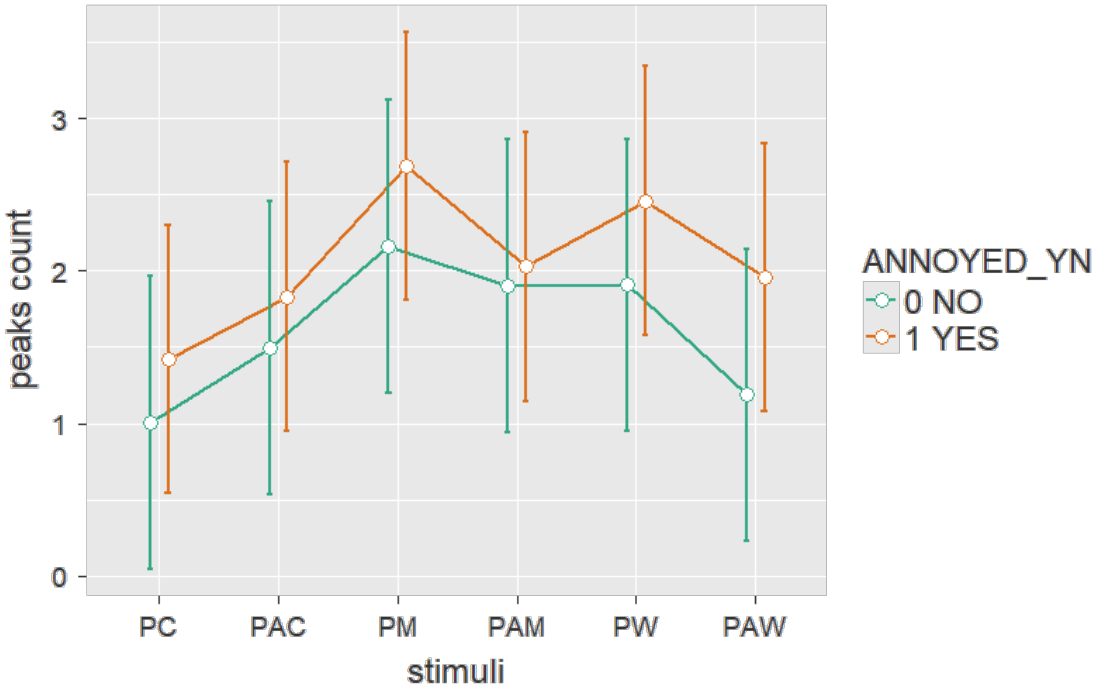
The main effect found with the ANOVA within is confirmed $F(5, 140) = 5.43$, $p < .001$, $\eta 2\ p = .162$. There wasn't a significant effect between subjects of *Annoyed* group on changes in skin conductance responses *(peaks count),* $F(1, 28) = 0.64$, $p = .42$, $\eta 2\ p = .023$, as well as interactions between *stimuli* and *Annoyed* group $F(5, 140) = 0.33$, p .89, $\eta 2\ p = .012$. participants who claimed to be annoyed didn't show significant differences in SCR during the fruition of the stimuli compared to whom who did not.

Although the statistical data are not significant, the ANOVA within-between subjects graph for the *Annoyed* group shows the same trend as for the *Tingles* group: who reported to be annoyed shows higher *peaks count* values overall and in particular respect to the two ASMR videos (Graph 4).

Post hoc comparisons using the Tukey HSD test for *stimuli*ANNOYED_YN* group indicated that:

- There is a significant difference in terms of *peaks count* for who felt annoyed between the control video condition and the ASMR man video $t(140)=-4.1$, $p=.004$.
- There is a significant difference in terms of *peaks count* for who felt annoyed between the control video condition and the ASMR woman video $t(140)=-3.36$, $p=.04$.

Graph 4 *stimuli* ✻ ANNOYED_YN



The number of conductivity peaks of those who were bothered compared to those who were not (Graph 4), shows a higher activation (even though not statistically significative) in those who were annoyed with respect to whom were not. The post hoc analysis carried out showed a significant difference between ASMR videos (both man and woman) and control video *peaks count* for the annoyed group. In the light of these results it could be said that those annoyed were most likely to be annoyed by ASMR videos.

Relaxed vs Not Relaxed. The third Repeated Measures ANOVA within-between subjects was made among those who claimed to have been relaxed by watching/listening the stimuli and those who did not. Frequencies are shown in Table 6.

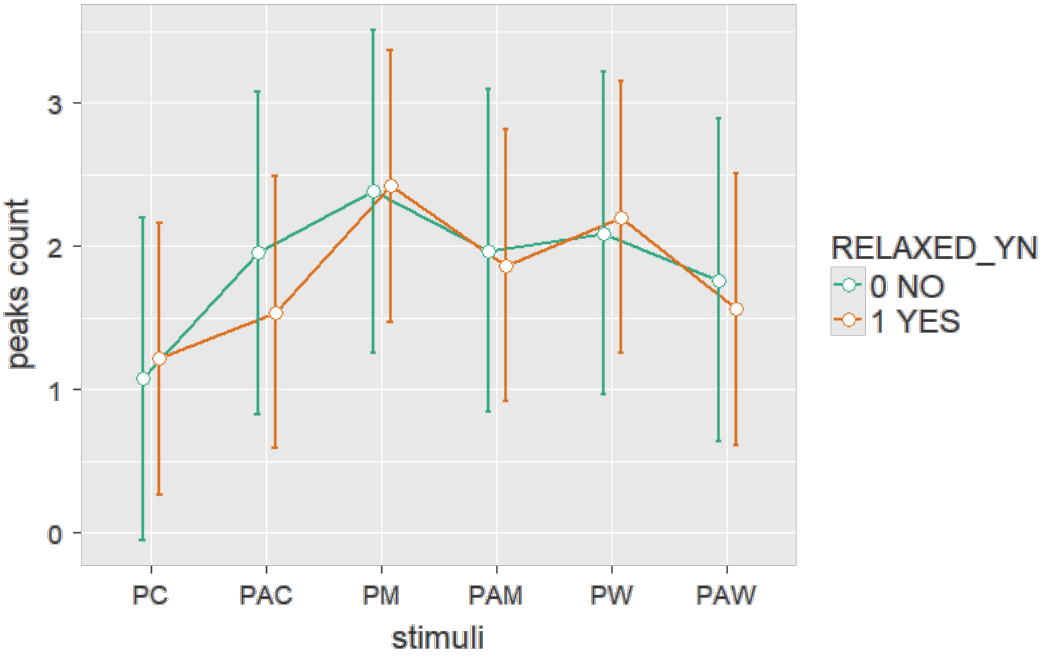
Table 6 Frequencies of RELAXED_YN

Levels	Counts	% of Total	Cumulative %
0 NO	6	20.0 %	20.0 %
1 YES	24	80.0 %	100.0 %

The Repeated Measures ANOVA within-between subjects (Test of Sphericity, Mauchly's W=.54 p=.33) indicated that there were not significant differences in terms of *peaks count* between the group that claimed being relaxed and participants who did not.

The main effect found with the ANOVA within is confirmed $F(5, 140) = 3.77$, p=.003, $\eta 2$ p = .119. There wasn't a significant effect between subjects of Relaxed group on changes in skin conductance responses *(peaks count),* $F(1, 28) = 0.01$, p = .91, $\eta 2$ p = .00, as well as interactions between *stimuli* and *Relaxed* group $F(5, 140) = 0.23$, p=.95, $\eta 2$ p = .01. participants who claimed to be relaxed didn't show significant differences in SCR during the fruition of the stimuli compared to whom who did not (Graph 5).

Graph 5 *stimuli* ✻ RELAXED_YN



Among whom who have felt relaxed by ASMR there is also who have felt tingles, hence the high arousal, measured through *peaks count*, also among whom felt relaxed.

As shown in Table 7, even though the Chi-square test was not significant (probably with a larger sample it would have been) χ^2 (1, N=30) =2.73, p=.09 who wasn't relaxed didn't felt tingles.

Table 7 Contingency Tables

TINGLES_YN		RELAXED_YN 0 NO	RELAXED_YN 1 YES	Total
0 NO-DON'T KNOW	Observed	6	16	22
	Expected	4.40	17.60	
1 YES	Observed	0	8	8
	Expected	1.60	6.40	
Total	Observed	6	24	30
	Expected	6.00	24.00	

The study by Barratt & Davis (2015) propose an analogy between the state of relaxation achieved through ASMR videos and the state of flow, described as the state of intense focus and diminished awareness of the passage of time (Csiskemenhalyi, 1991). This state is often associated with optimal performance in several activities (Swann et al., 2014).

Citing the authors:
"Anecdotal reports of ASMR describe states of focus, of greater "presence" and of relaxation which are consistent with the non-active aspects of flow". (Barratt, Davis, 2015, p. 3)

Is it possible to think that whoever manages to reach a state of flow through ASMR video can also feel the tingles? To this question other studies may eventually give an answer.

For the time being the results of this ANOVA can be interpreted as a consequence of the fact that those who felt relaxed also experienced tingles. This entails a greater arousal than expected had there been a simple relaxation, without other components. Similarly, those who were not relaxed by ASMR videos were generally annoyed, as demonstrated by the Chi-square test χ^2 (1, N=30) =10.8, p=.001, Phi and Cramer's V=0.6: this aspect also led to the observation of a greater arousal than might have been expected in a sample of subjects who were only bored or otherwise immune to any ASMR effect (Table 8)

Table 8 Contingency Tables

		ANN_ASMR_VID		
REL_ASMR		0	1	Total
0	Observed	2	14	16
	Expected	6.40	9.60	
1	Observed	10	4	14
	Expected	5.60	8.40	
Total	Observed	12	18	30
	Expected	12.00	18.00	

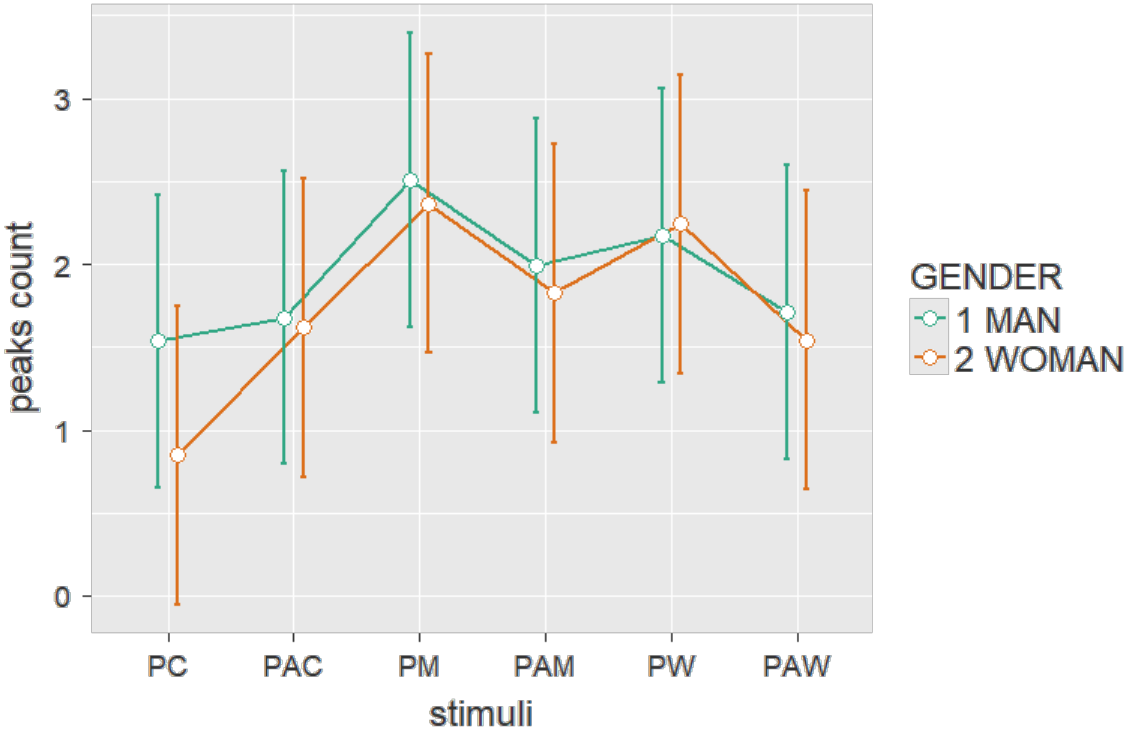
Gender. The fourth Repeated Measures ANOVA within-between subjects was made with gender as variable between. Frequencies are shown in Table 9.

Table 9 Frequencies of GENDER

Levels	Counts	% of Total	Cumulative %
1 MAN	16	53.3 %	53.3 %
2 WOMAN	14	46.7 %	100.0 %

The Repeated Measures ANOVA within-between subjects (Test of Sphericity, Mauchly's W=.55 p=.35) indicated that there were not significant differences in *peaks count* between male and female users. The main effect found with the ANOVA within is confirmed $F(5, 140) = 6.32$, $p<.001$, $\eta 2\ p = .184$. There wasn't a significant effect between subjects among the *Gender* group on changes in skin conductance response *(peaks count),* $F(1, 28) = 0.13$, $p = .72$, $\eta 2\ p = .005$, as well as interactions between *stimuli* and *Gender* group $F(5, 140) = 0.52$, $p=.75$, $\eta 2\ p = .018$. Male and female didn't show significant differences in SCR during the fruition of the stimuli (Graph 6).

Graph 6 *stimuli* ✻ GENDER



Affective responses

The participants were able to express their emotional state during the presentation of the stimuli by pressing two keys (some subjects chose not to press any key). The intuition to measure affects online through the key presses, came from an autocriticism by Poerio et al. (2018) regarding their experiment:

"participants reported on their changes in affect from before to after watching each video, a design feature that may have been affected by the order of video presentation (e.g., watching a control video, followed by watching an ASMR video)" (p.8).

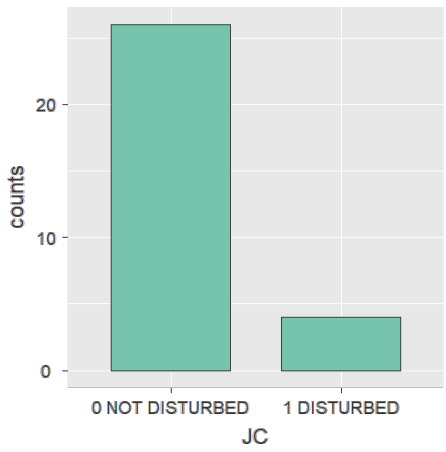
The keys were: J, for particularly unpleasant / disturbing sensations; L, to bring back particularly pleasant sensations.

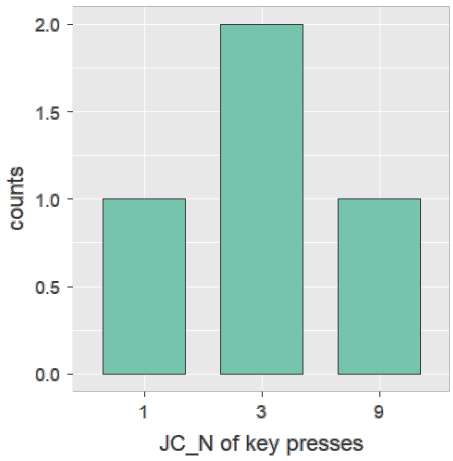
The keys were pressed with the hand on which the electrodes were not applied (29 out of 30 subjects pressed the keys with the right hand). The keys could be pressed whenever the subject felt the need to, for how many times the subject want. This online measurement was used to compute a more reliable affective measure comparing those responses to the responses obtained from the survey presented to the subjects after the stimuli presentation.

Below are the frequencies and their graphs showing the pressure of the two keys for each stimulus presented. For each stimulus, the bar plots relative to the number of times each of the two buttons has been pressed for each video by the subjects who have done so, are also reported.

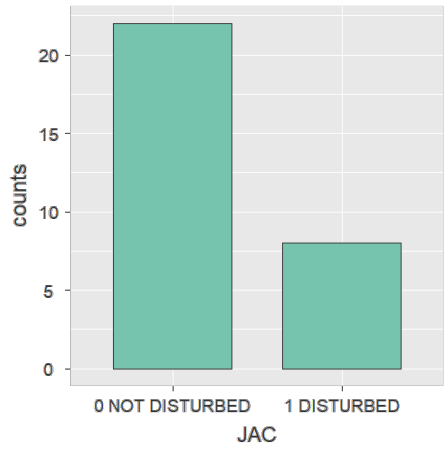
J Key – feeling disturbed

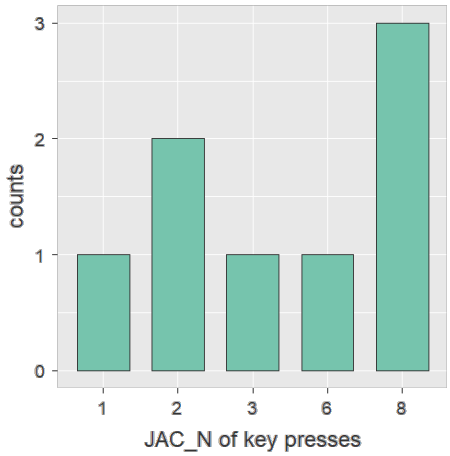
Control Video. 4 subjects (13.3%) pressed the J key, 26 (86.7%) did not. The number of key presses by subjects pressing the J key are displayed in the graph below.



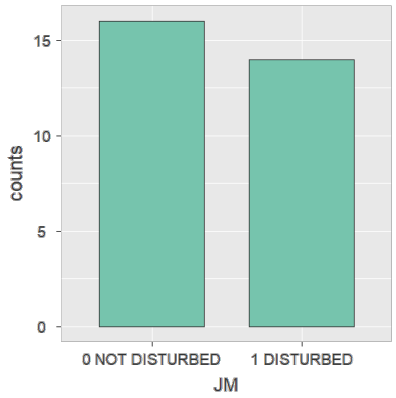


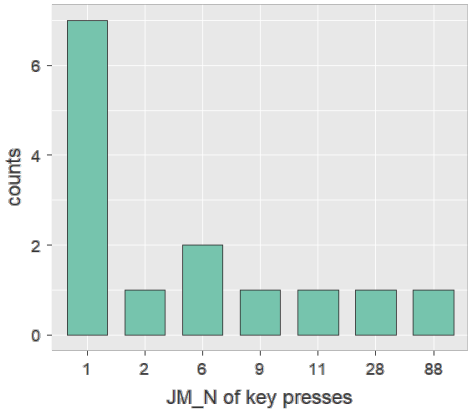
Control Audio. 8 subjects (26.7%) pressed the J key, 22 (73.3%) did not (see JAC graph). The number of key presses by subjects pressing the J key are displayed in the graph below.



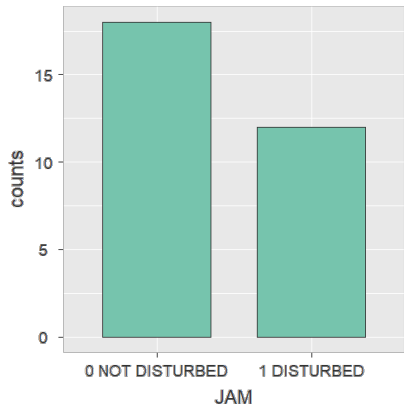


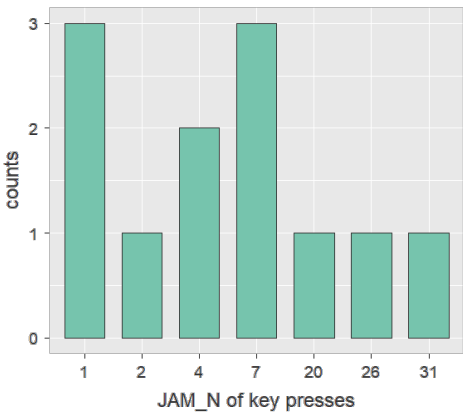
ASMR Man Video.14 subjects (46.7%) pressed the J key, 16 (53.3%) did not (see JM graph). The number of key presses by subjects pressing the J key are displayed in the graph below.



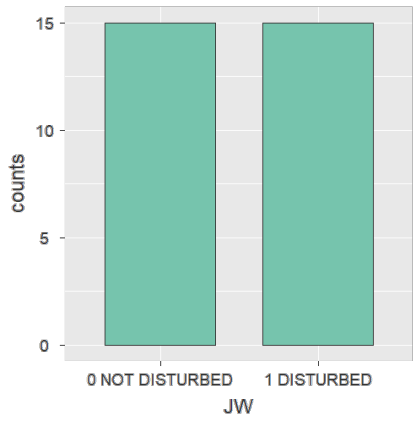


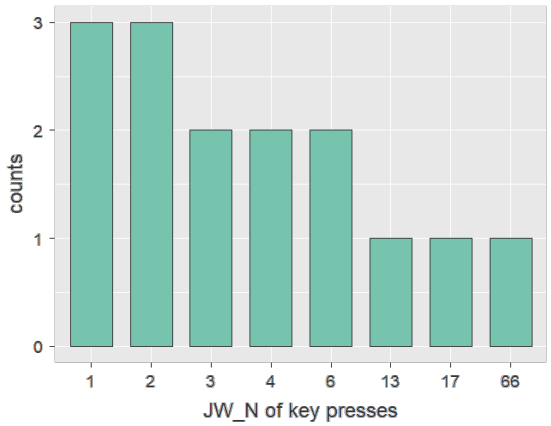
ASMR Man Audio. 12 subjects (40%) pressed the J key, 18 (60%) did not (see JAM graph). The number of key presses by subjects pressing the J key are displayed in the graph.



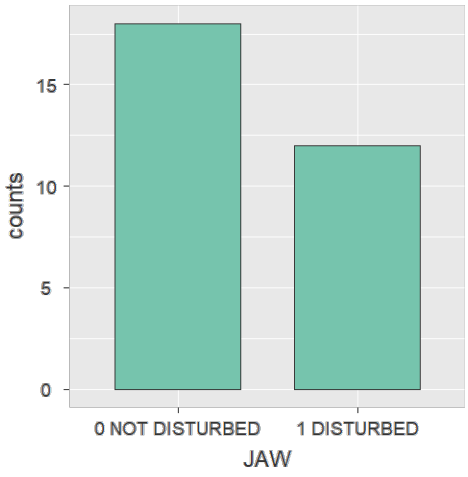


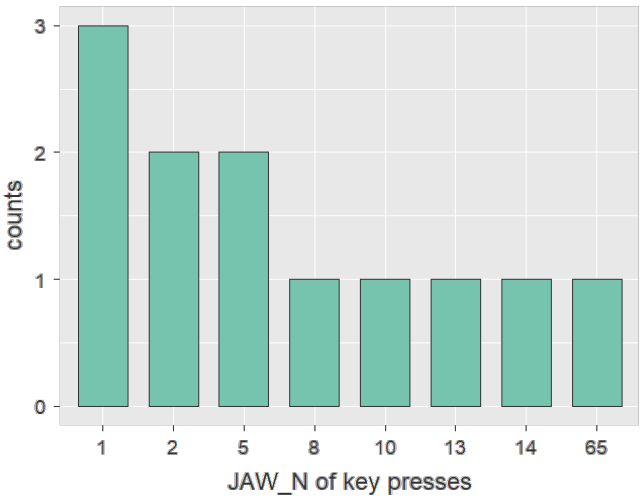
ASMR Woman Video. 15 subjects (50%) pressed the J key, 15 (50%) did not (see JW graph). The number of key presses by subjects pressing the J key are displayed in the graph below.





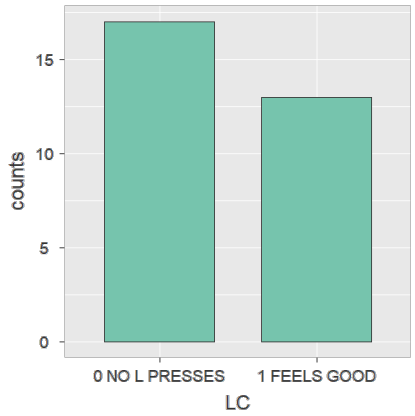
ASMR Woman Audio. 12 subjects (40%) pressed the J key, 18 (60%) did not (see JAW graph). The number of key presses by subjects pressing the J key are displayed in the graph below.

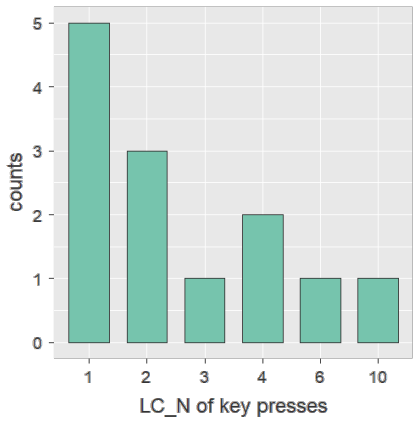




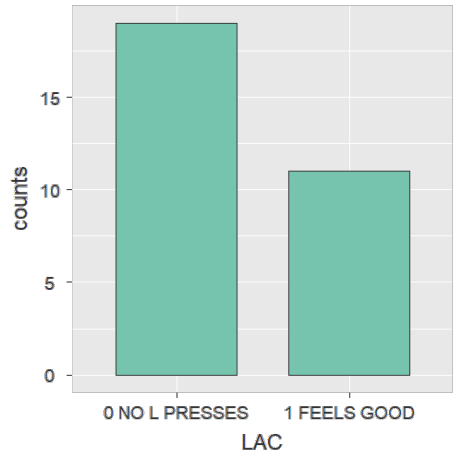
L Key – feeling good

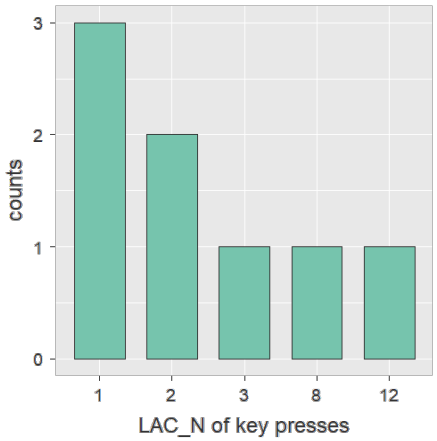
Control Video. 13 subjects (43.3%) pressed the L key, 17 (56.7%) did not. The number of key presses by subjects pressing the L key are displayed in the graph below.



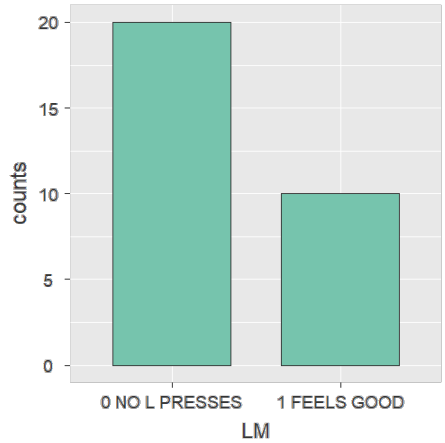


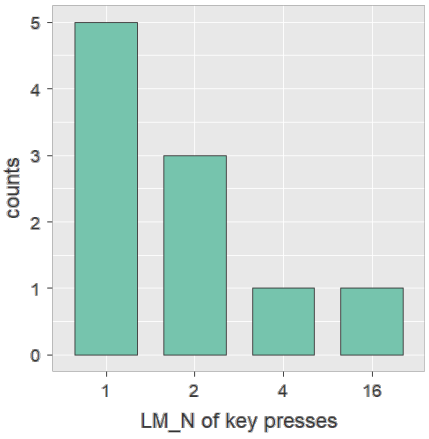
Control Audio. 11 subjects (36.7%) pressed the L key, 19 (63.3%) did not. The number of key presses by subjects pressing the L key are displayed in the graph below.



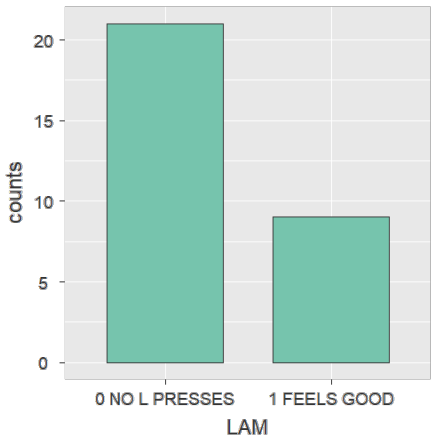


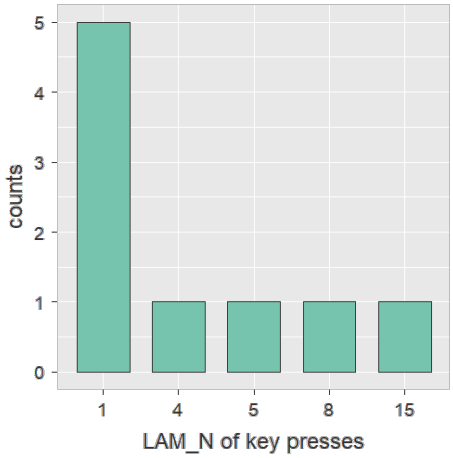
ASMR Man Video. 10 subjects (33.3%) pressed the L key, 20 (66.7%) did not. The number of key presses by subjects pressing the L key are displayed in the graph below.



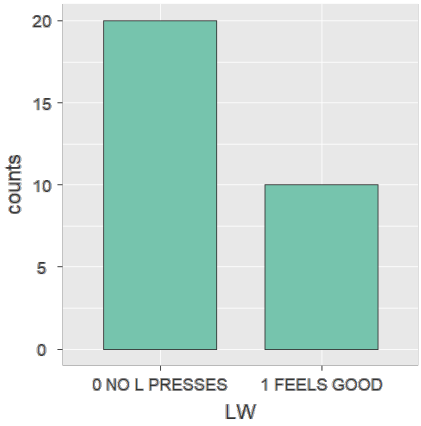


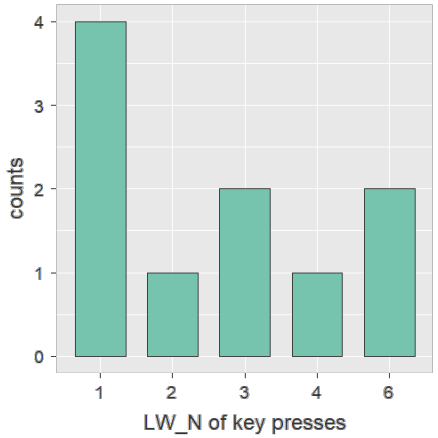
ASMR Man Audio. 9 subjects (30%) pressed the L key, 21 (70%) did not. The number of key presses by subjects pressing the L key are displayed in the graph below.



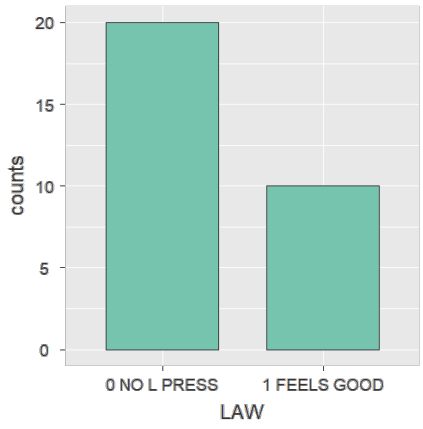


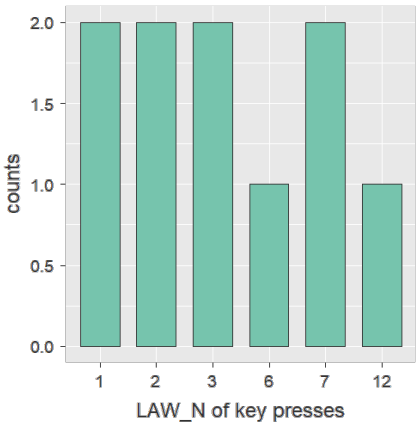
ASMR Woman Video. 10 subjects (33.3%) pressed the L key, 20 (66.7%) did not. The number of key presses by subjects pressing the L key are displayed in the graph below.





ASMR Woman Audio. 10 subjects (33.3%) pressed the L key, 20 (66.7%) did not. The number of key presses by subjects pressing the L key are displayed in the graph below.





Contingency tables

Tingles. No significant difference has been found of gender on having felt tingles χ^2 (1, N=30) =0.37, p=.54

No significant difference has been found of stress level on having felt tingles χ^2 (1, N=30) =0.68, p=.41

No significant difference has been found of feeling sad on having felt tingles χ^2 (1, N=30) =0.65, p=.42

Significant difference from expected values has been found of trouble sleeping on having felt tingles χ^2 (1, N=30) =4.68, p=.03, Phi and Cramer's V=0.395 (Table 10). Rejection of the null hypothesis that the data are independent can be made, indicating a relation between feeling tingles and trouble sleeping. Seems that who's having sleeping issues could have impedances in feeling tingles.

Table 10 Contingency Tables

		TROUB_SLEEP		
TINGLES_YN		0 NO	1 YES	Total
0 NO-DON'T KNOW	Observed	13	9	22
	Expected	15.40	6.60	
	% of total	43.3 %	30.0 %	
1 YES	Observed	8	0	8
	Expected	5.60	2.40	
	% of total	26.7 %	0.0 %	
Total	Observed	21	9	30
	Expected	21.00	9.00	
	% of total	70.0 %	30.0 %	

Can this result, in concert with the one already reported in Table 7 that sees a relationship between feeling relaxed and having experienced tingles, make us think that the ability to experience tingles is linked to the ability to relax in general? Could it be thought that the ability to relax could be mediator in the ability to experience the tingles? Further studies supporting this theory should be carried out.

Relax. No significant difference has been found of gender on having felt relaxed by ASMR videos χ^2 (1, N=30) =0.02, p=.87

No significant difference has been found of stress level on having felt relaxed by ASMR videos χ^2 (1, N=30) =0.15, p=.69

No significant difference has been found of feeling sad on having felt relaxed by ASMR videos χ^2 (1, N=30) =2.08, p=.15

No significant difference has been found of trouble sleeping on having felt relaxed by ASMR videos χ^2 (1, N=30) =0.37, p=.54

Annoyance. No significant difference has been found of gender on having felt annoyed by ASMR videos χ^2 (1, N=30) =0.20, p=.65

No significant difference has been found of stress level on having felt annoyed by ASMR videos χ^2 (1, N=30) =0.55, p=.45

No significant difference has been found of feeling sad on having felt annoyed by ASMR videos χ^2 (1, N=30) =1.02, p=.31

No significant difference has been found of trouble sleeping on having felt annoyed by ASMR videos χ^2 (1, N=30) =1.69, p=.19

Gender. No significant difference has been found of gender on having felt tingles by ASMR man video χ^2 (1, N=30) =0.37, p=.54

No significant difference has been found of gender on having felt tingles by ASMR woman video χ^2 (1, N=30) =2.71, p=.10

No significant difference has been found of gender on having felt relaxed by ASMR man video χ^2 (1, N=30) =0.43, p=.51

No significant difference has been found of gender on having felt relaxed by ASMR woman video χ^2 (1, N=30) =0.37, p=.54

No significant difference has been found of gender on having felt annoyed by ASMR man video χ^2 (1, N=30) =0.15, p=.69

No significant difference has been found of gender on having felt annoyed by ASMR woman video χ^2 (1, N=30) =1.16, p=.28

Video vs Audio. Significant difference from expected frequencies has been found of having felt tingles watching ASMR woman video on having felt tingles listening ASMR woman audio χ^2 (1, N=30) =8.73, p=.003, Phi and Cramer's V=0.539 (Table 11). Rejection of the null hypothesis that the data are independent can be made, indicating a relation between feeling tingles watching woman video and listening woman audio.

Table 11 Contingency Tables

		TINGLES WOMAN AUDIO		
TINGLES WOMAN VIDEO		**0**	**1**	**Total**
0	Observed	23	1	24
	Expected	20.80	3.200	
	% within row	95.8 %	4.2 %	
	% within column	88.5 %	25.0 %	
1	Observed	3	3	6
	Expected	5.20	0.800	
	% within row	50.0 %	50.0 %	
	% within column	11.5 %	75.0 %	
Total	Observed	26	4	30
	Expected	26.00	4.000	
	% within row	86.7 %	13.3 %	
	% within column	100.0 %	100.0 %	

No significant difference from expected frequencies has been found of having felt tingles watching ASMR man video on having felt tingles listening ASMR man audio χ^2 (1, N=30) =0.37, p=.54

It seems that the sounds created by the woman performer induced more tingles than the sounds created by the male performer. These results may suggest that some ASMR sounds (per se, without the visual components) are more triggering than others.

No significant difference from expected frequencies has been found of having felt relaxed watching ASMR woman video on having felt relaxed listening ASMR woman audio χ^2 (1, N=30) =1.22, p=.27

No significant difference from expected frequencies has been found of having felt relaxed watching ASMR man video on having felt relaxed listening ASMR man audio χ^2 (1, N=30) =0, p=1

Significant difference from expected frequencies has been found of having felt annoyed watching ASMR woman video on having felt annoyed listening ASMR woman audio χ^2 (1, N=30) =16.3, p <001, Phi and Cramer's V=0.736 (Table 12). Rejection of the null hypothesis that the data are independent can be made, indicating a relation between feeling annoyed watching and listening woman stimuli.

Table 12 Contingency Tables

		ANNOYED WOMAN AUDIO		
ANNOYED WOMAN VIDEO		0	1	Total
0	Observed	15	1	16
	Expected	9.60	6.40	
	% within row	93.8 %	6.3 %	
	% within column	83.3 %	8.3 %	
1	Observed	3	11	14
	Expected	8.40	5.60	
	% within row	21.4 %	78.6 %	
	% within column	16.7 %	91.7 %	
Total	Observed	18	12	30
	Expected	18.00	12.00	
	% within row	60.0 %	40.0 %	
	% within column	100.0 %	100.0 %	

It seems that, based upon the sensations reported by the subjects, there is a stronger relationship in the case of the couple of video and audio stimuli performed by the woman compared to the pair of video and audio stimuli performed by the man.

No significant difference from expected frequencies has been found of having felt annoyed watching ASMR man video on having felt annoyed listening ASMR man audio χ^2 (1, N=30)

=3.27, p=.07. However, the same trend as for the previous analysis could be observed, suggesting that ASMR audios in general could have the same annoying effect on whom is annoyed by ASMR videos (Table 13).

Table 13 Contingency Tables

		ANNOYED MAN AUDIO		
ANNOYED MAN VIDEO		**0**	**1**	**Total**
0	Observed	11	5	16
	Expected	8.53	7.47	
	% within row	68.8 %	31.3 %	
	% within column	68.8 %	35.7 %	
1	Observed	5	9	14
	Expected	7.47	6.53	
	% within row	35.7 %	64.3 %	
	% within column	31.3 %	64.3 %	
Total	Observed	16	14	30
	Expected	16.00	14.00	
	% within row	53.3 %	46.7 %	
	% within column	100.0 %	100.0 %	

2.3.5. Discussion

The key research issues that guided this study were the following:

1-To find out whether there is an ASMR physiological effect or not.

Overall, in this study with 30 non-pre-selected individuals (50% completely naïve in the research matters), ASMR videos elicit higher arousal than the control (non ASMR video).

The evidence in terms of physiological activation measured by the skin conductance parameter in this study suggests that there is an ASMR effect and that it is limited to the multisensory stimuli (more data discussion about multisensorial vs unisensorial ASMR content will follow).

It can also be asserted that ASMR effect is dichotomous: it has a positive value for some and a negative value for others. The *positive ASMR effect* results in the pleasant sensation of extreme relaxation that leads some subjects to experience the typical tingles; the *negative ASMR effect* also leads subjects to feel physical sensations associated with extreme discomfort, something comparable to the annoying sensation caused by the "noise of nails on the blackboard".

2- Measure the incidence of people, among a naïve population, who actually experience the ASMR effect.

In the cohort of 30 non-selected individuals, 8 (26.7%) reported having experienced the *positive ASMR effect* (tingles). Of these subjects, 3 reported that they did not know what ASMR was, 3 others reported that they only occasionally watched ASMR videos but were not regular users; only two declared to be ASMR users.

A first hypothesis that can be advanced is that ASMR effect is probably typical of individuals predisposed to feel the tingles that ASMR videos seem to be able to elicit. This observation is in line with the evidence reported by the two fMRI studies conducted so far. According to the study by Smith et al. (2017)

"the DMN of individuals with ASMR showed significantly less functional connectivity than that of controls. The DMN of individuals with ASMR also demonstrated increased connectivity between regions in the occipital, frontal, and temporal cortices, suggesting that ASMR was associated with a blending of multiple resting-state networks. This atypical functional connectivity likely influences the unique sensory-emotional experiences associated with ASMR." (p. 363)

The study by Lochte et al. (2018) states as follows:

"Subjects who experienced ASMR showed significant activation in regions associated with both reward (NAcc) and emotional arousal (dACC and Insula/IFG). Brain activation during ASMR showed similarities to patterns previously observed in musical frisson as well as affiliative behaviours." (p. 295)

The study by Lin, Tseng, Lai, Matsuo, & Gau (2015) showed that reduced connectivity between the frontal lobes and sensory and attentional regions in the precuneus and parietal cortex has been linked with reduced attentional control and inhibition in patient populations. The same pattern of reduced connectivity was found in ASMR experiencer by Smith et al. (2016).

As suggested by Smith and colleagues (2016), it is possible to think that

"ASMR reflects a reduced ability to inhibit sensory-emotional experiences that are suppressed in most individuals." (p. 364)

The *positive ASMR effect* found in this study could be read in that light.

3- Comparison of the results of this study with the results obtained by Poerio and colleagues in relation to the arousal in people who feel the tingles.

As in the study by Poerio and colleagues (2018), some differences in terms of EDA between subjects who have and have not felt ASMR tingles have emerged also in this study. In the latter EDA was measured using a different parameter, the NS-SCR *(peaks count):* this seems to be more reliable than SCL (Braithwaite et al. 2013). However, in this case, SCL measure has shown the same pattern as SCR.

Nevertheless, the evidence of this study proved a different scenario in some aspects: there were no significant differences in terms of activation between those who perceived the tingles and those who did not feel them, watching ASMR videos (as shown by the post hoc comparisons). The fact that statistics do not detect a significant difference between the *Tingles* and the *No-Tingles* group with regard to the two ASMR video stimuli, could be explained by the other evidence that emerged in relation to the *negative ASMR effect*: ASMR videos leave some people neutral, elicit a positive effect in others and a negative effect in yet others. Those who are "victims" of the negative effect are aroused (although the activation has a negative value); in this way the activation gap between those who have not perceived tingles is reduced.

In the study by Poerio and colleagues, the two experimental groups ASMR and non-ASMR both came from a population aware of ASMR (given the fact that the non-ASMR group was selected on the basis that it did not experience the tingle). This could account for the difference in activation found between the two experimental groups: those who were in the non-ASMR group, although not feeling the tingles, are presumably people to whom the ASMR videos still give positive sensations (in terms of relaxation - those psychological and non-physical effects of the phenomenon), so there was no activation (of negative value) in the non-ASMR group. Moreover, an expectancy effect –not included in this study with a naïve sample - could have played a role in creating more defined results (Cash et al., 2017).

There is no significant difference in the mean score for the control video condition between the *No-Tingles* group and the *Tingles* group: this specific result is in line with Poerio and colleagues' evidences.

On the other hand, the difference is clear in the case of SCR mean between *Tingles* and *No-Tingles* group across ASMR videos and control video. SCR's mean for who felt tingles watching the ASMR man video, differs also from SCR's mean for control audio condition and woman audio condition, but not for man audio condition. Moreover, there is a significant difference among those who felt tingles between control video and ASMR man video, but not between control video and ASMR woman video.

We may therefore affirm that, overall, the ASMR man video was more arousing than the ASMR woman video, but this can be true in terms of both pleasant and disturbing sensation.

It should be pointed out that in this study the 2 groups, *Tingles* and *No-Tingles*, were not balanced: only 8 subjects out of 30 checked "YES" when asked "Have you felt ASMR effect (pleasant physical sensations that came in the form of tingles) whilst viewing the stimuli?".

4- <u>Understand the reaction to ASMR stimuli in people who do not like this kind of video.</u>

Although there is no significant difference overall in the number of conductivity peaks of those who were bothered compared to those who were not, Graph 4 shows that those who were bothered were generally more activated than those who were not. A post hoc analysis was then carried out and a significant difference emerged between the average number of peaks relative to the control video in the *Annoyed* group and the average number of peaks relative to the two ASMR videos in the same group. This result corroborates the theory that those annoyed were

most likely to be annoyed by ASMR videos. Thus, ASMR videos are more arousing (higher *peaks count*) than control video, also in a negative way (*negative ASMR effect*).

Emblematic are the answers to the question "why don't you watch ASMR videos?":

"they bump into me and bother me"
"they cause me annoying sensations"
"they tend to be irritating and they tend to stir me up."
"often activate my misphony problems, especially in the presence of specific sounds such as the pronunciation of letters like *p* and *t* and the noise of chewing".

In a mirror-like way, also in this case, in the group of those who were not bothered there are those who experienced tingles watching ASMR videos. It can be hypothesized that for this reason there are no statistically significant differences between those who were bothered and those who were not, with respect to ASMR videos.

5- Understanding if there is a difference in the perception of the ASMR stimulus, multisensory by definition, and the same stimulus submitted in unisensory mode.

It seems that the single-sensory stimulus (audio only) does not have the same characteristics as the audio-visual stimulus in terms of physiological arousal, while no differences were found in terms of affective responses regarding ASMR videos and audios stimuli.

Statistically significant differences were found between the multisensory ASMR stimulus (audio and video) and the monosensory ASMR stimulus (audio only) in relation to arousal, measured by SCR *(peaks count).* No statistically significant differences were found with respect to the activation of the subjects during the listening of ASMR audio and its control (non ASMR audio).

In terms of affective responses (J and L key presses count) seemingly there are no significant differences regarding the different kinds of stimuli (audio vs video).

J button (feeling disturbed) online pression results: ASMR man video. 14 subjects (46.7%), ASMR man audio. 12 subjects (40%), ASMR woman video. 15 subjects (50%), ASMR woman audio. 12 subjects (40%).

L button (feeling good) online pression results: ASMR man video. 10 subjects (33.3%), ASMR man audio. 9 subjects (30%), ASMR woman video. 10 subjects (33.3%), ASMR woman audio. 10 subjects (33.3%). In order to better define those L press data, it can be specified that

tingles were felt for man video and woman video by 6 subjects, 3 subjects report having felt tingles for man audio and 4 subjects for woman audio.

Although the qualitative perception of the multisensory ASMR stimulus was not different from the perception of the monosensory ASMR stimulus, significant differences were noted from the point of view of physiological activation. ASMR effect was found, but it was limited to the multisensory component (audio and video).

"The decreased connectivity of the thalamus seems to be relevant to the multimodal experiences in ASMR". (Smith et al., 2016, p. 364)

ASMR users indicate the audio phonic component as the most important part of this kind of content (Barratt et al. 2017), however it seems that it is the specific combination of audio and video that defines the ASMR effect. We cannot rule out that in some individuals the sound component alone is able to cause the tingles.

6 - Understanding if there are differences in the perception of ASMR stimuli created by men or women also in relation to the gender of the user.

Based on the gender of the user, no significant differences were found with respect to the gender of the performer, neither in terms of qualitative responses, nor in terms of physiological reactions.
In this study the man video was the one that activated subjects the most (according to the SCR *peaks count* measurement and the SCL mean level): both the *Annoyed* as well as the *Tingles* group. Regarding the affective responses the subjects showed no differences in perception based on the performer's gender. It is however not possible to generalize this evidence because the effect may be ascribable to the specific video used. Additional data will be necessary to support hypotheses regarding gender differences (in both directions, user's gender and performer's gender) with respect to the ASMR effect.

This specific aspect could also be further influenced (mediated or moderated) by sexual orientation: it will therefore be necessary to check this variable too.

"The ASMR community rejects any links with nonnormative sexual public intimacy, firmly denying the transgressiveness of their digital pleasure. Instead, they suggest that their experience of bodily pleasure is conjured up by the pure interaction between sound waves and brain. Yet,

when read in the context of the content of ASMR videos, the assertion that the ASMR experience is created apart from the suggestions of physical proximity and intimacy created by the aural environment of the whisper and the situations acted out by whisperers does not stand to scrutiny". (Andersen, 2015, p. 685)

2.3.6. Research limits

Since there is little literature about the ASMR phenomenon, the idea was not to set a standard time for watching videos, but to leave a minimum and a maximum limit within which, depending on the reaction, each subject could better adjust their own experience. This choice was also made with the idea to keeping the data as ecological as possible, given the many limitations imposed by conducting this type of experiment in a laboratory. However, in retrospect, this arrangement proved to be more limiting than informative. First, it was necessary to standardise the conductance data on the basis of the viewing time of each subject for each video. With respect to the number of peaks (NS-SCR count), the number of total peaks in the different time units was divided by the length of time itself. It has not been possible to do the same with SCL (average) data, otherwise there would have been a significant loss of information and a bias in the final data, and the subsequent discard of such data. It is also for this reason, indeed, that the analyses have been carried out mainly on the SCR parameter which is in many ways more informative and reliable (Braithwaite et al. 2013).

Since only two videos of a specific type were selected (personal attention, ear massage, no speaking) the effects found could be related to specific videos and not to the ASMR phenomenon in general. There are no claims that the achieved results will be exhaustive. They are a starting point to extend and expand the research on the phenomenon with more structured studies, that may encompass all the many facets of this complex phenomenon.

Whispering videos are the most effective in eliciting ASMR response (e.g. Barratt et al. 2015; Smith et.al, 2016; Fredborg et al. 2017; McErlean, Banissy, 2017), but given the constraints of this study, this kind of videos have been excluded in order to avoid spurious component that could bring confounding elements (arousal more related to sexual attitudes and/or language comprehension). Also, as reported by Barratt et al. (2017), the sound of the host's voice could be subjectively non-conducive to relaxation thus inhibiting the ASMR effect.

With respect to the idea of studying gender differences in relation to the use of ASMR videos, the limited number of samples has once again limited the possibilities of analysis, as already discussed above.
Additionally, since one of the advanced theories explaining the ASMR effect is that ASMR videos relax those who arouse sensations felt during childhood when in company of the primary caregiver, one of the research inquiry was to understand if the genre of the primary caregiver played any role, in relation to the gender of the ASMR performer in evoking these feelings. Within the analysed sample only two subjects indicated that they had a male primary caregiver. It was therefore not possible to process the data obtained from the measurement of skin conductance compared to the group "gender of the primary caregiver" because of the limited number of the group "male primary caregiver".

Moreover, in order to make the results obtained by pressing keys J and L more informative, it would have been necessary to control, for each subject, the inclination to express their own sensations in that way, in order to operate a normalization of the data and make it more valid.

To obtain results with adequate statistical power, a sample of 30 subjects - although sufficient given the number of repeated measures - is still reduced. There was no margin to counterbalance the presentation, also for this reason a randomisation was chosen. In fact, at least 36 subjects would have been necessary to display all possible presentations.

The presentation of the questions related to the emotional state perceived during the stimuli would have been better if randomized too. That way possible bias in the answers would be more likely avoided.

The use of ASMR content and its effects are particularly affected by the type of stimuli, as confirmed by the two subjects in the sample analysed who watch ASMR videos on a regular basis, in addition to what has already emerged in the literature (e.g. Gallagher, 2016). The limitation to a single typology was therefore a constraint; however, it would also be very difficult to carry out a study that included all the different typologies. More valid and reliable results could have been obtained by selecting a pool of stimuli to be submitted to the subjects. A best practice (so far) comes from the study by Poerio and colleagues, in Study 2 where the physiological response was measured, it was "(i) asked ASMR-participants to self-select an ASMR video clip and (ii) showed participants the video clip from Study 1 that produced the most reliable ASMR response. This approach of using self-selected and standardized stimuli has been used in previous research on music-induced chills. For example, studies have shown that

music-induced chills cannot be reliably provoked in different individuals using the same musical stimuli and have therefore capitalized on the use of musical excerpts that are participant-selected to reliably induce chills." (p. 8)

The context of use greatly influences the use itself;

"ASMR has brought viewers back into the house, searching for 'listening pods', where a good degree of control can be regained over the sonic environment, against increasingly invasive urban soundscapes". (Garro, 2017, p. 4)

Some of the comments of the participants in "ASMR Effect Experiment" were:

"I have not found among the proposed videos those that I prefer watching"
"I love to watch ASMR videos when I'm in bed before I sleep, but the video of the woman in particular has disturbed me a lot because it was too intimate: the feeling that she touched my ears annoyed me".
"if I hadn't felt the presence of someone with me in the room, I would have relaxed more and maybe I would have experienced the tingles".
"I've been distracted by noises coming from outside and I haven't been able to immerse myself in what I know by seeing and hearing"

Also for these reasons the data collection in this experiment is biased, it is therefore extremely important e to develop equipment that enables to carry out research on ASMR phenomenon in the most ecological way possible.

2.3.7. Conclusions and questions for further researches

Even though, in a sample not selected a priori, there are more people who are annoyed by the ASMR contents rather than relaxed and experiencing ASMR (positive) effect, this study shows that tingles still cause a greater arousal (in terms of frequency of the peaks of conductance) compared to the sensation of annoyance raised by the same contents. ASMR effect has been physiologically recorded, and it seems to create a dichotomy between those who attribute an extremely positive value to it and those who are extremely annoyed by it. Both factions play on the field of physical sensations.

Feeling relaxed by watching an ASMR video could be a mediator for the capability to feel tingles: as shown by the χ^2 test, those who are capable of feeling relaxation are more likely to experience them. A significant result also emerges from the χ^2 test which compares the frequencies of those who have trouble falling asleep and those who have experienced tingles: those who have trouble falling asleep probably won't sense tingles. This results in a further matter for potential future research: is it the ability to relax, as a whole, that mediates or moderates the possibility of feeling tingles?

Another aspect that has not been clarified is the influence that gender has on the perception of ASMR videos and its effect. 4 out of 30 people reported being annoyed by one of the two videos and relaxed by the other, as shown in Table 7. What variable influenced this result? The hypothesis is that the gender of the performer, possibly in relation to the gender of the user, is the discrimination. In my sample of 30 unselected subjects no effect was found in this sense, but it is possible that, in a sample selected a priori, we can reach the expected results. Future studies may eventually shed light on this issue.

Other questions arise regarding the rise and spread of ASMR phenomenon. Will those who find themselves capable of experiencing tingles (*positive ASMR effect*) be likely to become regular users? This would explain why the majority of comments to ASMR videos on *YouTube* are positive: those who become frequent users of this genre really benefit from it and experience pleasant physical or at least psychological sensations.

Being a unique phenomenon, many people have watched these videos out of curiosity, without becoming real users. But it seems that there are people who, even not knowing ASMR, are able to feel tingles when enabled to do so. It can therefore be assumed that the phenomenon is doomed to grow because when people hear about it, they become curious and want to

understand if they are able or not to experience tingles. And if they do, they could become regular users.

It would also be interesting to observe, with fMRI, the activation pattern of individuals that are annoyed by ASMR stimuli, let's call them "ASMR's haters" and compare it with the "ASMR's lovers".

The ASMR phenomenon is interesting and multifaceted. In order to understand its characteristics and its real potential, it will be necessary to collect a lot of data and to carry out a corresponding amount of analyses. Moreover, as this phenomenon manifests itself mainly in the presence of a specific setting, it will be desirable for future research to try to collect these data in the most ecological way possible.

Many of the (few) studies conducted so far are aimed at confirming the therapeutic potential of ASMR phenomenon (e.g. Fredborg, 2018). Some suggest that ASMR helps students relax and cope with exam stress (Apprich, 2016). If there are any chances of therapeutic power of ASMR, it will be better to know that such power could be exerted only to a certain type of individuals. Proposing relaxation techniques that involve the use of ASMR videos to certain people would not only not be functional but even counterproductive.

3. VISUALIZE

After having shed a light on different aspects of ASMR and having observed the ASMR effect through an experiment, my past as a designer leads me to look forward to a concretization of what I have learned, thus the "ASMR*Effect* App Project". The first goal of "ASMR*Effect* App Project" is to support the research on ASMR, the second finality of the project is merely commercial. In this third and last part of the dissertation, the commercial potential of ASMR phenomenon will be highlighted, since it is also this aspect that can give strength (and money) to future research. "ASMR*Effect* App Project" will be presented and discussed: for the time being it will consist of a mock-up for an app and its related devices. The app is thought to cope with the limits of ASMR research scenario as it is today (i.e. the "research purpose"), as well as to give "ASMR lover" new features in order to enjoy ASMR even more (i.e. "the commercial goal").

3.1. ASMR & marketing

ASMR video creators often use objects to create sound effects, especially food products: rustling wrappings, chews that are chewed, a can that is opened. Tic Tac, Swedish Fish and Taco Bell are some of the brands that appear in *YouTube* ASMR creator videos.

In 2015, BBDO created ASMR video for the Chinese market to advertise chocolate Dove; the videos were designed to evoke the sensation of sweet pleasure that consumers experience when they taste these sweets.

Ikea has made 6 videos (22) with a voice that describes the furniture whispering and a hand that touches some accessories, such as sheets, producing sound effects.
Fashion magazine W asked some celebrities to shoot ASMR-style videos.
KFC has also decided to take advantage of the trend. In a *YouTube* video, actor George Hamilton, in the role of Colonel Sanders, whispers sweet little words about pocket handkerchiefs, interspersing them with the inviting sound of a bite of KFC's crispy fried chicken legs. "There is an entire community absolutely fascinated and enthusiastic about the sensory experience of sound," said KFC CMO Kevin Hochman in an interview with The Washington Post. "ASMR generates a feeling of comfort, just like our food" (23).

But the consecration of ASMR as a communication tool, took place at the beginning of 2019 during the Super Bowl to advertise an organic beer, Michelob Ultra. In that context, a video

(24)was shown in which Zoe Kravitz (daughter of singer Lenny Kravitz) sat at a desk in the paradisiacal context of the Hawaiian Islands and gave the audience a series of auditory and visual stimuli whispering, making them listen to the effervescence of the drink and ticking with her fingers on the glass. Michelob Ultra management's idea was to stand out in the chaos of the Super Bowl using a different strategy: not to focus on a spot as loud as possible to capture the attention, but on the exact opposite, creating a space of relaxation and tranquillity that can stand out on everything else. A choice in line with the company's eco-bio-friendly philosophy.

In addition to the list of large companies that have used ASMR as a means of promoting their products/services, there is one of the most important insurance companies, AXA. On the website of AXA PPP healthcare, a UK private medical insurance provider part of the AXA group, appeared an article in which health benefit of ASMR were promoted (25).

Beauty products also play a starring role in this trend. Makeup tutorials have long been very popular on *YouTube*, but after viewers realized that they are also extremely relaxing, many of them are now being used as ASMR videos. Some creators adopt the role-playing approach, simulating the feeling of being in the hands of a makeup artist, while others use makeup brushes to produce soothing sounds.

Another audience that is growing in the ranks of followers of the ASMR is that of technology and games enthusiasts. Those interested in the ASMR are very likely (more than twice the others) also interested in consumer technology products such as laptops, mobile phones and game consoles (26). On *YouTube* there is even an ASMR channel for players. The ASMR could indeed be an antidote to the frenzy of video games.

Recently (2018) a student in Marketing Management at Bocconi University in Milan chose ASMR as topic of her Master Thesis, which was titled, "Autonomous Sensory Meridian Response (ASMR) Videos: An Exploratory Analysis of Communication and Sales Potential for Companies."

And then again, the marketing agency behind the Ritz campaign has been led to a 30% increase in sales (27).
This is a timely research topic as more major brands are turning to ASMR-inspired commercials. The public dedicated to ASMR is vast, passionate and constantly growing.

3.2. Spreading the ASMR word

Maria *Gentle Whispering*, leaning into the camera, traces the tip of a makeup brush against a microphone, whispering that she's stroking your face. It's like “tingles that form on the outer edge of your brain and send shivers of electricity through your whole body”, says ASMR enthusiast Tamara Green, 37, of Queens, New York (28).

“I get messages from firefighters and veterans with PTSD, moms who listen to my videos on speakers to soothe their babies, and a lot of teenagers and young adults who use them to reduce panic attack symptoms, stress, and insomnia”, says Maria (29).

Fig.9 Maria Viktorovna aka Gentle Whispering

Maria Viktorovna, the "Queen of ASMR" (30), is a Russian born *YouTuber* and *ASMRtist*. She moved to the United States in 2006 and after experiencing depression while going through a divorce, she watched her first ASMR video. Viktorovna worked in administration at a medical company before starting her *YouTube* Channel, *Gentle Whispering* in February 2011. As of 2019, her channel had almost 1.7 million subscribers, making Viktorovna one of the most famous ASMR artists on the site. It is estimated she makes $130,000 a year from her videos. Viktorovna generates money from Google advertisements that appear at the beginning of her videos (31).

Below are two images showing the growing interest in terms of search volume and geographical areas of interest for the word “ASMR” (source: google trends) (32).

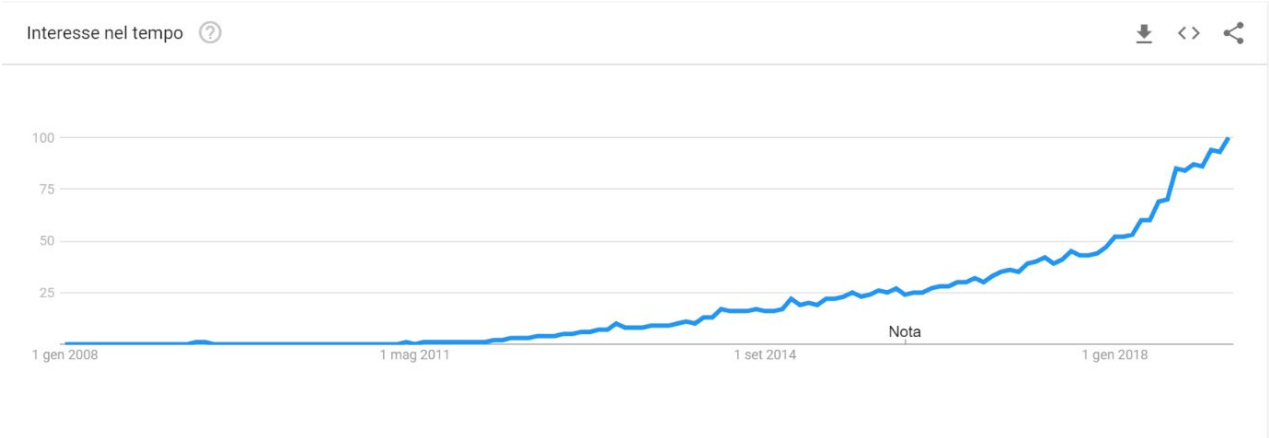


Fig.10 ASMR research volume over time

Fig.11 Interest by geographic area

3.3. Aims of "ASMR*Effect* App Project"

The aim of interactive systems designers is to balance the PACT elements (Persons, Actvities, Context and Technologies) with respect to a domain (33).

With that in mind, aims of the "ASMR*Effect* App Project" are:

- **To create a specific app for ASMR researchers, since this will be a new field of interest for different disciplines. (Research purposes)**
- **Conduct more ecological experiments, gathering more reliable data, eliminating the problem of overbooking of spaces and equipment: measurement of physiological parameters through a Bluetooth device. (Research purposes)**
- **In a second phase, once collected enough evidence supporting the physiological effect of the ASMR, the app will be launched on the market, using the results as a marketing leverage. (Commercial purposes)**
- **To provide new features for ASMR users by giving them biofeedback in real time during each and every session. (Commercial purposes)**
- **To give ASMR lovers who doesn't experience tingles a similar sensation that could make them enjoy more each and every session: a Bluetooth device will provide the tingles for them. (Commercial purposes)**

3.4. Developing Personas

Personas are a model of representative users (a kind or a group of users) and tell us:

WHO users are

WHAT, which activities they want to do

WHY they should use our product (their motivation)

Principal Persona: GIORGIA, the researcher

A researcher interested in getting into biofeedback ASMR data. His/Her university may provide the devices and the app.

PERSONA NAME:	Giorgia Bellora	SECTION 1: WHO
BACKGROUND	 Jan 2017– present PostDoc Position Università degli Studi di Milano-Bicocca · Department of Psychology Italy · Milano Giorgia comes from a middle class family, she has lived since birth in Monza, near Milano. During her studies in psychology she had some Erasmus experiences abroad. At the beginning of her career as a student she wanted to become a psychotherapist but right now she is working as a researcher into the University. She now aims to become a University Professor.	
DEMOGRAPHIC	Female Age 35 Yearly Income: $ 20,000 Monza (MB)	
IDENTIFIER	Giorgia is a Researcher interested in: Cognitive Neuroscience, Cognitive Neuropsychology, Experimental Psychology, Perception and Action, Haptics, Multisensory Integration, Multisensory Perception, Touch, Electrodermal Activity, Physiological Parameters. She has often trouble to access the University laboratory and equipment due to the overcrowding of the Universities facilities.	

PERSONA NAME:	Giorgia Bellora	SECTION 2: WHAT
GOALS	To publish her research To add new knowledge to ASMR field To give prestige to her University	
CHALLENGES	To collect a reliable amount of data To create new experimental trials To find a consistent number of subject for her experiment To find empirical evidence supporting ASMR effect	
WHAT WE CAN DO	Make it easy to manage the data collection and analysis Make it easy to find new subject for experiments Help her overcoming the problem of University facilities	

PERSONA NAME:	Giorgia Bellora	SECTION 3: WHY

REAL QUOTES	"ASMR is a new and yet undiscovered field with a lot of potentials" "Once there will be enough data supporting ASMR effect we can focus on developing new products based upon that"
COMMON OBJECTIONS	Since it is a new field, universities will not invest resources and money on that

PERSONA NAME:	Giorgia Bellora	SECTION 4: HOW

MARKETING MESSAGING	Overcoming problems of availability and reliability of data Easiness in conducting longitudinal studies
ELEVATORS PITCH	Once tested in ASMR research, the product can be easily adapted and used in many other research field. It is an open an flexible tool that will bring to the next level the way in which research can be conducted

Secondary Persona: CHIARA, the ASMR lover

An ASMR lover who just want to learn to relax a bit more deeply, while getting concrete evidence of His / Her progress.

PERSONA NAME:	Chiara Parma	SECTION 1: WHO
BACKGROUND		Chiara lives with her parents in a town near Milan. Her family is composed by her mother, who works in the local postal office; her father, who is a chemical engineer; her brother, a 20 years old sound engineer student who is living in London and a dog, Justine. She doesn't practice any sport; she loves to play online games with her friends, many of whom lives far from her, so she spent a lot of time on the social networks chatting with them. She has a boyfriend who attend the same school as Chiara. She suffer of anxiety, especially concerning her school performances.
DEMOGRAPHIC		Female Age 17 Yearly Income: None Giussano (MB)
IDENTIFIER		Chiara is a high school student, she studies textile technologies and she spent a lot of her spare time on the internet. She likes to watch ASMR videos, especially those concerning food and personal attention role plays. She had known about ASMR videos from more than two years, while searching something to relax and help her falling asleep. She uses Tingles app when in bed because she enjoy to fall asleep while listening her favourites ASMRtists whispering in her ears.

PERSONA NAME:	Chiara Parma	SECTION 2: WHAT
GOALS		To maintain a sufficient average at school. To continue to play online with her friends. To feel the tingles while watching ASMR videos (one friend of Chiara experience tingles and she would like to feel those as well).
CHALLENGES		To overcome her anxiety problems. To sleep at least 7 hours per night (her anxiety leads her to suffer for insomnia). To find ASMR trigger that made her feels the tingling sensations.
WHAT WE CAN DO		Give her real time biofeedback concerning her relaxation state while watching ASMR videos. Providing her ASMR tingles. Make her feels as an important part of ASMR community and in doing so contributing to the scientific knowledge.

PERSONA NAME:	Chiara Parma	SECTION 3: WHY

REAL QUOTES	"I love to watch ASMR videos in my room alone" "My favourite ASMR videos are the ones with people (but just female, not male) eating food" "ASMR videos relax me"
COMMON OBJECTIONS	Providing tingles is different from feeling them spontaneously

PERSONA NAME:	Chiara Parma	SECTION 4: HOW

MARKETING MESSAGING	To relax more deeply, while getting concrete evidence of progresses...with a bit of fun added.
ELEVATORS PITCH	Once ASMR proven to be effective in induce relaxation, it could be adopted by many more users with this aim. The relaxing effect could be enhanced providing also the tingling necklace.

Secondary Persona, NICKOLAS the therapist

A trained professional who uses biofeedback to help treat anxiety.

PERSONA NAME:	Nickolas Friedman	SECTION 1: WHO

BACKGROUND	 Nickolas received his Ph.D. from the California School of Professional Psychology at Berkeley in 1986 and became licensed to practice in California in 1988. Since 1995 he has worked in a private psychotherapy practice providing counselling services to individuals, couples, families and groups. Nickolas has also taught counselling courses at the Los Angeles University as a sessional instructor and supervised counselling graduate students.
DEMOGRAPHIC	Male Age 50 Yearly Income: $ 60,000 Los Angeles (CA)
IDENTIFIER	Nickolas works full-time providing individual, couple, group and family psychotherapy to clients experiencing various life problems such as childhood and adult trauma, illness, depression, anxiety, and relationship problems. He also provides brief "symptom-focused therapy," in which the emphasis of treatment is more on easing or resolving more immediate symptoms. Another profound personal influence on Dr. Friedman's work has been in the area of mindful awareness. He also practice EMDR technique to his patients.

PERSONA NAME:	Nickolas Friedman	SECTION 2: WHAT

GOALS	These past 15 years Dr. Friedman has become increasingly interested in the newly developing field of "Interpersonal Neurobiology." The recent explosion of research about the brain and its functioning under different interpersonal conditions is at the cutting edge of deepening the effectiveness of psychotherapy and our understanding of the mind.
CHALLENGES	While Dr. Friedman has many years of clinical and teaching experience, he views himself as a continuous student in this exciting and ever evolving field. He is always searching for new techniques he could learn and use with his clients.
WHAT WE CAN DO	Provide him evidences of ASMR effectiveness. Provide him a new technique he could use with his clients. Provide new devices so that his clients could practice also at home.

PERSONA NAME:	Nickolas Friedman	SECTION 3: WHY

REAL QUOTES	"Never stop learning" "Sometimes even the support of friends and loved ones may not be enough to make a difference. At such times the unique relationship developed between psychotherapist and patient can become transformative."
COMMON OBJECTIONS	Scientifical data supporting the effectiveness of new techniques are diriment.

PERSONA NAME:	Nickolas Friedman	SECTION 4: HOW

MARKETING MESSAGING	With real time biofeedback a client can see the effect of therapy with his own eyes.
ELEVATORS PITCH	Once tested the ASMR effectiveness, the product can be easily used with therapeutic purposes. It is an open an flexible tool that will bring to the next level the way in which theraphy can be conducted

3.5. The state of the art: existing technologies and related user experiences

The "ASMR*Effect* App Project", which develops upon the observations already set out above, will be based on technologies already available on the market today (or soon to be released). The most used and appreciated app by "ASMR lovers" today is *Tingles*: the layout and the main features of this app will be maintained also for the "ASMR*Effect* App". One of the best devices on the market for measuring skin conductance is *Moodmetric*: with this company it is expected to develop a collaboration, as is expected to do with the start-up *NeoSensory*, already in possession of a technology that can be used for the development of the tingling necklace.

3.5.1. Tingles

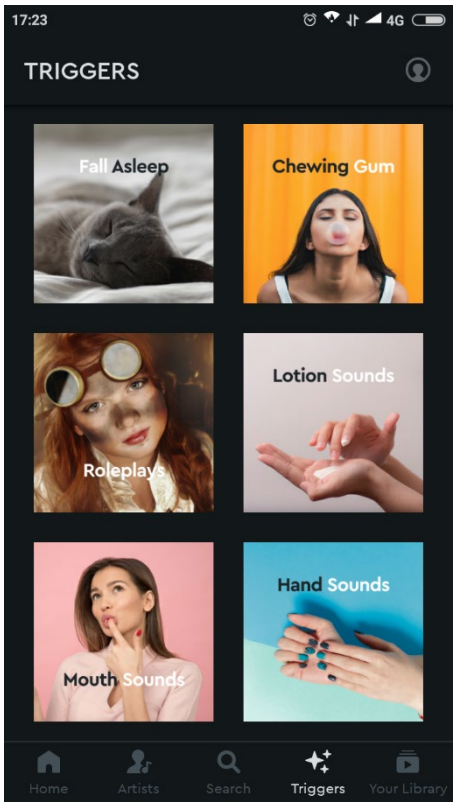


Fig.12 A screenshot from Tingles App

Today there are many apps dedicated to ASMR. Some dedicated to specific triggers (mouth sounds, slimes, tapping, eating sounds, brush sounds, and so on...), others collect and categorize different kind of ASMR videos, becoming a sort of alternative to *YouTube*, with several additional features that have decreed their success. The main and most used app from ASMR video lovers is *Tingles* (more than 500 thousand downloads only from the play store, also available on the app store).

Since the Slovenian co-founders Gasper Kolenc and Miha Mlakar launched the app in 2018, the service has already built a fairly sizable following in its community.

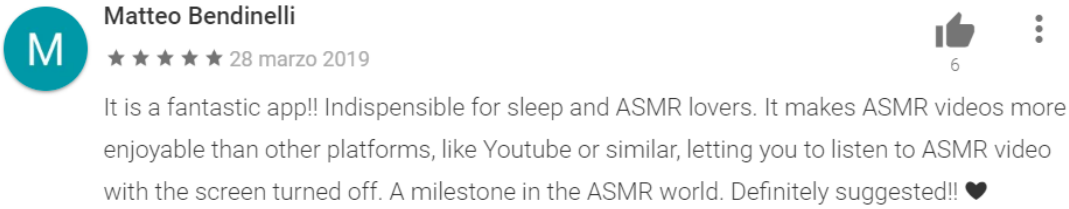
"We were just trying to figure the best way to build it for artists and the community," Mlakar, who also serves as the company's CPO, tells in an interview to TechCrunch. "We established all of these relationships. All of the features came from the community. We needed time to work on the product."

In spite of a lack of promotion, the company says it's pulled in 60,000 monthly active users, about a third of whom use the product every day.

"I think *YouTube* is great for discovery," says Mlakar. "I discovered ASMR on there. But when you become a regular user, it becomes a problem. The main thing is the ads. If you're listening to ASMR to fall asleep and you're just about to doze off, then a loud commercial wakes you up, it's really unpleasant."

For *Tingles*, ASMR is just the beginning. Mlakar describes the Android/iOS app as "basically the best place to find any video content that helps you relax and fall asleep," and future plans include a larger push into other relaxation categories, like meditation/mindfulness.

Users comments confirm the optimistic position of the creators



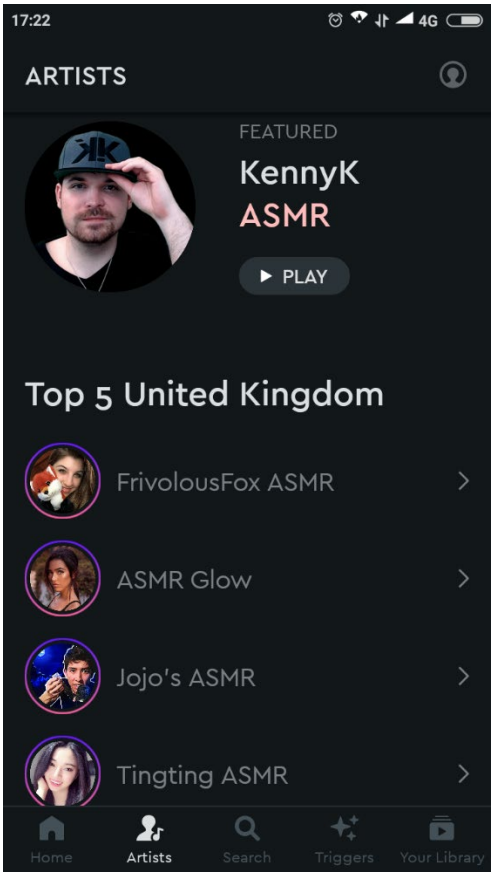


Fig.13 A screenshot from Tingles App

However, there is no shortage of problems within the copyright of content created by *ASMRtists*. Several complaints are emerging on the web, such as this posted by a creator on reddit:

"It is (was) good for viewers, but it totally screwed content creators. They embedded our *YouTube* videos (mostly without our permission!) and disabled the ads on it. They contacted me a couple of months ago and asked me if I was interested in partnering with them. I didn't reply because I wasn't interested, but they still used my videos! And not just mine, hundreds if not thousands of other creators were affected as well, most of them probably didn't even know about that.

How did they justify their behaviour? Apparently no answer = yes: "[...] in most cases we weren't getting any answers and the answers we did get were

overwhelmingly positive. We took it from that that artists are ok with us featuring them."

Lots of artists (me included) contacted the guys who made the app and asked them to remove our content. We got a couple of "interesting" responses, but our stuff was removed eventually which is great.

Long story short: If you appreciate what *ASMRtists* are doing and if you want to support them, don't use "services" like that that literally prevent content creators from earning revenue. The app also offered to download creator's videos for a small fee. Not only is it against *YouTube*'s terms of service afaik, but they were making money off of my and other people's content without our permission!"

Given the *Tingles* user experience (of both users and creators) the same strengths that have decreed its success will be used as leverage for "ASMR*Effect* App" and solutions will be found for the already existing problem: the main is the one described above which sees the dissatisfaction of content creators.

Since a first release of the "ASMR*Effect* App" and its device will be purely for research purposes, it will be possible to leverage on this argument to sensitize the *ASMRtists* whose contents are used. Where enough data is collected to support the effectiveness of the phenomenon, the commercial potential for them too would in fact increase exponentially.

3.5.2. Moodmetric

There are several devices on the market that, connected via bluetooth to an app, measure physiological parameters related to a person's stress / relaxation. Among these devices, *Moodmetric* is the one that best suits a collaboration with the "ASMR*Effect* App Project" due to the developed technology and philosophy of the creators. This can be read on their website (36):

"The Moodmetric measurement helps you to recognize your stressors and what makes you relax. You will find your individual ways to manage stress. You will learn to balance your autonomic nervous system to feel and perform better. The Moodmetric smart ring is a powerful tool for preventive stress management.

The ring detects stress levels by measuring electrodermal activity / skin conductivity (EDA). The Real-time measurement is displayed on a smart phone screen (iOS and Android). The EDA measurement gives a good picture on fluctuating stress levels. The results can be high during hectic periods in our lives. Even small changes may add recovery to the days, and the measurement shows which actions are most efficient.

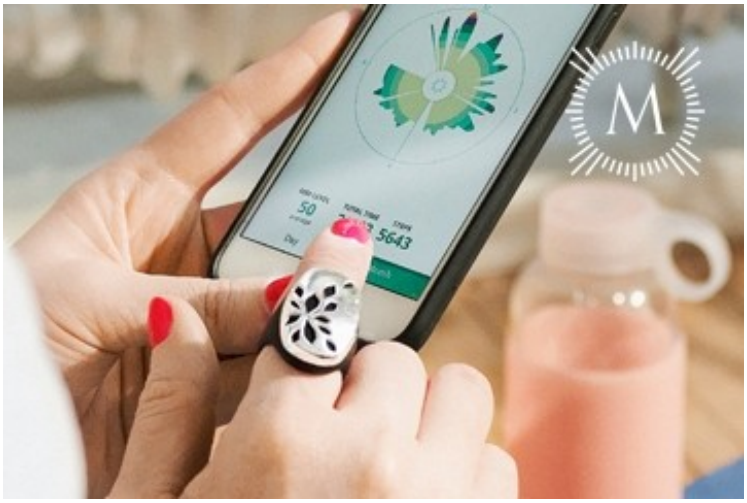


Fig.14 The Moodmetric smart ring

The Moodmetric smart ring is also a tool for researchers and health care professionals. It suits well both to real-time observation of stress reactions and long-term field research.

The Moodmetric smart ring for electrodermal activity measurement is an invention of a Finnish company Vigofere Oy. The inventor Henry Rimminen (Ph.D.) has a solid background in sensor technology and physiological measurements. He came up with the idea of incorporating the electrodermal activity (EDA) measurement into a ring in 2011. The measurement signal accuracy of the ring is comparable to laboratory devices and the research by the Finnish Institute of Occupational Health (Torniainen et al. 2015) has found the device valid for field research."

Vigofere Oy is the Finnish health tech company behind the *Moodmetric* products and services and they have collaborated with different universities.

A study by Honka and collegue (2018) analysed the user experience of the *Moodmetric* ring:

"Adopting the Moodmetric device was easy, except two experts had problems in finding the most suitable finger for the ring. Use of the ring was mainly easy and effortless, but some problems occurred. One evaluation could not be completed, because the ring stopped measuring. This may have been due to the user's dry hands, during the cold weather, when using the device (around -20 Celsius). Other problems included the difficulty to notice whether the ring was switched on and the low battery indication of it, and problems in everyday use, when washing hands, wearing gloves or doing physical tasks. The ring was felt to be in the way when changing clothes and holding or lifting items. However, the ring was found durable, since it continued to work regardless of water splashes or accidentally hitting it on items. The experts evaluated the appearance of the ring either as neutral or too bulky. One expert commented that the ring should either look more stylish or clearly indicate that it is a measurement device. The feedback provided by the app was perceived as understandable and interesting, but real-time feedback and more detailed event-related feedback were wished for. One expert experienced connection problem with the phone, but in general, synchronizing the ring with the app was fast.

The experts noticed that most of their emotional reactions were correctly detected and that the device detected both low and high intensity (active/nervous/alert state vs relaxed/calm state). In addition, they reported that the device could detect a rushed feeling, annoyance, stress, uncertainty and multi-tasking. However, the measures also included some false positives, at least partly due to a high body temperature, which seemed to have a clear impact on the measurements. High emotional intensity was shown, for example, after having a sauna or during physical activity. One expert noticed that her tiredness and longer-term stress were reflected in the measurements, during a stressful week." (p. 7)

Also on the basis of these considerations the ring design will have to be revised so as to make it more functional and suitable for the purposes of "ASMR*Effect* App".

3.5.3. NeoSensory Buzz Wristband

"The Buzz allows you to listen with your skin. The wristband detects the world around you and translates the sounds into rich patterns of vibrations".

Fig.15 Neosensory Buzz Wristband technology

This sentence presents the wristband Buzz on *NeoSensory* websites (37).

Founded out of the Texas Medical Center, developed by a Stanford neuroscientist, and backed by True Ventures (a Silicon Valley-based venture capital firm that invests in early stage technology start-ups), *NeoSensory* creates novel sensory experiences.

The *NeoSensory* research began with the idea that the experience of reality can go beyond sensory limitations. In 2013, Scott Novich, then a PhD student, and Professor David Eagleman set out to create a general sensory substitution device:

"We focus on sending a variety of data streams to the brain via the sense of touch. With so much unused real estate on the body, the skin presents huge potential for the delivery of new information. We are currently building the world's first hearing assistive technology that enables people to listen with their skin." Says Professor David Eagleman (38).

Housed inside a wristband, the Buzz has a microphone that picks up sound and a computer chip that breaks it into eight frequency ranges. Each frequency range links to a built-in micromotor. When sound from a specific range activates the corresponding motor, it buzzes slightly. It's more than a tingle but less than a bee sting.

While they are capable of turning sound into touch, they actually can do the same with almost any data stream. Eagleman has versions that work with images, the major difference being that the microphone capturing sound is replaced by a camera capturing video. He's also built versions that can detect information that typically eludes human senses. There are varieties that can see in infrared and ultraviolet, two parts of the spectrum that are invisible to the human eye.

Others can take live Twitter feeds or real-time stock market data and translate them into haptic sensations.

Fig.16 Neosensory Buzz Wristband prototypes

His inspiration for *NeoSensory* grew out of a long-time interest in synaesthesia, a neurological condition in which one sense gets substituted for another. ASMR phenomenon is frequently associated to synaesthesia (Barratt & Davis, 2015).

NeoSensory has already developed the technology (purchasable from the end of 2019, according to the developers) that "ASMR*Effect* App" could use for subsequent releases, when the buzzing necklace will be designed for commercial purposes.

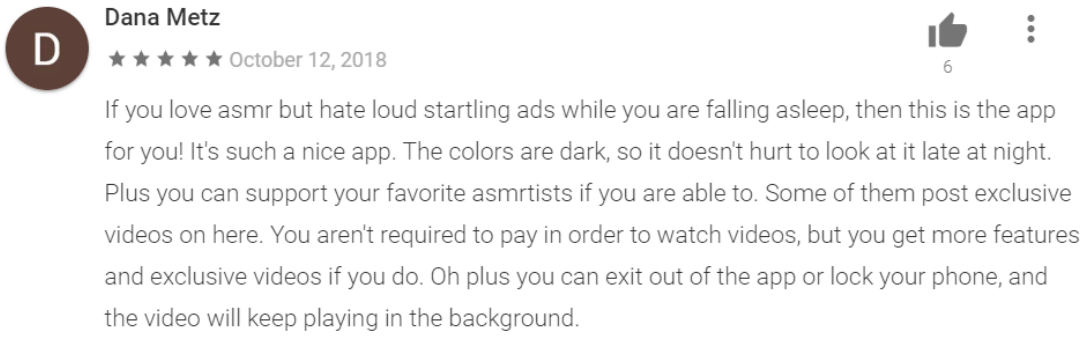
3.6. "ASMR*Effect* App"

The "ASMR*Effect* App Project" includes the design and development of an app that, similarly to *Tingles*, is an ASMR video collector, but which at the same time integrates a biofeedback measurement system via an external device, a ring based on the technology already developed by *Moodmetric*.

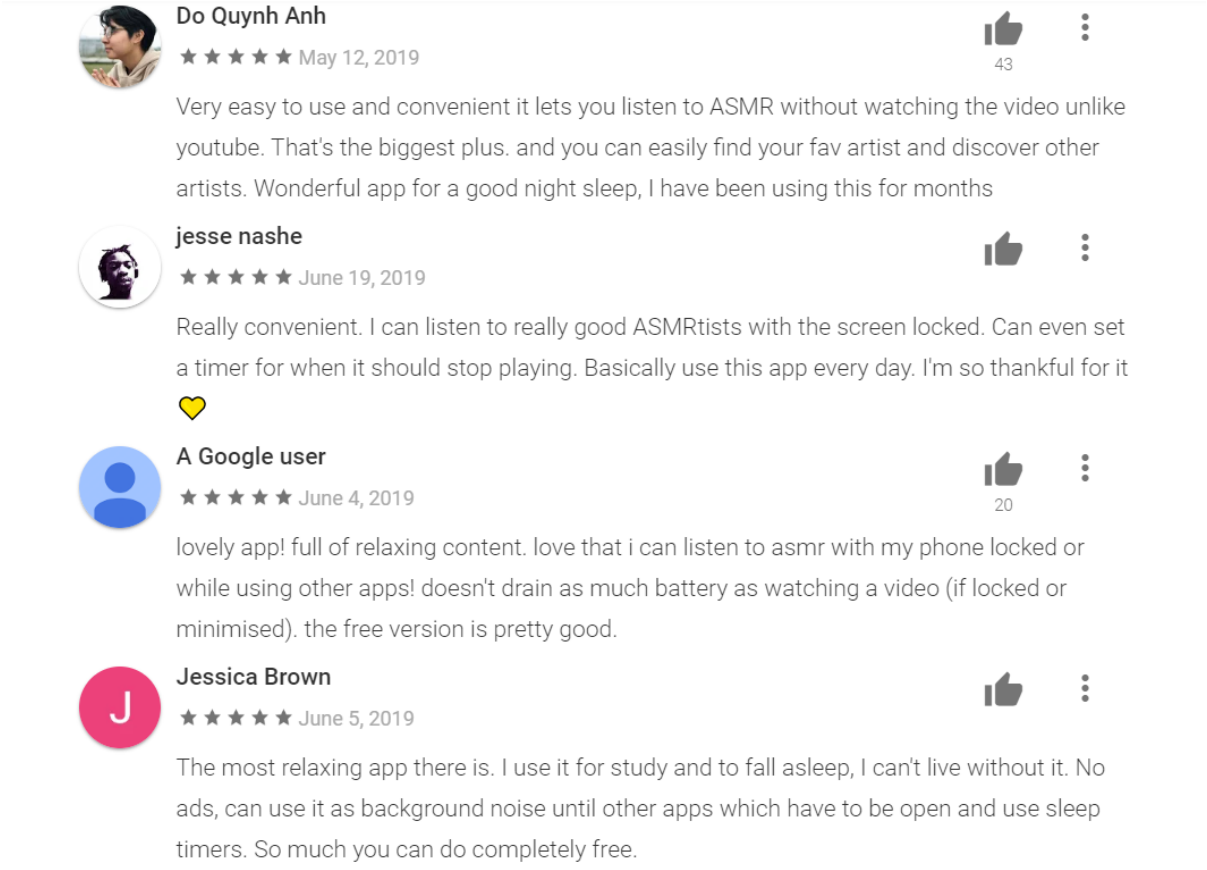
3.6.1. Usability, feasibility, acceptability

In the interaction (with devices and technological systems), what give us the information for the way in which the system work is the visible part of the system together with instructions and past experience (39).

The app interface is based on *Tingles* layout, already well known by ASMR users. The main features of *Tingles,* already appreciated by users, will be maintained, as well as the dark layout.



The app will in fact give the possibility to search for the favourite videos; the videos will also be categorized upon the triggers contained in them as well as the *ASMRtists* who created them. The app will also work in the background, allowing users to close the video screen and set a phone shutdown timer; this is because most users use the app to fall asleep and therefore find it useful to do so knowing that the phone will not stay on all night.

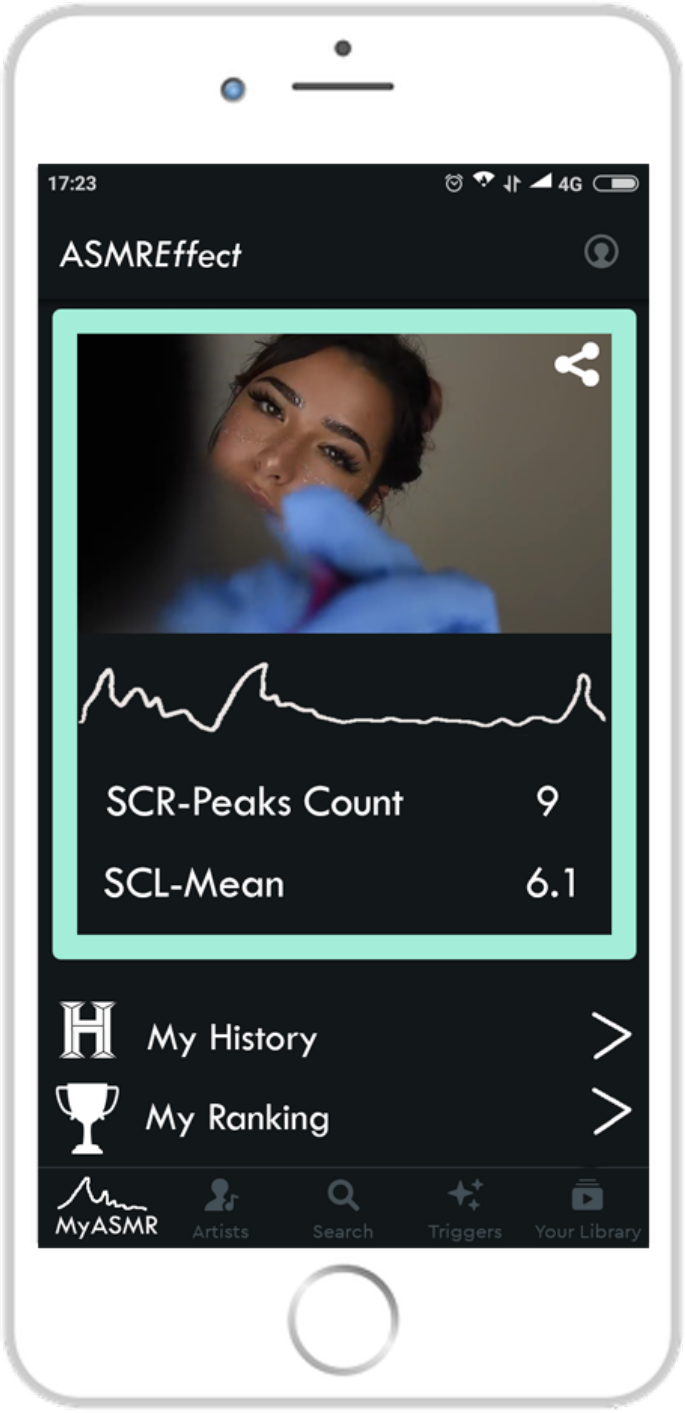


The additional functions are related to the measurement of skin conductance, a parameter linked to the detection of stress / relaxation levels of the person. Electrodermal activity (EDA) is one of the most studied psychophysiological markers of the autonomic nervous system and has been applied in psychophysiological research for over 100 years (Boucsein 2012). EDA is an indicator of sympathetic activity of the autonomic nervous system that is associated with emotion, cognition, and affection (e.g. Critchley, 2002).

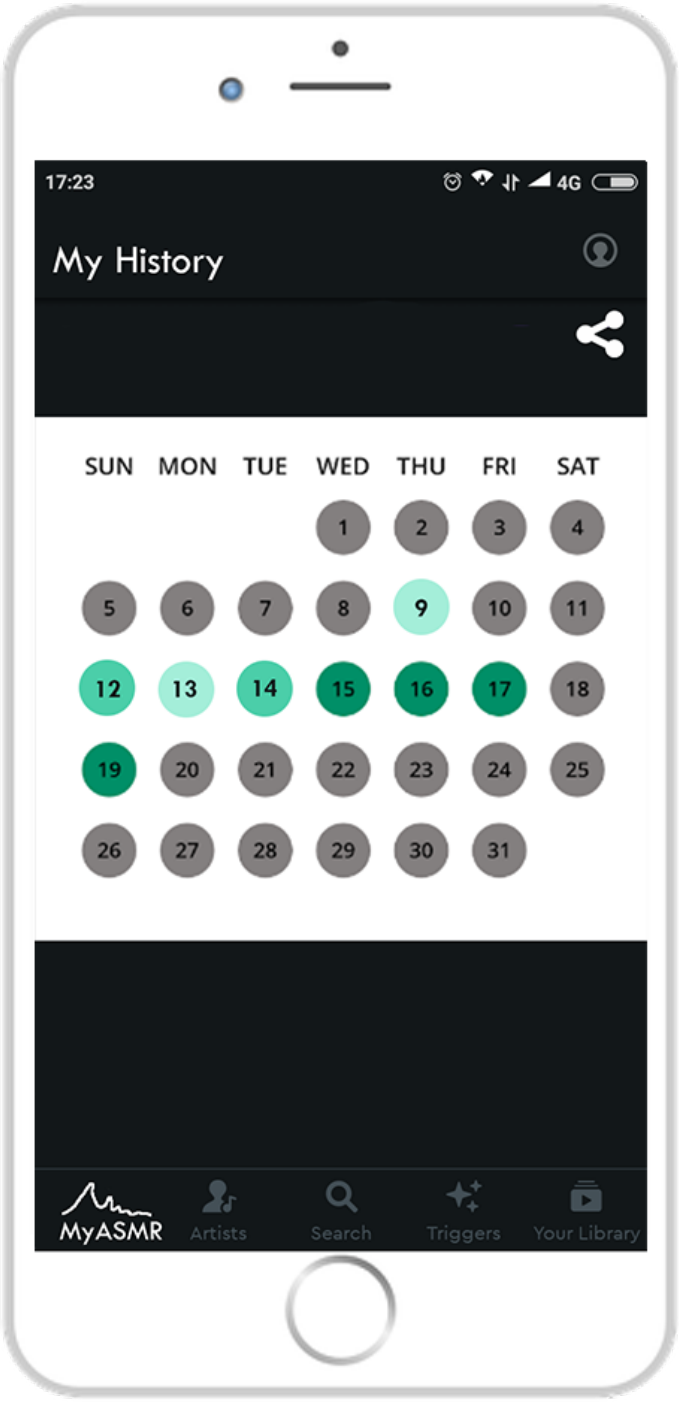
The ring for the detection of this parameter will automatically connect via bluetooth to the smartphone when the user opens the app. Once the user has selected a video, the data will be collected by the device. The detection will take place only 60 seconds after the start of the video itself, in this way it will be avoided the collection of data that is not reliable and therefore unusable for research purposes. This prevents bias due to hand movement when searching and starting the videos themselves.

3.6.2. The mock-up

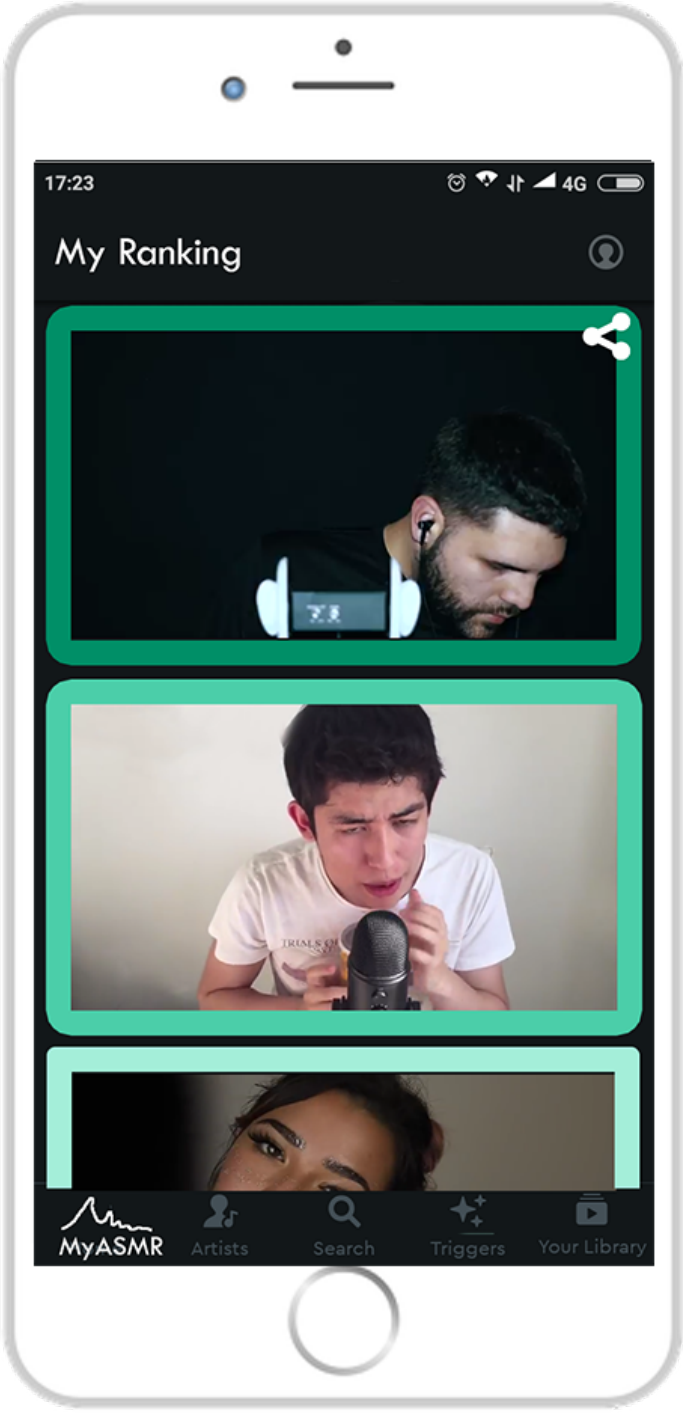
The app will display at its opening the last video seen by the user, with the relevant parameters shown in a graph, as well as the SCR-Peaks Count value and the SCL-Mean value.



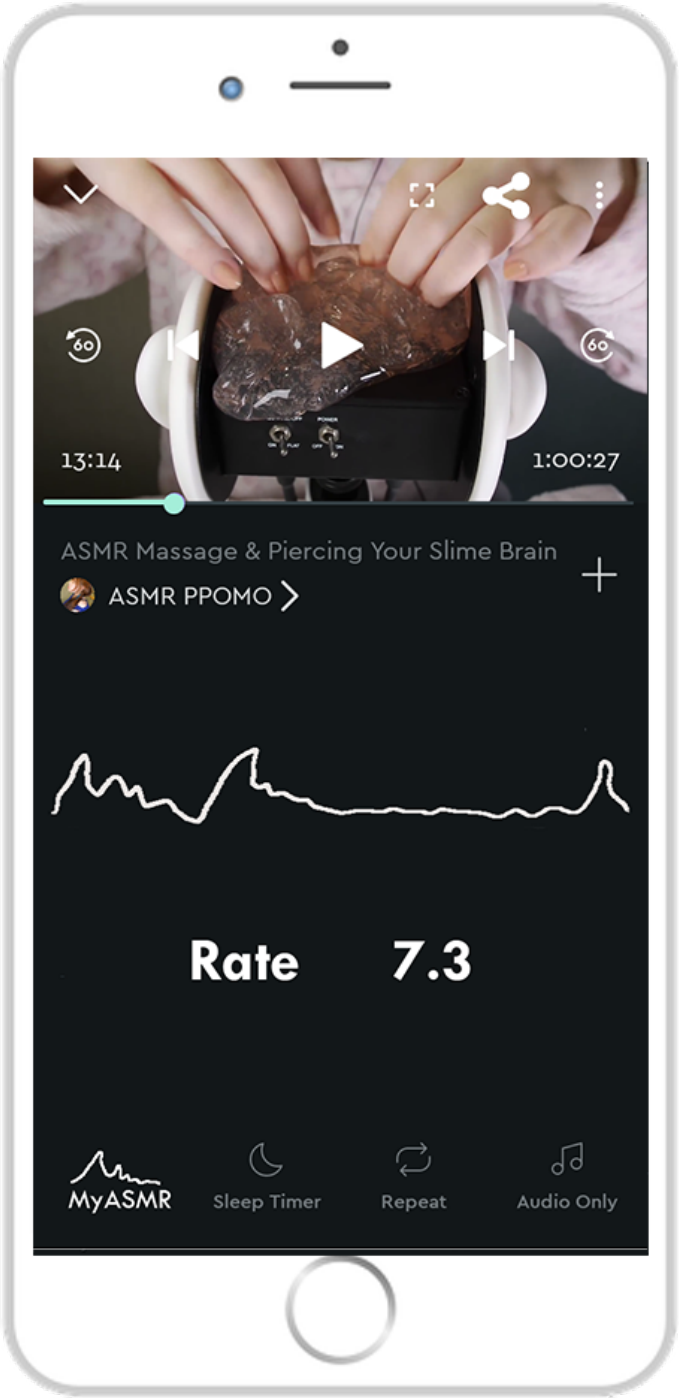
The app also includes a "My History" section: a calendar in which, using different colours, the user can immediately view the days in which videos were viewed and the level of relaxation/tingles achieved with them. An example is showed below: grey dot means “no video watched that day”, lightest green means “slightly relaxed that day”, darker green means “pretty relaxed that day”, darkest green means “very relaxed that day”. With the same logic but with a different colour would be implemented the ranking for tingles on the calendar.



In the "My Ranking" section, the user will also be able to view a personal ranking made up of videos that have had the most relaxing/tingling effects, also marked by different colours.

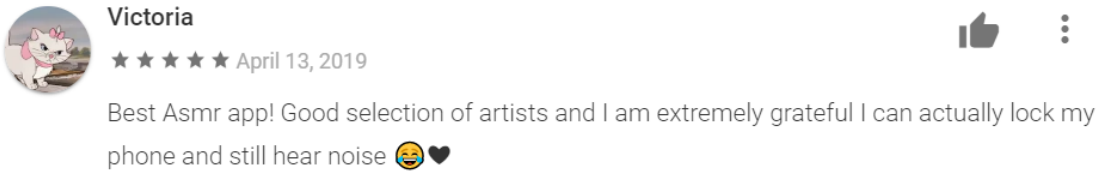


During the viewing of the content chosen by the user, the measurement of skin conductance will be shown in real time when the phone is in a vertical position, while turning the phone horizontally will display the video in full screen so as not to create obstructions to the vision. The measurement will stop automatically with the closing of the video (or pause of the same) and resumed with the start of a new video (or reboot of the same) with a delay of 60 seconds.



Since One of the aims of technology is to make our life more easy, feasible, comfortable (feasibility), The ring will be easy to wear and it will be connected via bluetooth, in this way no wired connection will be required. The ring will have a simple and minimal design so that it can be comfortably worn even during the night (acceptability). In this way it is possible to monitor the effect of relaxation even during the phase of falling asleep and the first stages of sleep (until the phone is switched off), and possibly monitor it again if the user wakes up during the night.

Data collection also works offline, as the offline viewing mode is often used by *Tingles* users.



As soon as the phone returns online, the data are transmitted, so that the researchers will have databases that are always updated in real time in a single cloud to which all users, with the credentials to do so, will have access.

The data, collected in the cloud automatically at each measurement, enables long-term remote monitoring, and uploads data from the cloud to further analysis in csv or excel format. The data flow will therefore be constantly updated and available for the purpose of research on the ASMR phenomenon by Universities and Institutes.

For this first version the target customers are in fact Universities and Research Institutes that decide to start projects for the study of the ASMR phenomenon also, and above all, through longitudinal studies otherwise difficult to conduct even for logistical reasons.

Cockton, cited in Benyon (2019) argues that designers need to understand values to which their designs are aiming. Designers need to consider what their designs bring to the world. The "ASMR*Effect* App Project" involves the creation of a product (app and related devices) which main purpose is to support research on a phenomenon whose popularity is on the rise but of which little is known in terms of psycho and neuro physiological. The added value is not only given by the possibility of knowing, and better studying, ASMR (including its potential therapeutic developments), but also by the strong involvement that a type of research carried

out through this instrument implies for the participants: each and every user can contribute to the knowledge about the phenomenon, helping the scientific community collecting (anonymous) data. This point is particularly effective since the ASMR community is pretty involved concerning the scientific basis of ASMR itself. All the stakeholders are highly engaged in "ASMR*Effect* App Project".

3.7. Further investigations and mock-up testing

An informal chat was conducted with a sample of 21 students attending the fourth year in a secondary technical school near Milan.

Of these students (all born between 2000 and 2001), 9 had already seen ASMR videos of some sort, and everyone had heard of them before. The channel through which they came to know about ASMR was mainly *Instagram*: "influencers / creators already followed, started to publish, at some point, ASMR content".

YouTube is a media that has conveyed the phenomenon too; in the specific case of the survey participants, creators already followed, who produced videos with non-ASMR (makeup tutorial) content have also started to create this type of content. A participant who initially declared that he had never seen ASMR videos, then rectified: "I didn't know they were called ASMR videos but from the description of the type of video I recognize I saw them". None of the participants declared themselves to be a real "ASMR lover", the type of use was mostly accidental and driven by curiosity. None of the participants had ever heard of specific ASMR apps, commenting however "now that I know I will download it".

The aim of the app and the technique of measuring skin conductance was described to the participants.

Once provided a description of "ASMR*Effect* App" and its features, the participants talk about their impressions. They consider useful to be able to measure biofeedback in order to see in real time the effect of watching videos; however asked them if they would use this app the answer was negative (as could be expected given that the sample it is not representative of the user type "ASMR lover").

When they envisaged a different scenario than the individual user who uses the app independently, the reactions were different. They were presented with a scenario in which

universities want to conduct research to measure the physiological reactions linked to viewing ASMR videos and in order to do so ask them to use apps and devices for measuring skin conductance during the hypothetical period of a month.

Feedback in this case was enthusiastic: everyone would be willing to embrace the fictitious research using the app and the related device. It has been specified them that the data collected would be sent to anonymous databases from which researchers could draw information.

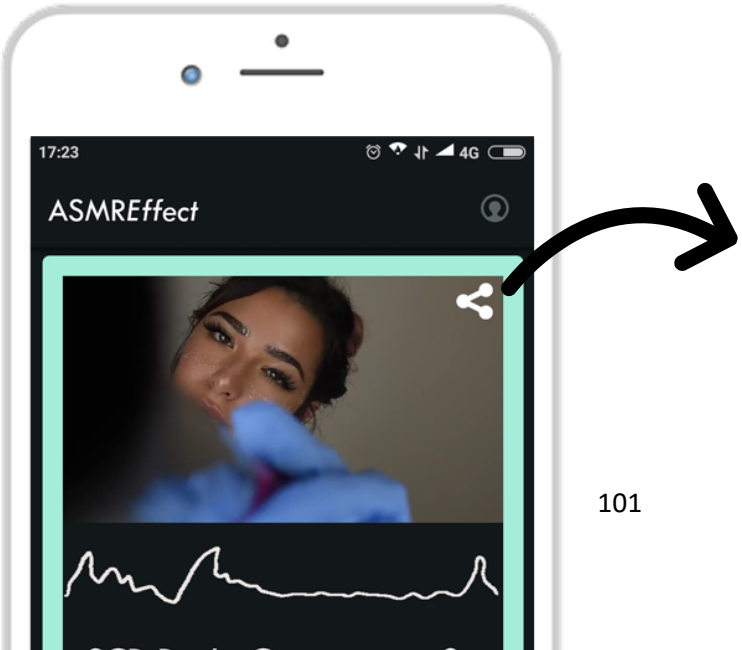
No privacy violation of any kind was perceived (acceptability) and no one said they were disturbed by the idea of wearing a ring - the device connected to the app (feasibility). The participants were galvanized by the idea of being able to contribute to scientific knowledge about the phenomenon.

Asking them questions regarding their availability to go to the university and participate to the same experiment for the measurement of skin conductance while watching ASMR videos (today such experiment can only be conducted in the laboratory at university) a lot of reticence was noted, when not effective denials: the laboratory is a place that creates aloofness and suspicion. Logistic and practical reason were also pointed out in justifying their refusal. With premises like these, only a priori biased experiments would be conducted, especially considering the peculiarity of an ecological ASMR fruition.

The "ASMR*Effect* App" mock-up was then shown to the group.

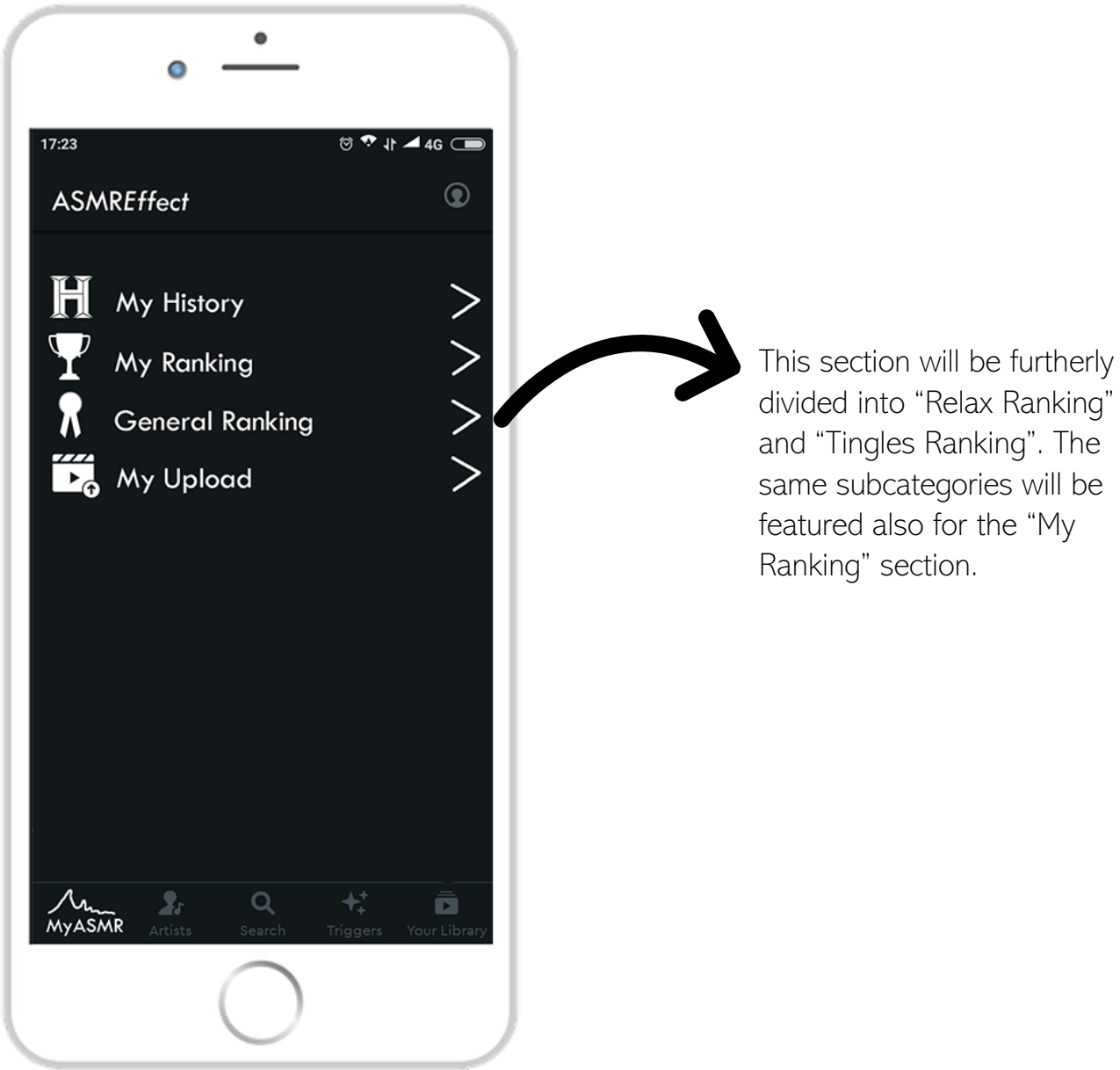
It immediately emerged that the app, very specific and limited to a certain type of user, should have social features that create connections between members of the same community.

The idea of the "share button" is therefore to be thought of not for sharing content on generic social media, but for sharing content between users of "ASMR*Effect* App", "and possibly via *Whatsapp*, to send videos to a friend who I know like these kind of videos".



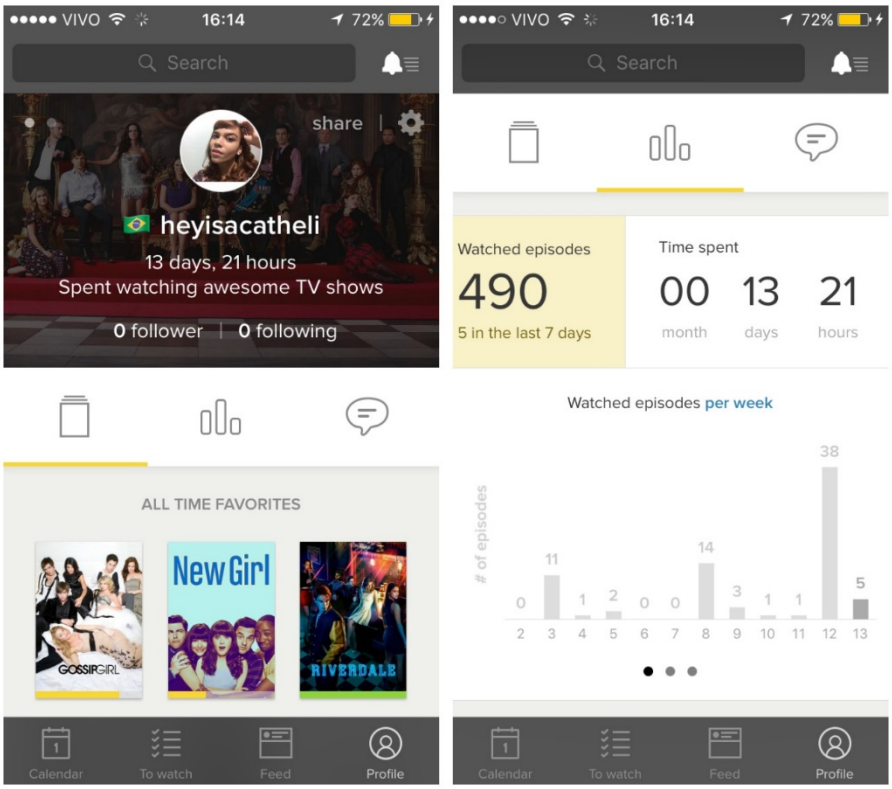
The "share" button will offer the possibility to share also only among the community "ASMR*Effect* App"

To do this it will be necessary to provide a connection system between members that also "allows you to follow someone's library, as on Pinterest, and to link you to people who watch videos that are more relaxing or closer to my tastes". This feature is followed by the possibility to watch what friends are watching on the app, with a sort of access to their personal rankings. Always with a view to creating and consolidating the community, it has been suggested how it could be interesting to see not only one's own and individual users' rankings, but also an overall ranking given by data and visualizations of all users, with indications with respect to the average degree of relaxation / tingles triggered by each video in the app. One participant highlighted the opportunity to allow all users to upload original content they created, and in doing so contributing to the amount of videos available.



The possibility of having the data relating to the total time spent on the app in one day was then proposed. This data could be entered in the "MyHistory" section, at the opening of each single day.

More than one person cited the app *TvTime* as an example to look at for adding some features, like the way in which it allows to connect with other users and the total time count. *Instagram* time counting function was also cited as exemplar in this way.



An example of the time counting function graphic display: *TvTime*

An example of the time counting function graphic display: *Instagram*

3.8. The tingling necklace

A second release, with a purely commercial purpose to which target are the single users will give the possibility to buy in addition to the ring also another device: the necklace.

The tingling necklace will support the action of the typical ASMR sensations also helping the user who cannot feel them.

The sensations, which in the case of some users come up autonomously with the sole view of the videos are described as follows (40):

“What physical sensations do you feel? I feel tingles.

Where do you feel these sensations on your body? I feel them on my head and back.

What emotional and psychological sensations do you feel? I feel calmness. I always listen to ASMR right before I go to bed. I suffer with insomnia, so it helps me sleep.

How strong are the sensations? depending on who does the ASMR they can be very strong.

How long does it last? It lasts for as long as they do that certain trigger. Sometimes 5 to 10 mins…sometimes shorter sometimes longer. All depends.

When I experience ASMR, I get tingles throughout my scalp and sometimes also the back of my neck. It is like a warm, fuzzy feeling. It can last anywhere from a few seconds to a few minutes. It causes relaxation and calmness and can help induce sleep.”

Some early pioneers of usability, Gould et al. (1987) underline the concept of iteration. Design must be iterative: there must be a cycle of design, test and measure, and redesign, repeated as often as necessary. Empirical measurement and iterative design are necessary because designers, no matter how good they are, cannot get it right the first few times.

This philosophy, which guides the development of the entire "ASMR*Effect* App Project", requires that, in the case of necklace design, questions should be asked about how and when it is best to activate the micro vibration to instil the sensation of tingling to the user. In particular, the questions that will have to be answered, through tests and retests of prototypes will be:

Does the necklace detect the point of maximum relaxation and at that point the vibration is activated? Is the vibration randomized within a time interval from the beginning of the vision? How long should the vibration last to maximize the ASMR effect?

More specific research will need to be conducted…but this is all material for another study!

Conclusions

ASMR is a strange, controversial, not entirely understandable phenomenon.

“Although ASMR users and content providers likely will disagree with such anantihumanist assessment, […] ASMR trigger-chasing involves a wilful commitment to go nowhere—an engagement not with desire, but with the drive, the goals of which are nonobvious and the pleasures of which are quite literally pointless in human terms.” (Manon, 2018, p. 232)

Little is known about the underlying mechanisms of ASMR because is still rarely studied. Maybe it is a bubble doomed to disappear as happens to many phenomena that are born (and die) on the web, or maybe it will emancipate from the virtual world and make its way into the real world.

There are already services that are using ASMR techniques to better achieve their goals: theme spas and beauty salons are the most linear outcome, but the world is not restricted to this. A research project of the Varna University of Management, Bulgaria, investigated how the typical ASMR triggers might affect experiences with doctors, hotel clerks, and others in the service industry (41).

Whilst drafting this dissertation, totally unknown perspectives emerged, which would be worth exploring in depth with specific research projects. For example, according to the focus group results, watching ASMR eating videos gives a sense of satisfaction and gratification. If watching this kind of video, paradoxically, diverts the attention from the desire for food, could the use of ASMR videos help people who want to lose weight to achieve their goal? If that were the case, the commercial potential of such a discovery would be enormous. The sensation of satisfaction is also due to the fact that the sounds produced by chewing different foods are enhanced.

The research by Zampini & Spence (2004) has shown how the more or less "crispy" sound of crisps affects the perception of taste, emphasizing once again that human perception is not reducible to the individual organs of sense but always has a multisensory component.

Multisensory is the main feature of ASMR.

Do those who 'get' ASMR have a different activation pattern of the sensory areas of the brain? The only two studies that have tried to "map" ASMR brain have focused on DMN and on components related to affiliative behaviours. The patterns underlying the "pure" sensory perception of the phenomenon are still to be investigated.

The research conducted so far points to one direction: the therapeutic potential of ASMR. Comparisons have been made with mindfulness, a technique of proven effectiveness adopted in psychotherapy as well as in medicine (Kabat-Zinn, 2010). If future studies will increase the amount of data available, it is possible to think of a development of ASMR also in this perspective.

The space for new investigations is infinite. We are still at the dawn of knowledge in this field and institutions that decide to follow this path of research could easily become reference points for both the ASMR community and the business branches related to it. The "ASMR*Effect* App Project" was conceived with the aim of supporting universities and research institutions in general that want to strategically position themselves in leadership roles in this domain.

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Appendix

Instructions:

Welcome!

Soon you will be shown videos and you will listen audios. Remember that it is your right to interrupt the experiment and decide not to continue.

If you get bored and want to interrupt the viewing you can do it by pressing the space bar, but the video can be stopped, to go to the next one, only after at least 2 minutes; so if you press the bar before 2 minutes the video will not stop. Please close your eyes when the audio stimuli will start (i.e. the display will be green).

If during the course of the fruition you will experience particularly pleasant sensations, report it with your "Like" by pressing the "L" button. If you find it particularly unpleasant, report it with the "J" key.

We advise you to hold your hands in position so as to make as few movements as possible.
At the end of the experiment, if you wish, the reasons for the study will be explained to you.
Press the spacebar to start.

Survey questions:

Part 1

1. “Do you know what is ASMR?” “Yes”, “No”

1a. “Please briefly describe what it is”

2. “How long have you known about the term “ASMR” or related terms?”

"More than 4 years", "About 2-3 years", "About 1 year", "About 6 months", "About 6 months", "About 1 week or less", "Today for the first time"

3. “Do you usually watch ASMR videos?” “Yes”, “No”

If the answer is “No”

3a. “Have you ever seen at least one ASMR video?” “Yes”, “No”

If the answer is “Yes”

3a1."Why did you stop to watch this kind of videos? Please briefly describe the reason why"

3b. "During which time of the day do you prefer to watch ASMR videos? (more than one answer allowed):"

"when I woke up", "During the morning", "During the afternoon", "In the evening", "When I'm in bed, before sleeping", "During my spare time"

3c. “Do you require specific conditions to achieve ASMR?” “Yes”, “No”

3c1."Please briefly describe the specific conditions that you need (e.g. dark vs bright room, your bedroom, etc)"

3d. "Please indicate which triggers are more effective in order to elicit ASMR effect (more than one answer allowed)"

"Crisp sounds", "Tapping", "Whispering", "Personal attention", "Role play", "Mouth sounds", "Repetitive action", "Food chewing", "Poured water", "Slime", "Brushing", "Ear cleaning", “other: please elaborate

Part 2

4. "Have you felt ASMR “tingles” (pleasant tingling sensation behind the neck/along the spine) during the experiment?" “Yes”, “No”, "I don't know"

4a."Which audio/video stimuli gave you these feelings? (more than one answer allowed)"

"car wash audio", "woman massage audio", "man massage audio", "car wash video", "woman massage video", "man massage video"

5."Did you feel relaxed listening/watching these audio/video?" "Yes", "No", "Partially"

5a."Which audio/video stimuli made you feel this way? (more than one answer allowed)"

"car wash audio", "woman massage audio", "man massage audio", "car wash video", "woman massage video", "man massage video"

6. "Did it bother you to listen/watch these audio/video?" "Yes", "No", "Partially"

6a."Which audio/video stimuli made you feel this way? (more than one answer allowed)"

"car wash audio", "woman massage audio", "man massage audio", "car wash video", "woman massage video", "man massage video"

7. "Watching these stimuli make you feel bored?" "Yes", "No", "Partially"

7a. "Which audio/video stimuli made you feel this way? (more than one answer allowed)"

"car wash audio", "woman massage audio", "man massage audio", "car wash video", "woman massage video", "man massage video"

8. "Did any of these videos conjure up images or childhood memories?" "Yes", "No"

8a. "please briefly describe the image evoked"

9. The person who cared for you most in childhood (primary caregiver) was (gender)":

"male", "female", "other"

Part 3

10. "Your gender is:" "male", "female", “other”

11."How old are you?"

12."Select the couple of terms that best describe you:"

"Efficient and organized", "Improvising and disorganized"

13."Select the term that best describe you:" "Outgoing", "Introvert"

14."Select the couple of terms that best describe you:"

"Friendly and compassionate", "Analytical and detached"

15."Select the couple of terms that best describe you:"

"anxious and nervous", "confident and self-assured"

16. "Select all the phrases that suit you:" "I often have trouble falling asleep", "I often feel stressed", "I often feel sad", "None of the sentences fit me"