Layers Of Visual Imagination And Degrees Of Subjectivity In Listening Experiences Exploring Visual Imagination In Acousmatic Composition And Listening

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Abstract: Electroacoustic music (especially Acousmatic) is often perceived differently between listeners and a wide variety of visual images is evoked. This because of the spectromorphological qualities and the abstract reality in which this kind of music carries the listener into. In everyday life, it seems that we have a natural tendency to assess and understand reality around us and to quantise how and if the perceived circumstances could affect our wellbeing. Some studies also affirm that brain and the biological function of the sensory and perceptual processes are commonly identical in each listener. This gives evidence that arises the interest to investigate which variations the subjectivity of visual imagery depends on, and if it is possible to unfold it in various layers. This experimental research has taken in consideration questionnaire-based listening tests to gather details from each listening experience and to get a better understanding of the visual imagery evoked by electroacoustic compositions into the listener's mind and its degrees of objectivity and subjectivity. The compositions used in the experiment were both composed by the author, with the intention of guiding listeners into their personal perceptual-imaginative journey, by delivering encoded, perhaps objective, sonic cues. This paper is a theoretical, inter-disciplinary analysis, backed by research on the foundations of senses, perception, cognition, emotions, etc. An artistic approach based on scientific evidences led to the theorization of layers of imagination and their bias to produce visual images with a degree of subjectivity that lies into micro aspects of sounds and in the perceptual and innate 'knowledge' of each individual. Glossary: The terms listed here have been invented (or readapted) for the purpose of the study, in order to make concepts easier to assimilate and understand. Aural World: sonic world with intrinsic features (Smalley, 1997). The purely auditory realm which an individual "enters" by listening to (electroacoustic) music. The perceived stream of sonic material before imagination occurs. As Nyström (2013) described it: "a portal to a state of modal confusion, at the mercy of our imagination." Chimerical Imagery: a meaningful blend of the aural world perception, visual imagery and emotions (stimulated by perception and visual imagery). The 'integrated whole that is both perceived and imagined' (Kim, 2008). PANSC Knowledge: Perceptual, Aesthetic, Natural, Socio-cultural, Cognitive Knowledge. The whole package of knowledge in exponential and continuous update since we are born, composed by sensory stimuli, perceptions, emotions, instincts, memories (of all kind), acquired notions and cognitive processes stored in the individual's unconscious and memory. It can also be accessed consciously. It may also be intended as a blend of the 'three ideas' according to Descartes: "innate ideas, adventitious ideas, factitious ideas". Emotive Memory: the virtual place in PANSC knowledge where emotions and feelings in relation to perception and imagination are stored.

Index Terms: Acousmatic, Avant Garde Music, Audio Engineering, Cognition, Composition, Electroacoustic, Listening, sychoacoustics.

1 INTRODUCTION

"I suppose therefore that all things I see are illusions; I believe that nothing has ever existed of everything my lying memory tells me. I think I have no senses. I believe that body, shape, extension, motion, location are functions. What is there then that can be taken as true? Perhaps only this one thing, that nothing at all is certain."

— René Descartes (1901)

Perception is the constant automatic process that occurs in the human brain which is needed to translate the sensorial stimuli of everyday life into meaningful domains, and it is fundamental for the natural continuous assessment of the reality around us. (Kendall, 2009: pp. 1-2) The perceptual and thoughts processes are often accompanied by the visual imagery, which is useful to solve tasks such as memory planning and problem solving. (Cohen, 1976: p. 513) In an electroacoustic music listening context the same principles of perception and visual imagery occur just as if the auditory realm would be conceived by listeners as another reality that they enter and assess in the same way of the everyday reality. Not much has been researched in relation to 'mental-visual journeys' that a listener of EA music might undertake. Having personal evidences of this happening, the author wondered how listeners associate sounds with images and on which basis the visual imagery constructs; therefore the idea to research how electroacoustic music informs visual imagery, and which degree of subjectivity to the listener it has. To address this issue the author composed a piece of electroacoustic music and run a questionnaire-based listening experiment, in order to understand what sort of mental processes and associations occur in listener's mind in producing visual imagery and how the composition's *intrinsic* features affect the images produced. The results of the experiment and a valid literature review helped to address the issue, contributing in the theorisation of four imagination layers with their relative degrees of subjectivity to the listener and objectivity to the composition. This research may be of interest for listeners, composers and researchers in order to explore the blurred concept of imagination and mind's processes in listening to electroacoustic music, introducing also some terminology. A practical and theoretical exploration of visual imagery evoked by the acousmatic medium, which also led us to ideas on how to address this type of music towards a wider audience.

2. LITERATURE REVIEW

"If the doors of perception were cleansed everything would appear to man as it is, infinite."

—William Blake (1827)

The intention of this manuscript is to investigate the distinction between the degrees of subjectivity of visual

imagery evoked by electroacoustic music, and to develop a theoretical set of layers of imagination deconstructing the process of the creation of images in listeners' mind. This theory will be developed form research in literature review (exploring the core concepts of human perception and visual imagination), the experiment discussed in the next chapter, and a personal intuitive analysis; also, the presented theory might be useful both for listeners (to have a good understanding of the complex processes that occur in mind while 'making sense' of a composition), and for composers, which could take advantage of it while composing in order to have a clearer idea on how to influence listeners' perception and imagery. In order to follow a logical path it is worth to consider the whole process since the origins, starting from the basic sensory information, therefore 'outer objective events', passing through perception, until the assessment of the overall image created in the mind, which we could interpret as 'inner subjective event', contemplating also the emotions and feelings that arise from the perceptual or imaginative processes. The intention of the paper is not to prove scientific facts but rather to theorize definitions of intricate mind processes in relation to electroacoustic music listening. Scientific (and semi-scientific) studies, though, have been relevant to back some core concepts useful for this thesis such as sensation and perception, emotions and feelings, aural cognition and visual thinking.

2.1 Sensation and Perception

2.1.1 Sensation

This research finds its foundations in the basic sensory and perceptual processes, which are worth to take in consideration since we are going to understand the objective stimuli transmitted from the external world. **Sensation** is the biological process in which our receptor organs, such as ears or eyes, capture the stimulations from the external world and translate them into neural signals which brain can understand. In theory we could say that the brain perceive the world indirectly, since we perceive the neural electrochemical representations of stimulations and not directly the stimuli. The process of 'translating' physical stimuli into neural messages is called '**transduction**'. The brain, after receiving these neural messages, will then excerpt the basic information needed for aid of survival such as position in space, intensity and movement (Goldstein, 2013 - pp. 503–534). Another relevant aspect of the human sensory process is the **sensory adaptation.** Imagine someone entering a room where there is a noisy air conditioner, after some time, when s/he would start to work or do something else, or even talking to someone, s/he will not notice the noise produced from the air conditioner, placing it unconsciously as a 'background' sound or completely removing it from his/her hearing perception. The receptors (ears, eyes) tend to 'get used' to a stimulus that does not vary (or slightly does) over a certain amount of time. The concept could be reassumed saying that human sensory system perceive variations in stimulation and mutual traits between stimuli (Goldstein, 2013 - pp. 503–534). Sensory adaptation would be useful to keep in mind while composing, taking advantage of it in order to place the listener into a sonic landscape (i.e. using an 'ambient' sound) by letting his/her hearing sense adapt to it, to then change the sound and bringing the listener somewhere else.

2.1.2 Perception

According to scientists the neural messages 'sent' from sensations arrive to the brain, where it has to figurate them into meaningful data to make sense of the external world. In other words, the brain interprets the world giving a meaning to sensations (Goldstein, 2013: pp. 503–534). The brain continuously organises sensations into meaningful bits that we will call **percepts**. To assess the general situation our brain uses the basic visual pathways of **'what**?' and **'where**?' these pathways can be compared with the auditory ones (Goldstein, 2013: pp. 503–534). The 'what' process identify the qualities of the object (such as colour and shape, whereas in aural perception may be perceived size, intensity, timbre); the 'where' pathway, instead, locates the object (or sonic object/event) in space (or aural space), and perceives the movement of it. There are two different kind of **perceptual processing**: the top-down processing, and the bottom-up processing. In the **top-down** processing the perception is guided by cultural background, acquired knowledge, memory, experience, expectations etc. and it is a **conceptually driven processing**. On the other hand, the **bottom-up** processing is the innate perceptual analysis which has more value in the perception process than a concept already stored in the brain (top-down processing); the bottom-up process analyses the stimulus characteristics such as movement or morphology and defines if a stimulus can be pleasant or dangerous; it is a **stimulus driven processing** (Goldstein, 2013: pp. 503–534). The top-down and bottom-up processes are worth to be kept in mind while analysing a listening experience, since they could be useful to figure out whether a percept of a given stimulus (sound in the specific case of this research) may be considered more objective (stimulus driven) or subjective (conceptually driven). It might be useful to look at the Gestalt psychology in our walk through this intricate world of perception. This group of scientist affirmed that stimuli may be perceived in patterns or configurations other than only stimulus by stimulus (Sharps & Wertheimer, 2000), where the pattern would be a sum of stimuli with mutual qualities. Gestalt studies also stated the existence of 'laws of **perceptual grouping**', that it is worth to investigate in order to draw a parallel with the recognition and grouping of sonic material in an electroacoustic music listening context. If we are listening to a song, our perception of it would be a realm composed by notes, rhythm, various timbres etc. and not the internalisation of every single isolated stimulus (i.e. a single note). Human being have a natural tendency to group things that have some characteristics in common (e.g. words that sound the same, rhymes). This is called **similarity law**. **Law of proximity (and law of common fate)**, instead, affirms that we tend to group things that are close together and moving (in the case of the law of common fate). For instance, two sounds that move together in the stereo image may be perceived as a single object, or a shoal is identified as a single big object composed by smaller bits, moving in the same direction. Another interesting law to look at is **Pragnanz's Law**, which states that our brain focuses on the most elementary percepts, using a reduced amount of mental resources (Goldstein,

2013: pp. 503–534). **Context** and **expectations** also have a strong influence on perception. We tend to analyse the context and to expect percepts related to the context itself. Therefore we will identify objects, sounds and images that we are more likely to experience in the contextualised realm although still matching them with their physical properties.
Finally, the **perceptual set** is an expectation due to the things happening in our life in that precise moment (a new mother aware of her child's cries), which our senses are more keen to pay attention to (Goldstein, 2013: pp. 503–534).

2.2 Emotions and Feelings

Since some of the aspects of sensation and perception have been clarified, and the proposed study is facing towards the analysis of mental images, we have to remember that emotions and feelings have a firm role in the perception and assessment of the external world. According to Damasio (2000: p. 51), biologically, **emotions** are needed from man to shift the state of the physical body in order to align with the perceived circumstances, to appraise or evaluate them; they are a direct consequence of the sense of aid survival of the human being. **Feelings,** instead, are considered by Kendall (2014: p. 3) the subjective outcome of the emotion and sensations that lie in the consciousness, or in the long-term memory, as part of the package of cognitive and perceptual knowledge. Emotions are often influenced by experiences occurred in the past (Kendall, 2014: p. 2). The mind associates similar situations without having to reassess everything from the beginning in every single occasion; such mechanism happens because it stores in memory the emotions experienced in certain situations in order to be ready to react efficiently in a similar event. We defined *emotive memory* the virtual spaces in which emotions are stored. Our **emotional state**, instead, reflects our high-level cognitive activity; while choosing what to think about, we focus on defined things that evoke emotions regarding that particular thought. (Kendall, 2014: p. 2). Scientists have identified a list of **basic emotions**: happiness, sadness, fear, anger, disgust, surprise, interest and joy (Tomkins, 1962 - Friesen and Ellsworth, 1972), which are common in the mammals' activities. We are now going in the direction of electroacoustic music listening experience, and it is worth to consider Juslin's (2009: p. 224) list of emotions reported from classical and popular music listening experiments: happiness, calm, nostalgia, love, sadness, interest, hope, excitement, and longing. In fact, some of these emotions have been reported by listeners in electroacoustic music listening. (Questionnaires, Appendix B). Did it ever happen to cry listening to a song? Or feeling particularly touched from a piece of music? Assuming that the answer is positive we discover, as Kendall (2014: pp. 3-4) named them, the ***phenomenal qualities.*** This kind of sensations are individual and do not match with the basic emotions descriptions (labels), therefore it has been hypothesised that phenomenal qualities are feelings in which the brain stores this particular sensations without naming (categorizing) them. These feelings are detached from the basic or listening emotions concept as they vary continuously and have some particular traits that do not characterize them as part of the above listed basic emotions (Kendall, 2014: pp. 3-4). Imagine those songs that we link to some tragic event, for instance, there is the possibility to feel those sort of 'cramps' in the stomach area, not commonly stored as clearly-defined events in the *emotive memory.* Phenomenal qualities can be also consciously explored, for instance, when a qualitative appraisal of the state of the body is done (i.e. feeling fatigue in specific parts of the body and consciously shifting attention on others). (Kendall, 2014: pp. 3-4) Therefore the individual might create a sort of *emotional status-assessment framework* composed by: the framing of different streams of feelings (i.e. shifting focus); and the perceptual blends made of phenomenal qualities, also contradistinguishing the conceptual boundaries in which they are placed into. Phenomenal qualities can also be distinguished in internal and external; internal refer to the act of actually (e.g.) feeling dynamical qualities of energy flowing, while external describes the act of (e.g.) listening to the sound of energy flowing. (Kendall, 2014: pp. 3-4). Kendall (2014: pp. 3-4) also describes different types of phenomenal qualities, which are relevant to the theoretical development of the layers of imagination that we are going to explore in later discussion. Such distinction discovers *qualia* which refers to components of static perception as raw sensations (the quickest assessment of the percept); *flow dynamics* that is described as the sense of how textures of flowing energy are perceived over time; *image schemas* (Lakoff and Jhonson, 1999) that the individual captures as recurring patterns of forces, objects and motions which are felt and stored in the emotive memory as patterns (that produce a certain feeling). It is also useful to discover how emotions and feelings work in the music listening context as there is the possibility to link them with images evoked in listeners' mind by music, tracing associations between past perceived events, the emotion (or feeling) they evoked and the visual imagery. In other words, if an emotion is memorized as strongly associated with an event, or a certain type of percept, and it is re-evoked by music, the mind tend to recall the same emotions which perhaps are linked with mental images.

2.2.1 Emotions in Music

Scientists have often studied how emotions in the music context work, and there are different theories focusing on several aspects of this research field, even though, at present, there is no theory which is dominating above the others. (Juslin and Laukka, 2004: p. 3) We will take in consideration a blend of different studies in order to have a fairly broad view and a general idea of the concept of emotions in relation to music. As confirmed by Juslin & Sloboda (2001), we could state that music has the potential to alter mood and emotion, and it is an effective mean of mood induction. Music is also used to mediate with people's mind (i.e. treatment for emotional disorders), to alter the behaviour of the individual as in commercial purposes (making the consumer more keen to buy something or to choose one thing over another), or for the normal everyday emotion and mood regulation. (Zentner, Grandjean Scherer, 2008) Back in ancient Greek times it has already been proposed that some qualities of music relate with determined emotions and that musical properties affect the emotional expressiveness of a piece of music. (Gabrielesson & Juslin, 2003: p.4) Every individual has a singular personal experience and a sort of 'perceptual-

cognitive knowledge' (that from now on we will define ***PANSC Knowledge*** – *Perceptual, Aesthetic, Natural, Socio-Cultural, Cognitive Knowledge, see Glossary*), while music have measurable characteristics that can be labelled. So we can assume that a music listener may be emotively affected by some structural characteristics of music as well as by his/her personal associations (Juslin & Laukka, 2004: p. 218) even though the source of the emotions might not be the same for everyone. An important distinction have to be done: the emotions *expressed*, in a sense that are represented with conventional expression parameters (as a film would do), and the *induced* emotions that are the ones that the listener actually feels. Studies (Juslin & Laukka, 2004: p. 218) confirmed that the structural characteristics of music are strongly related to a high percentage of consistent listeners' judgments in the evaluation of musical **expressiveness**; the majority of it is due to modifications in the musical details over time such as: tempo, rhythm, attacks and decays, tone, micro-intonations and many others (Juslin & Laukka, 2004: p. 220). This creates a vast variety of possible combinations between musical features and the different kind of emotions that they can express, therefore not directly related to the listener but to the musical features themselves. Can the music also induce emotions into the listener? The "combined evidence" reported by Juslin and Laukka (2004: p. 223) proves that the answer is positive, and the emotions evoked are part of bigger categories of behaviour related to evolution and everyday life (i.e. Danger – competition – loss – cooperation – care giving) (Juslin 1997, 2001). These categories can also be juxtaposed to the basic emotions of fear, anger, sadness, happiness, love. This section attempted to prove that music is a solid mean through which emotions flow (induced) and/or are expressed. Therefore, in a scenario of an imagined (or recalled) 'reality' (visual imagery) stimulated by sounds, we might assume that emotions can be are recalled from/produced by the PANSC knowledge.

2.3 Exploring the "aural world"

We will now explore the listeners' mind as we move into the deeper realm of the perception of what we might name: ***aural world***. Aural world is intended as the perceived stream of sonic material before imagination may occur; it is an auditory realm characterised by *intrinsic* features (Smalley, 1997: pp. 110-112). "*Whole of our living experience in the world which we might register as relating to sound*" (Tzedaki, 2011). We suppose that aural world co-exists (figure below) with its own imagined, *extrinsic*, visual representation, commonly experienced by electroacoustic music listeners (Results section, this paper): what we named **Chimerical Imagery.** The listener is supposed to be immersed into the aural world (which exists, is physically there in the form of energy, air pressure); if mental engaging occur and **chimerical imagery** is experienced, it will be the product of listener's perceptions of the aural world, that evoke visual imagery and emotions.

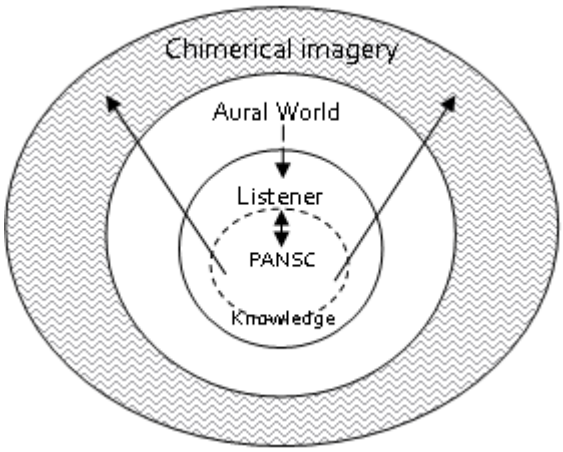


Fig. 1 *– Representation of aural and chimerical imagery. Aural world is perceived by listener, then the mind 'scans' PANSC knowledge and formulates the chimerical imagery, afterwards the listener will be able to modulate and organise the imagery consciously (Author, 2015).*

2.3.1 Analysis and grouping of sounds

What we call 'sound' is intended as a complex amalgam of frequencies produced from various sources. In order for the listener to make sense of the enormous quantity of frequencies (and related amplitudes and variations) that reaches his/her ears, a process of deconstruction is needed to analyse and distinguish the different sounds, or "*auditory streams (sensory data stored in mental representations)"*. Bregman (1990: p. 3) named this process **Auditory Scene Analysis**. The process of creation of the auditory streams comprises the two: simultaneous grouping and sequential grouping. The **sequential grouping** is characterised by the auditory streams' similarities in the spectrum content over time. As described by Bregman (1990: pp. 3-5), given two intermitting high and low pitched tones, the listener will distinguish a high-low pitch sequence and a rhythm formed by all notes. As the speed of the tones increases a stream of high tones *or* low tones is perceived, therefore it is stated that if the distinction is unclear the listener chooses which stream to focus onto. As previously found by Gestalt psychologists in regard of visuals (then adapted by Bregman, 1990), the perception of different sounds match their closest neighbour in terms of similarities. This perceptual grouping, though, might be classified as *competitive;* e.g. if a sound (A) is matched with another one (B) and a third one (C) (which has more features similar to A) comes up, A will then be coupled with C (Bregman, 1990: pp. 3-4). Also other commonalities between streams affect our process of sequential grouping. (E.g. timbre, spatial direction, fundamental frequency and transition between different streams.) On the other hand, the **simultaneous grouping** occurs when some characteristics of the auditory stream are common to the same acoustic source; when the differences go beyond a certain level, instead, the streams are perceived distinctly. Some relevant factors considered in simultaneous grouping are: synchrony of the onset and offsets, similar spectrum characteristics coming from the same spatial location and similarities in the amplitude fluctuation (Bregman, 1990: p. 4). Both sequential and simultaneous grouping seem to have a wide

variation range and they easily compete with each other, making the distinction not possible to prove with complete certainty. In the case of electroacoustic music the listener is brought into a particular aural world since the realm is quite different from the one experienced in other types of music. According to (Juslin, 2000) the performer (and/or composer) intentions as well as the listener's experience are information that must be considered in the understanding of the meaning of a piece of music. The listener will also have to mentally engage with the piece and evaluate and mix the various cues perceived in order to get an overall idea of the expression, but the composer, on the other hand, has to be capable to capture and guide him/her into the experience.

2.3.2 How the aural world 'feels'?

We now go back to the concept of emotion and meaning in music to better understand how a listener assess the aural world through feelings originated by perceptual information. Meyer (1956) and others (Spitzer 1999, Juslin & Laukka 2004) have already explored the concept in depth developing theories and running experiments. One of the theories is that emotion is felt when the **expectation**, an amalgam of universal Gestalt principles and learned cultural conventions produced by music, is stopped or obstructed (Meyer, 1956: pp. 43-51). For instance, it is rare that we experience emotions listening to a piece of music (or composition) that we already know in detail (just as the composers with their own compositions, *introspective evidence*). Emotion in music appears to be perceived in two parallel stages, as proposed from Spitzer (1999: pp. 3-5): "quick and dirty" and "reflective-cognitive". This model proposes the first stage as a quick affective appraisal (sort of temporary emotion), called *ethos,* that runs a continuous path of information-exchanging with the second one, which is a more contemplative section that regulates ethos and emotions by balancing them with the '*PANSC Knowledge'*. It has been found that listener may process different musical patterns (or other features) relatively to the model of the basic emotions and that emotional response changes over time and it is the outcome of cognitive activity, anticipation, tension and release (Spitzer, 1999: p. 5).The listener has to engage with tensional and logical events occurring in the aural world in order to be 'transported' into it completely. Other ways in which music interact with and induces emotions in listeners have been discovered by scientists and researchers: **arousal potential** of a general stimulus, **mood contagion** (listener affected by other listener's expressions), **associations** (personal associations between musical and non-musical factors) which involve the PANSC Knowledge, and (visual) **mental imagery** (connection between musical structure and images structure). (Juslin & Laukka, 2004: pp. 225-226) Especially the associations and the mental imagery are relevant to explore the construction of chimerical imagery. According to Splitzer (1999: pp. 7-12) there are possible variations (or meanings) of emotions, he explained them in the "five concept of emotion". The first concept refers to **emotion as mood**, where the material presented at the beginning of the composition sets the 'mood' of it, which often lasts for its whole duration. The second concept takes the **emotion as holistic** that is, emotion assimilates the character and the melodic patterns of music and a "quick and dirty" assessment is made considering some of the commonly 'stable' parameters such as: tempo, register, dynamic level and mode, iconic gestures and logical organisations (harmonies). The third concept is **emotion as behaviour** where splitzer assume that the 'tendency to respond', assessed by Meyer (1956) comprises also the action tendencies of an individual (e.g. a fearful person might close eyes in consequence of a sudden sound), that might not be the same to those linked with the basic emotion. (Spitzer, 1999: p. 8) **Emotional space**, the fourth concept, emotions are suddenly 'recognised' by listeners through the sonic parameters of sounds; performers (and/or composer) encode cues of the basic emotions in sonic cues (e.g. slow tempo, legato, staccato...) in order for the listeners to decode them. Finally we find the fifth concept, the **appraisal/re-appraisal loop;** the idea lies in the evolutionary process, where a 'quick and dirty' understanding of the situation is necessary as if in a (e.g.) dangerous scenario another thought process might be too slow in acting. Different layers of processing the perceived danger would be: affective appraisal (recognition of possible threat), cognitive appraisal (it is a spider), and reflective re-appraisal (it is only a black plastic bag). (Spitzer, 1999: pp. 3-10) This process is constant over time and repeats itself forever, therefore *loop*.

2.3.3 Cognitive-Mental Processes

Emotions and feelings in the assessment of the aural world are the consequences of cognitive and mental processes. These psychophysical events occur within a fraction of a second and produce the above discussed reactions. *Common* types of music can bring the listener into an *almost* pre-determined aural world, since PANSC knowledge delivers information about the genre, therefore a possible structure, and other extrinsic factors; hence, we will focus mainly on the mental processes which are stimulated by electroacoustic music. The particularity of electroacoustic music regarding cognitive-mental processes is being characterised by sounds and morphologies that are possible to re-conduct to real life or physical events which are not commonly found in a (e.g.) rock band performance. Every individual's unconscious constantly determines meanings and evaluate the situations and events around us. (Kendall, 2009: p. 1) Such theory is applied similarly to the electroacoustic listening, as it may mirror (even if through abstract artefacts) realistic and natural environments and morphologies. Therefore, we might assume that the listener, when 'entering' an *electroacoustic aural world*, consciously place him/her self into an unknown (possibly hostile) environment, almost like entering in a unknown intricate building. *Perceptual thinking* is how Kendall (2009: pp. 1-2) names the process of understanding the perceived reality of the listener (as well as the everyday context). Such process is the product of *cognitive unconscious,* a mixture of the general and specific knowledge (Kendall, 2009: p. 2) (or PANSC Knowledge). Also other streams of activities usually take place in the perceptual thinking in order for the listener to analyse both the everyday world and arts. (i.e. "active exploration, selection, grasping of essentials, simplification, abstraction, analysis and synthesis, completion, correction, comparison, problem solving, combining, separating and putting in contest"; (Arnheim, 1980) such activities are the ones that

we experience in listening contexts, while exploring the aural world and entering the imagined one. Kendall (2009: p.2) described the *cognitive schemas* as the recurrent patterns that help us to understand a given event, physical forces and relationships between objects and are assimilated and stored in memory as image schemas (Lakoff and Jhonson, 2007-1987); our mind conceive these patterns also considering a 'cause-effect' idea, anticipating the effects of "bodily experiences" (Kendall, 2009: p. 3). Kendall also reported Fauconnier and Turner's (2003) concept of *mental spaces,* which are fundamental in holding the ongoing package of information and associations; each mental space is built and connected with others in order to produce meaning (Kendall, 2009). Mental spaces, by logic, will be part of the PANSC knowledge.

2.3.4 Thinking Mind

Imagine the mind as if it would be a complex computer; when it is required to process a big stream of information, only by a 'broad first glance' it associates different degrees of priority to them and also organises them logically in patterns, in order to processes them in depth later. Automatic is the assumption that an electroacoustic music listener will feel 'lost' in his/her first 'visit' to the electroacoustic (acousmatic) aural world, since the cues that this kind of music transmits varies between real and abstract, the mental resources used to assess a new reality will be higher than the ones used to re-explore the same realm (Kendall, 2014), once the 'unknown' is conceptualized the mental resources can be used to explore more in detail other aspects of the composition. Kendall (2014: pp. 4-6) proposed a valuable 'five mental layers model' to describe the various contiguous and simultaneous processes in which mental activity "unfolds" in the assessment of the aural world. This model has been applied with success also to the analysis of electroacoustic music and has been strongly inspiring for this study. The model is accurately reported as follows with the equivalent productions of each layer:

1. **Sensations:** quick assessment related to "*perceptual organisation and constancy of immediate sensation (involuntary perceptual binding and grouping: auditory streams, percepts organisation, trajectories of change, cross-modal integrations)*" (Kendall, 2014). We may conceive this layer as the one which is more related to **objective perceptions**, the psychophysical reactions within the human mind.

2. **Gist:** "*framework of things and space that, spread over time, gives us a sustained awareness in the short term*; *(cognitive and image schemas, features linked with schemas such as: objects' physical properties, forces, gestures etc. – organization and grouping of things placing them in background or foreground)"* (Kendall, 2014) in simple terms, the layer in which a general (instinctively produced) idea is produced and things start to gain priority.

3. **Locus:** "*self governing actions in response to situation assessed in perceptual present"* (e.g. shouting asking for help, crying just after an event) *– relation and connections between schemas and actions, responses in focusing or ignoring things, executing actions considering priorities and updates, networking of associations between schemas in order to place them in to deeper contexts.* (Kendall, 2014)

4. **Contexts:** *"framework for enlisting and assessing medium and long term event oriented schemas and expectations over time"* (sonic patterns, environments etc.) (Kendall, 2014)

5. **Domains**: *"frameworks of background knowledge, long term oriented"* (Kendall, 2014). In this layer the mind scans and gathers information from the ***PANSC Knowledge*** defined above, in order to close the circle of perceived reality with less gaps and unknown percepts possible.

These processes take place almost simultaneously in listeners' mind, and they are in continuous correlation between them while exchanging information. Each one produces meaning and a systemisation of sensory information but also an internal representation of sensed reality, which can be altered at every stage. (Kendall, 2014)

Table 1. The differentiation of the five layers with respect to feelings

Layer	Feelings
1. Sensations	Qualia, flow dynamics
2. Gist	Qualia, flow dynamics, short-term image schemas
3. Locus	Medium-term image schemas, schematic associations, certainty/uncertainty
4. Contexts	Anticipation, basic emotions, long-term image schemas
5. Domains	Consistency/inconsistency

Table 1. *The differentiation of the five layers with respect to feelings - From Kendall (2014)*

In the table above (Table 1) is shown the correlation between the mental layers and phenomenal qualities discussed in the previous chapter. Last but not the least, Kendall also introduced the theory of **feeling blend** (2014), where he describes how human beings are keen to accept and internalize the blend of conflicting emotions and events that we face in everyday life, as well as in arts. Through the feeling blend theory he also explained the dynamism of conflicting emotions, stating that when we do not find any possible resolution to tension (conflicting streams) we tend to seek a blend, in order to provide ourselves with a *sense of catharsis* (Kendall 2014, Deacon 2006).

2.4 Visual Mind

As most might have experienced, human has the 'magical' ability to form images in mind when thinking, imaging, reminding, predicting or recognizing, and also, listening to music. Some people experience visual imagery a lot, some other witness to have a more developed sense of language-related imagery other than visual. (Choen, 1976: p. 515) We want to give foundations to the concept of **chimerical**

imagery mentioned above (in section 2.3 Exploring the Aural World) by exploring the realm of *visual mind*. Not much has been studied in depth regarding visual imagery, but what is mostly being addressed now is the role of images (visualised in mind) while thinking. (Cohen, 1976: p. 513) Choen (1976) confirmed the role of visual imagery in memory-planning processes and problem solving. Visual information is stored in mind via "*coded descriptions*" or a list of characteristics of the information itself; this information are not accessible to consciousness but they work in memory and thinking processes. (Choen, 1976 p. 513) Choen (1976: pp. 513-516) proposed the visual imagery's different functions:

- The **recall function:** visual imagery is used to recall words-images schemas from memory. Some words might have high image potential (e.g. ball) and some may be more abstract, so difficult to visualize.

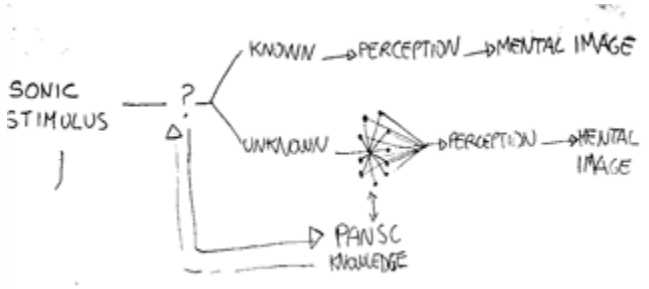
- **Mnemonic function**: visual imagery is used to fix determined things and patterns in memory (e.g. mental walk, see Cohen, 1976).

- **Problem Solving function:** visual imagery is used in mental paths of problem solving, such as comparing, grouping, organising, calculating, arranging strategies etc.

- **Recognition function:** visual imagery splits into two different types of pattern in recognizing things. The easiest pattern to assess is the one composed by labelled images; the other pattern contains images with abstract and vague traits and therefore too intricate to label.

The recognition function arise interest in understanding the structure of it, truly because we wonder: what if there is nothing to re-cognize, as it has never been encountered before? When an image cannot be found in the PENSC Knowledge or memory, it is built up from fragments of other information which have been stored in different times (Cohen, 1976), and from context or features related cues that match the present situation. A new image can also be evoked by verbal description (Cohen, 1976) or by a sonic cue. The figure below shows the theorised process of creation of a mental image evoked by sound

Fig. 2 *Process of creation of a mental image evoked by sound (Author, 2015)*



Hence, the recognition happens by matching a stimulus already experienced with a stored image (or description); most of this happens to an unconscious level, even though sometimes we might consciously scan a group of faces, for instance, in order to find the one that matches with the name heard. Therefore the assumption of existence of **visual memory** can be confirmed, as Cohen (1976: p. 516) did, by reporting experiments and introspective evaluations. Visual memory can also be strongly related to the *emotive memory* and the *auditory memory* (which is really short, but stores in the long-term memory various characteristics of the sound and a vague, general and re-cognizable sense of them). The senses memories and *emotive memory* can be blended into the concept of *perceptual memory*, which is contained in the PANSC Knowledge. If composed images are made of fragments of visual memory, then a will a congenitally blind person be able to experience visual imagery in mind? Evidences of absence of visual imagery in congenitally blind people and high degrees of diminishment in people who lost their sight, confirm the impossible condition (Cohen, 1976: p. 518). Although in the experiment below described, one of the listener was a congenitally blind guy who, in the description of the imagery evoked by electroacoustic music, described vivid images such as environments, machinery etc. These images are vivid to us as because stored in visual memory, whilst his memories are composed by every sense other than the sight so, it is impossible for him to visualize things although imaging is still possible. (The listening Experiment section) The recognition function of visual imagery is a valuable thing to keep in mind while addressing the concept of visual imagery evoked by electroacoustic music. This because evidences proved that a named stimulus enact the mind in generating an image of it in order to match a second stimulus. (e.g. looking for a friend in the crowd) (Choen, 1976: p. 516); therefore we could imagine the named stimulus as the sound (object, event etc.), which generates the image in mind and also automatically produce an emotion, feeling sensation or thought. This may be assumed as the "passage" from **aural world to chimerical imagery** (or from passive imaging to active, passive-active loop discussed below). The above idea may be directly linked with the one affirmed by Choen (1956: p. 516) that the visual images are "*constructed*, *modified and manipulated to meet the demand of the task";* such theory has valence in the evaluation of electroacoustic music listening experience. The idea of intentionality in visual imaging makes the produced images not to consider as 'fully evoked in the listener by the composition's acoustic features', but they are also mounted in relation to stimulus-context relationships (or thoughts) found in the PANSC Knowledge; plus they have a range of fluctuation in being the outcome of what I theorized as: **active imaging** or **passive imaging**. We might think of **passive imaging** as the process of imaging and wondering while been 'struck' by the aural world, a confused situation in which a large quantity of information is being processed, imagined, associated etc. I figured this condition as a 'storm' of PANSC knowledge information provoked by the natural mind's attempt to assess and explore the aural world. The passive imaging finds its resolution by 'placing' the listener into a meaningful realm (scenario), then the **active imaging** process takes place. The listener tends to (mostly) consciously guide the imagination in relation to the context, as he or she is keener to attend to the meaningful reality

(comfort zone) also unconsciously producing images in relation to it. The passive and active imaging processes occur constantly and they repeat themselves in the '**passive-active imaging loop'.** Cohen (1976: p. 520) also proposed a "*second order visual imagery*", in which we can overlap more abstract images (representing "*class, temporal, causal relationships"*) to (e.g.) a naturalistic landscape. Such condition has relevance in constructing and enriching the chimerical imagery evoked by electroacoustic music, as well as being useful for other mind's operations. Furthermore, Arnheim (1980: p. 494) distinguishes two different visual structuring processes: the intuitive process and the intellectual process. The **intuitive process** occurs when the (auditory) image is conceived as an "indivisible *and highly organized structure*" made of a blend of mutual characteristics between its particles; usually this process takes place at unconscious level. It can happen, though, that the individual may struggle to find meaning unconsciously and the process steps to the higher level of cognitive consciousness (where the image is actively explored and possible meanings imagined, *active imaging*). The result is a confused *quickly intuited* image in which the "*structure of the whole controls the parts and vice versa*" (Arnheim, 1980: p. 494), therefore we could say that the intuitive *unconscious* process belongs to *passive imaging,* discussed above. On the other hand the **intellectual process** assesses the (auditory) image as a construction of 'singularly perceived' subparts, analysing their characteristics and relations separately, taken one by one. This makes the (auditory) image overview sequential (happening over time), rather than "*synoptic*" (Arnheim, 1980: p. 495). We can also intend the intellectual process as part of *active imaging.* A journey through the basic concepts of human perception, aural world perception and visual thinking led us to a broader view of how our mind processes and interprets the information coming from the 'outer world'; it also gave us the foundations to address our issue regarding the subjectivity of visual imagination and the different layers in which it unfolds.

3. Composition

The compositions used in the experiment have been fundamental for the development of the proposed theory, the composition "Caustic Instability" (Audio 1) has been intentionally composed for the purpose of assessing visual imagery, a brief overview of the composition process and intentions will follow.

Caustic Instability

5.1 (6 channels) Acousmatic. 12'18'' – 2015. Differently to "Atomistic Motions" (Audio 2), in which source bounding is more tangible, this composition tend to place the listener into a more abstract environment where plausible physical events still occur, but they are masked by spectromorpholgical properties that maintain a determined distance from reality. The intention of the composition was to bring the listener into an unknown realm, giving him/her the time to "fall" deep into it and explore it, producing visual imagery. Since objectivity and subjectivity in visual imagery were to be assessed, some aspects of sound have been intentionally shaped in order to give objective cues (e.g. liquid, gassy, big environments, small closed spaces etc.) for the listener, to build subjective images from, even though melting abstraction and reality. It has been tested that is not the sound itself that is objective, but the characteristics that expresses; for instance the bubbly and watery sounds at the beginning of the piece (00'37'') were produced by recordings of bending a plastic CD continuously (the fake transparent plastic CD's on top of a new pack of CDs), this proved that we are not able to recognise so clearly the properties (or sources) of sound themselves but rather we tend to associate its characteristics to the most obvious source. The piece is based on cause-effect ideas where textures and environmental sounds continuously morph as an effect of an (e.g.) event, which I figured as the 'cause', giving birth to other environments and their linked situations; such changes resulted useful for the assessment of the passive and active imaging as they showed in the listening experiment that the listener tended to start to re-assess the aural world as if s/he would have physically moved from the place where s/he was into another. I intended to deliver a sort of sense of instability and discontinuity in the composition bouncing the listener 'back and forth' through time and space (sort of black hole, 4'19''). Also a sense of continuous mutation is felt until the climax occurred (6'04''to 6'53''), where the composition collapses in itself giving birth to a new different environment, just as a kind of 'big bang'. The spatial context, mostly abstract, is contra posed to more 'source-boundable' textures and objects in order to hold the listener into a reality that feels somewhat realistic but it is abstract, so giving space to their imagination to enrich such concepts with images. At the very beginning of the piece I intended to 'declare' something like: 'Welcome, something might sound real, but it will not be as real as you think', by using the sound of a tree falling which loses its meaning by starting to 'vibrate' in space.(00'18'') Weirdly, the human presence in the composition has not been perceived (only one listener noticed it), voices of children playing were present at some point of the composition(2'51'' to 3'19''), even though they were masked, valid cues for the identification were still there, so I assumed listeners were involved in a 'journey' which did not expected people being there, therefore not noticing the voices. Originally the piece was intended to express the five basic emotions in its different sections; such idea has been lost through the composition process.

4. THE LISTENING EXPERIMENT

4.1 Methodology

4.1.1 Design

The purpose of this study is not only to define whether visual imagination has degrees of subjectivity and objectivity, but also to produce a set of layers of imagination in order to differentiate the intricate mental processes that occur and produce images and sensations into human's mind when exposed to sound. To address these goals we decided to adopt a questionnaire-based listening experiment on various types of listeners in order to collect, compare and analyse different data relating to listening experiences and their outcome in terms of production of visual imagery and/or feelings etc. The aim was to discover the mutual traits in the various descriptions, in order to understand the sonic/aesthetic factors that may evoke

objective images in man's mind**;** furthermore, we wanted to analyse the different images that were **subjective** to the individual (depending on PANSC Knowledge)**.** The outcome is not to be considered as scientific evidence since the approach to the study is qualitative. The listeners answers are verbalisations of imagery evoked by sound rather than (e.g.) brain waves, therefore we might assume that the imagery occurring in the mind's eye could have been fairly richer than the one described by the listener, unless s/he was really keen to consciously enrich the description (which still is an alteration of the actual visual imagery). In any case, the study may still give valuable cues for further research.

4.1.2 Participants

The participants were 22 people (12 to 56 years old): males and females, all coming from (or integrated to) western cultures, and classified by: expert listeners and everyday listeners. Some of them have had already experienced electroacoustic music before the experiment, some did not. All of the participants were attending the experiment voluntarily, hence not paid; the intention was to reduce at minimum the possibility of influences on the listener.

4.2 Implementation and procedure

The questionnaire was divided in three parts, each part containing open-questions (apart from the 'how often you listen to music' question which was by list-choice). The first part had to be answered before listening to the composition whilst the second and third ones afterwards. The **first part** was to assess the cultural background and the psychophysical state of the listener, as well as his/her knowledge about electroacoustic music. The first three questions asked the age, the city of origin and the occupation. Age might be relevant to give us a general idea on the PANSC knowledge of the listener (higher in adults lower for children, as it is a matter of past experiences assimilation); city of origin, residence and occupation information are useful to have an idea of the kind of environments in which the listener is born, raised and spends time, in order to easily predict what sort of 'sounds packages' and images s/he is more keen to recognize and/or visualize. Then we asked the participants to define how often they listen to music and whether they ever heard about electroacoustic music, in order to better figure out the two models of 'expert' and 'everyday listener' and to predict if they could have any kind of pre-concept in mind about the type of music. The first section of the questionnaire ends with two questions that asked the listeners to auto-assess their psychophysical state. A question may suddenly arise: why the psychophysical state of the listener would be relevant? It has been supposed that if the psychophysical state of a listener is somehow altered, in a sense that it could affect mood or perception, the visual imagery outcome could be different (e.g. if the listener just had a trauma would be more keen to produce sad or dark images – or – if the listener is under the effect of drugs). The **second part** of the questionnaire, instead, was intended to explore in detail what sort of images the composition evoked in the listener's mind, and a general outcome of thoughts. The first question of this section asked the participants to describe the listening experience with some adjectives, in order to give us a general overview on the idea that the listener had in first place when 'coming back' from the aural world. The next questions focused on whether the listener experienced visual imagery while listening, also assessing the quality (blurred, vivid etc.) of it. If the answer was positive, the participants were also required to describe in detail (guided by a list of possible images evoked) the visual imagery experienced; if no mental images were stimulated the listener was required, instead, to describe what sort of mental processes were occurring in his/her mind and how did s/he made sense of the aural world. If visual imagery had been experienced, the next question asked the participants to define whether they were actively guiding their imagination or they were passively transported by the composition. This question resulted ambiguous as we will see in the Results section. The next question was about emotions, it asked the listener to specify whether they perceived or felt any emotion, sensation or mood during the listening experience; this question was helpful to assess, to some degree, the validity of listener's visual imagery by juxtaposing emotions and images perceived finding a possible 'psycho/physio-logical' match. This section concluded with four questions about specific things that the listener might have imagined during the listening such as: materials and their physical state, environments, objects (people, animals etc.) and gravity (or other forces); such things are useful for the assessment of the objectivity and subjectivity of images evoked by sounds with particular characteristics. The **third**, and last **part** of the questionnaire focused on the interest and the curiosity arisen in listeners about the novel (for most of them) listening experience, and their subjective impression about it. The first two questions of this section asked the listener whether they were curious about other compositions (other aural 'worlds to explore') and if they had any curiosity about the actual sources of the sounds. These questions have importance in establishing if individuals accept the unknown, and whether they would like their aural sense to be stimulated in this way. The various responses to this question also helped us to investigate whether the possible applications of electroacoustic music and visual imagery stimulation discussed in the next chapter would have been functional or not. The last question asks if the experience was unsettling, in order to have a clearer vision of the general idea/feeling of the listener and to open views to possible psychological application of the test. The participants attended the experiment individually and they were briefly enlightened on the procedure of the experiment as well as suggested to close their eyes while listening in order to "not being distracted by the sight". Two compositions have been used in the experiment. The stereo one (*Atomistic Motions*) (easy to "carry" around in order play it to random people) was an acousmatic composition which also contained some sounds that connect to reality, its duration was of eight minutes; the other composition (*Caustic Instability*) had more abstract traits and it was composed in 5.1 (five speakers around the listener plus the subwoofer, for an enhanced "immersion" in the aural world); its duration was twelve minutes. The characteristics and the composition process are described in the section Composition.

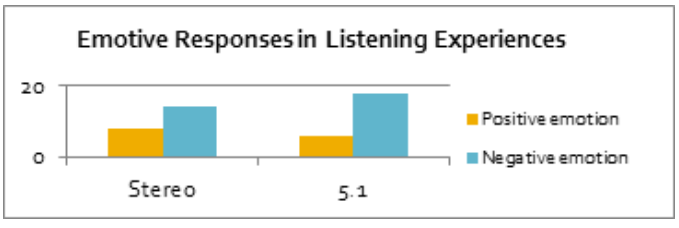
4.3 Results

4.3.1 Assessment of socio-cultural background and psychophysical state of the listener.

As explained above this first section seemed to be useful to understand the keenness of the listener in associating sounds with determined images, according to their past experiences and their psychophysical state. Results reported that the majority of the participants were hailing from cities and towns, while some of them were born and bred in the countryside or more naturalistic environments. Questionnaires reported that more than a half of the participants had audio related jobs (or were audio engineering students), which makes them categorised as 'expert listeners' that is that, in theory, they were more keen to focus on sounds properties other than imaging the source of the sounds (acoustic specification of sound properties). On the other hand, the remaining participants affirmed to have different types of jobs or to be students of not audio-related subjects; such thing will categorise them as 'non-expert' or 'everyday' listeners. Regarding on whether the listeners had ever heard about electroacoustic music before the experiment, we collected data that showed that some of them had a vague idea or "have heard" about electroacoustic music, some did not have any clue about what it is and, finally, some other had a general understanding of it. For what concerns the psychophysical assessment the results showed that listeners were generally in a "moderated" or good state, some reported being under the effect of drugs (marijuana) and some other reported being stressed; no heavily affective events or conditions have been reported.

4.3.2 Assessment of the listening experience, visual imagery and emotive response.

By on-field observation, after the listening some people looked bewitched and bewildered; they had various clean-cut facial expressions which might have been useful to capture for the sake of the experiment. The adjectives reported in relation to the overall listening experience were various: some of the more recurrent regarding the stereo composition (*Atomistic Motions*) were: "scary, unsettling, dark, real, intense" (Questionnaires, Appendix B). For what it concerns the 5.1 composition (*Caustic Instability*), instead, the responses were not really consistent as the piece presents abstract traits and is twelve minutes long (which makes harder to remember images and feelings once finished). In any case, some of the adjectives used were: "deep, abstract, unsettling, surreal, engaging, musically stimulating, immersive" (Questionnaires, Appendix B).



Tab. 3 *Emotive responses in listening experiences, categorised by positivity or negativity of the emotion.*

The questionnaire confirmed that ALL of the participants experienced visual imagery. Some listeners experienced vivid and clear imagery whilst some other visualised blurred or flashing images, apparently "disconnected" (Questionnaires, Appendix B). At this stage listeners had to describe the visual imagery experienced. Some of the listeners had "blurred, not clear" visual imagery so they found more difficult to express themselves but still gave some valuable answers.

> e.g. "Alone – night – city beach – ship – scary event – fear perceived – birds - how this sound is made?"

Or

> "Dark environments – relief towards the end – nature – tractor – countryside (where I was born) – plough
> Tragic scenario when climax comes (bombs) – reverberations makes it *dreamy*"
>
> ***(Questionnaires, Appendix B)***

On the other hand, other listeners have had more vivid imagery and were more able to describe their ***chimerical imagery.*** Here an interesting example:

> "Musical vibrations visualized as waves in a diagram, desert and earth with no life on it, weird sensations felt at the height of the belly button. A lot of wind and a broom which is removing the dirt, the black and the impurities of what I conceived as a street of New York. Aliens, visible brainwaves in my head (golden/yellow) thoughts fluctuating around me. Water that fills up my body, noise, forest in which metal animals are living, ancestral nature in the past. I am experiencing it in first person point of view; everything changes quicker in front of me. Emotions of insecurity but also deep relaxation until the end of the piece. I thought I was detaching my mind from my body, I thought that music is powerful"
>
> ***(Questionnaires, Appendix B)***

However, we assume that the description of an experience also consists in being able to verbalize the imagery. There might be some people which use more language-related imagery than visual imagery and vice versa (Choen, 1976), so there is the possibility that some listeners have experienced really vivid imagery but then struggled in verbalizing it; for instance, some could have found easier to describe the images by drawing them rather than labeling them with words.

To the question: *"Were you actively thinking and deciding what to "do", or what to "see" during the listening experience (guiding the imagination)? or were you passively transported?"* (Questionnaires, Appendix B) listeners answered the most disparate things, which gave a big contribution to the understanding of how visual imagery works (passive and active imaging, discussed in the Visual Mind section). Some of the most relevant answers were:

"firstly focusing on sounds (that is, no imagination but active cognitive activity), *then I spaced out"* (that is, passive imagination occurred);

"*initially guided* (that is, passive imaging occurring), *then active to take those images further"* (that is, active imaging);

"active - deciding what to see - building images" (active imaging);

"*passively transported but influenced by associations with books red in the past*" (the listener's mind transformed language (book – words) into audiovisual mental images which have been stored in PANSC knowledge and re-evoked by the composition)

"*active until the environment changed, then passive*" (passive-active loop has occurred, discussed in Visual Mind section, pg 19).

(Questionnaires, Appendix B)

Almost all of the participants experienced emotions while listening to the compositions and the most popular emotions reported were: fear (and its variations) and tension, followed by anxiety, sadness, and suspense. The few listeners which did not experienced emotions reported not being engaged with the listening enough to feel emotions or that they shifted their attention on the intrinsic features of sounds rather than being transported in the chimerical imagery; although they reported the presence of *expressed emotions.* The question asking whether the listener had perceived things like materials, environments, objects (people, animals, entities) and forces has been answered variously in terms of subjective images, although listeners had a consistent general idea of the **objective** images encoded in the sounds that inspired the question. For instance, in the section on materials and their physical state, some listener reported "mud", whilst some other "water", which are two different images but they both relate to the general physical state of *liquid.* This was also true for the imagined environments; answers vary but have common factors: "outside-jungle-wide" or "forest-waterfalls-open", or "wide spaces both inside and outside". Regarding the section asking if listeners visualized objects (people, entities, animals etc.) results showed that only one listener visualized people, others experienced abstract objects or jungle-creatures. Also for the section asking about forces (gravity etc.) listeners perceived them **subjectively** in relation to the visual imaginative context (e.g. abstract context fluctuating objects – real context gravity etc.) more than objectively (where low frequency content defines gravity, *quote*).

4.3.3 Assessment on interest and thoughts

The further two questions wanted to explore an overall interest or curiosity that might have been arisen in listeners after the listening experience. While being asked if they were curious to 'explore' similar chimerical imagery listeners gave a consistent positive responses. They reported being very curious to repeat similar experiences and that they liked how the composition stimulated their aural sense and imagination, even though, according to the next questions (whether they were curious to know which were the sources of the sounds or not, and if they found the experience unsettling) the majority of listeners did not want to discover any further information about the origin of the sounds themselves. They accepted the 'unknown' and they still were engaged in exploring this sort of 'unknown reality', also finding it somewhat unsettling in certain cases.

5. DISCUSSION

The presented paper intends to theorize the existence of layers of imagination (having degrees of subjectivity and objectivity) evoked by electroacoustic (acousmatic) music listening. By an accurate review of the core concepts of perception, emotion and visual thinking which have been applied to the (electroacoustic) music listening context and the results collected from the experiment, it has been possible to produce a theory that might be relevant for listeners, composer and researcher to understand how electroacoustic music affects the mind and the visual imagination. The first section of the questionnaire, used for the assessment of listener's personal information and his/her psychophysical state, did not result useful to analyse the influence of those factors on the visual imagery evoked. Some borderline cases might have been useful for assessments of this kind (e.g. a kid born and bred in the jungle which never heard city sounds; a listener high on hallucinogens). Also, a further question regarding personal hobbies would have been useful (e.g. a videogame player is more keen to 'see' *sci-fi images* than someone which reads thrillers that may visualize *city-related images*).The second section, instead, together with the literature review and intuitive analysis, has been relevant in the development of the proposed theory. The adjectives and emotions reported by listeners helped the overall evaluation of how an 'adventure in an unknown realm' is perceived by listeners but it also reassumed the effect (or impression) that the experience had on them. The responses showed that most listeners were "scared" but "engaged", "tensed" an "intrigued"(Questionnaires, Appendix B); I assumed that their PANSC knowledge was sending information about the context (e.g. you are in university facilities, safe) already before engaging with the aural world, that means that they would have not run away if they heard a sound coming from behind them; so the ambiguity of the piece induced a sense of fear because they *did not know what to expect*, and possibly, also because the traits of the composition evoked scary images in their mind. The distinction between expert listener and everyday listener did not find much valence in the study since the expert listeners were all experts in relation to music and audio rather than experts in electroacoustic music. However, some of the expert listeners focused on *intrinsic* (Smalley, 1997: pp. 110-112) qualities of the sound without allowing imagination to go further, perhaps visualising sounds in shapes, waves or blobs of energy etc. According to the questionnaires, every listener experienced visual imagery, some reporting 'seeing' clearer images, and some more blurred. The various descriptions of the 'mental journey' that each listener experienced resulted highly relevant to the proposed theory since they showed the objective sources that the subjective images could had. For instance, the *watery* sounds present

at the beginning of the 5.1 composition (*Caustic Instability*) produced images related to materials like mud, water and bubbles; this raises the idea that natural-physical properties of the sound as well as their states and morphologies may lie in some kind of intrinsic knowledge that every human being might have. The same theory is applied for the spatial location of sounds, which occur thanks to the auditory sense which naturally locates sounds in space (SCHNUPP, NELKEN & KING. 2012: pp. 177 - 209). Especially in electroacoustic music listening, we tend to focus our 'sensorial attention' on details which may determine the spatial properties, shapes and qualities of an object (Nyström, 2013: pp. 29-31). It is also worth to remember that ecological acoustics studies (Claudia Carello, Jeffrey B. Wagman and M. T. Turvey) proved that "*the perception of objects by sound alone is reliable, surprisingly accurate, and constrained by dynamical law*". Also according to this theories we assume that certain sonic stimuli are **objective** in the sense that *clearly* match with physical features (and motions) of *something* which is present in nature and are intuited by the listener as they are, no matter what the visual imagery outcome is (e.g. no one will perceive wood instead of water, if the sound has watery features, although mud might be perceived). If we said that memory and some innate principles of recognition lie in the individual PANSC knowledge we will have to take a step backwards to define a *virtual* space in PANSC knowledge that contains knowledge which is the same for each listener and does not depend on his/her personal experience. In order to disprove such thing it would be needed to run the listening experiment to an individual which never heard (e.g.) the sound of water. Apart from congenitally deaf people, we might assume that everybody who exists have heard the sound of water (i.e. to drink it), who did not, cannot report it.

5.1 The four layers of imagination

We can now develop the first layer in which imagination unfolds once the listener is immersed in the aural world: the **physical-structural layer;** in this level the 'what' and 'where' pathways and top-down processing of perception occur, the mind start to grasp, according to the Pregnanz's Law, all the 'elementary percepts' (intensity, distance, movement, possible threats, shapes etc.) from the aural world. These percepts express physical, almost *tangible*, qualities of the sound, according to Claudia Carello, Jeffrey B. Wagman, and M. T. Turvey, in a very reliable way (unknown); sensory information also evoke raw images attempting to make the listener 'visualise' what is perceived (i.e. "*we tend to allow the sounds themselves to acquire quasi-visual shapes, colours and spatial orientations, as if they were reflecting light",* Nyström 2013). Since it depends on physical qualities of the sounds, this layer is considered **objective.** *Qualia* (Kendall, 2014: p. 194) could be considered as part of this layer as it refers to components of perception as the raw sensations. This and the next layer of imagination might be assumed as the 'visual imagery side' of the blend of Kendall's *sensation* and *gist* layers (discussed above). Auditory scene analysis, in the form of **intuitive process** also occurs. We are in a **passive imaging** realm, where unconscious mental activity is going on.

Fig. 3 *Basic graphical representation of Physical-Structural Layer of Imagination (Author, 2015)*

According to the questionnaire, listeners described the perceived environments as "warehouses, forests, jungles, holes" etc. but still, mutual characteristics between descriptions have arisen. The common factors in these images showed that the *size* is the most objective characteristic (i.e. reverberation) perceived in relation to the environment, followed by the indoor/outdoor distinction (i.e. 'air' perceived); on the other hand images regarding the environment also have some subjective characteristics in relation to the listener's PANSC knowledge (e.g. a 'videogamer' will likely imagine a big/outdoor environment as an alien planet while some other might imagine a forest). The **Environmental imagination layer**; this layer function as the one which produce the basic image of the environment (wide, narrow, outdoor, indoor) in which images of other identities such as the ones evoked by textures and events, lie. An environment is usually perceived by the sense of how energy flows over time, therefore the phenomenal quality of *flow dynamics* (Kendall, 2014: pp. 194) match with this imagination layer together with *qualia*. Since the creation of the environmental image depends on both objective and subjective traits, it is considered a **semi-objective** layer. It is worth to remember, though, that the objective qualities inform the subjective ones by shaping them (e.g. reverberation-size).

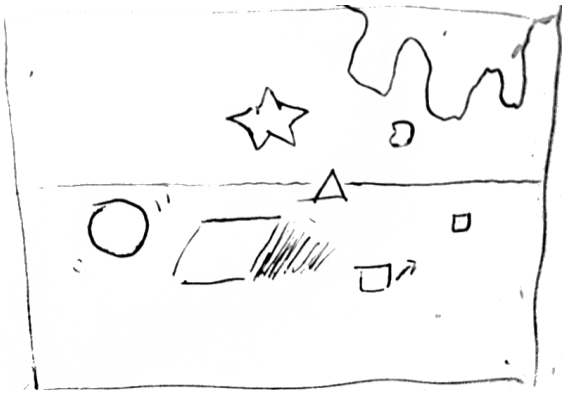


Fig. 4 *Basic graphical representation of: Environmental Layer. Author (2015)*

The environmental and the physical-structural layer are supposed to function almost simultaneously and continuously, placing the listener into a "*modal confusion*" (Nyström, 2013: pp. 29-31). The first two layers are part of

the *passive imaging*, since they happen to an unconscious level; a storm of PANSC knowledge information, and **raw images** produced by the first two layers of imagination start to inform the mind. The raw images that are perceived as 'more meaningful than others', or having more iconic (expressive) value, are then blended by the unconscious mind, into what we called **fundamental images** which in turn, are a blend of raw images that form a **meaningful whole scenario**. We have to keep in mind that simultaneously to this imaging processes emotive reactions are occurring to balance our physical state in reaction to the perceived stimuli (Damasio, 2000: p. 51). Once the mind created enough fundamental images the **associative imagination layer** blends them creating the **meaningful scenario**; environments and objects start to shape and relate under the influence of PANSC knowledge information. We might associate this to Kendall's (2014) layer *locus*, in which, among the other things, we tend to focus on or to ignore things organising various images schemas, and actions. This layer is categorised as **semi-subjective,** because it relies on the objective features of sound imported from the other layers, whilst PANSC knowledge associations have strong influence on the production of images. *Image schemas* (Kendall, 2014), the perception of recurrent pattern of forces, can be matched with this layer, since expectancy and anticipations start to occur. At this stage, imagery is in transition between *passive imaging* and *active imaging,* unconscious to conscious.

Fig. 5 *Graphical representation of: Associative Imagination layer*

Questionnaires have confirmed that listener were in a sort of *confusional* state (passive imaging) but at some point they were able to 'move' through the imagery somewhat consciously (active imaging); the reports of the listeners - "able to manipulate and shape the imagery, until a change of environment occurred" (Questionnaires, this paper) also could theoretically prove the existence of passive-active loop. The fourth and last, is called the **creative imagination layer;** in this layer the imagination is active, hence the listener is able to consciously "*construct*, *modify and manipulate images to meet the demand of the task"* (Choen, 1976: p. 516). This layer is to be considered fully subjective as it processes the images in relation to listener's expectations, longing and information recalled by the PANSC knowledge. A sort of bottom-up processing of visual imagery occur in this layer, which may be also related to Kendall's (2014) *context* and *domain* layers, and matched with the *image schemas* phenomenal quality, since long term image schemas are considered.

Fig. 6: *Graphical idealisation of: Creative Imagination Layer*

The process of the four layers of imagination is in continuous loop and reassessment, also relatively to the flow of emotions expressed or induced by the images evoked.

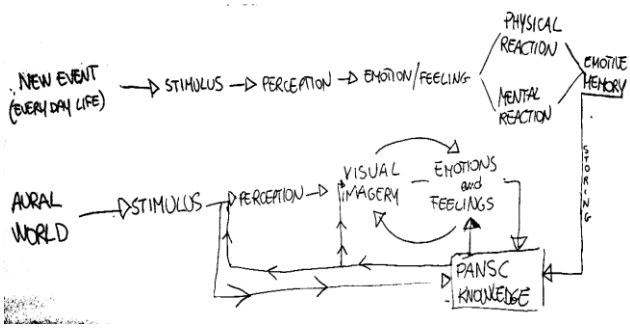
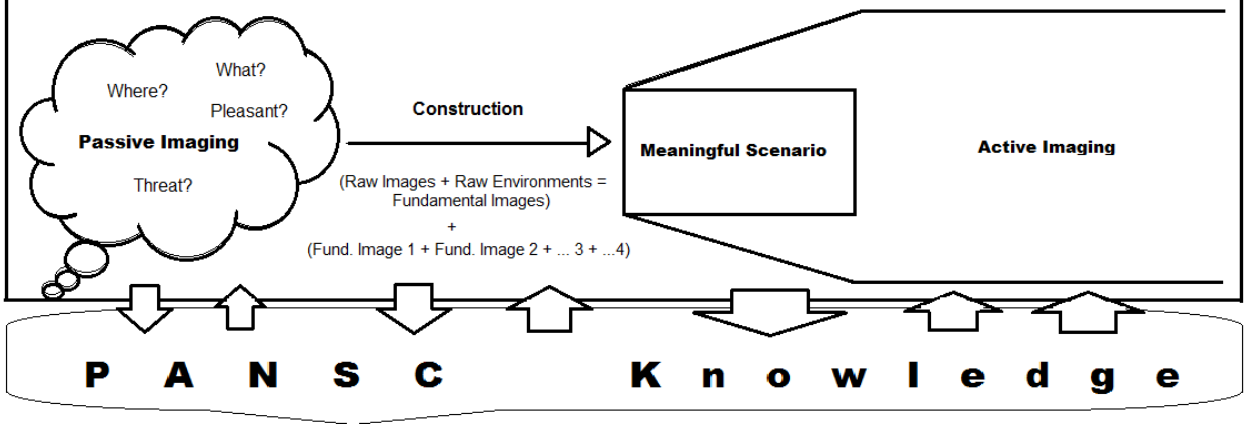


Fig. 7 *Emotions in everyday life - Emotions in Visual Imagery (Author, 2015)*

Both abstract and realistic imagery can be experienced, as Choen (1976) specified in the explanation of the second *order visual imagery*. We may also place the four layers on a timeline, where we can visualise them in relation to the other cognitive and emotional layers or functions discussed in the previous chapters.

Physical-Structural Layer and Environmental Layer	Associative Imagination Layer	Creative Imagination Layer
Sensation and Gist	Locus	Context and Domain
- Emotions as Mood - Emotional Space - Emotion as Holistic Affective Appraisal	Cognitive Appraisal	Reflective Re-Appraisal
Qualia - Flow Dynamics	Image Schemas - Certainity/Uncertainity	Image Schemas- Anticipation Consistancy/Unconsistancy
Objective / Semi-Objective	Semi-Subjective	Subjective
Passive Imaging	Passive - Active Imaging	**Active Imaging**



Tab 2 *Imagination layers schema (in relation with other concepts). (Author, 2015)*

At this stage seems that, visual imagination related to electroacoustic music experiences can be unfolded in the four layers above theorised, whilst in a more *common* music realm it might be harder to experience visual imagery with a vast variety of details and introspections, as *source bounding* (Smalley, 1997: pp. 110-112) is incredibly affective; for instance, if we hear a guitar and a singer we will most likely produce visual imagery of the performance rather than jungles, water and so on. The listening experiment helped to "explore" listeners' imagined visuals in order to validate any introspective idea arisen, and develop it within the theory proposed. However, the questionnaire needed more dull questions and the number of participants has had to be higher. Plus, I personally tested some participants asking questions face to face other than using the written questionnaire; this method seemed to be more functional since the listeners seemed to let off all of what they have had just experienced in a passionate verbal report, just as if they have been teleported into another dimension and came back. We only supposed the existence of the above discussed processes as we do not have any neuroscience knowledge or any scientific evidences that the imagination layers biologically exist, and work like it has been described; although the paper might be a contribution to the research field of electroacoustic music, and possibly originate curiosity on the topic.

6. POSSIBLE APPLICATION

6.1 New 'gig' concept

In regard to the better (?) theoretical understanding of visual imagery evoked by electroacoustic music gained in this research, various ideas arisen, especially because of the high level of curiosity that listeners expressed in the questionnaire. Media, as well as food, seem to be popular for entertainment that we might suppose that the stimulation of the senses is what people look for, what might be better than a personalised 'journey' in our own mind? In situations such as concerts, art galleries, or food fairs, we get to contemplate the aesthetic beauty of a piece of art, we get absorbed by the performance of a musician, or we experience the taste of food, seemingly quite passively experiencing the stimulation of our senses. Taking that electroacoustic music evokes images in mind, the idea of immersing listeners in the aural world, while being in an unexplored physical environment (actual room), and having the possibility to explore it, arises. In other words, electroacoustic-acousmatic music may be moved a bit closer to the *mainstream* by organising installations and events and developing a new concept of 'gig' in which listeners are not the 'audience' but rather the performers of their own entertainment. Placing the listener in a 'four dimensional realm' with the contribution of something like (e.g.) lights tricks, (e.g.) interactive objects or holograms might be the foundation for a new kind of entertainment. Imagine venues like stadiums, for instance, where thousand people could space out 'swimming in seas of sound and imagination'. It might be a utopia, but it was worth to mention it.

6.2 Psychology

A possible application of electroacoustic music in relation to imagery might be applied to music psychology. Considering that the Rosharch Test was intended to assess the patient psychological status by asking him to interpret abstract images (inkblots) (Rosharch, 1998), then acousmatic music, which can have a high level of abstraction, once intentionally shaped

for the purpose, might somehow be applied in testing psychological traits. Due to my ignorance in regard of the subject, the idea will not be taken further, but it is expressed in order to cause some interest.

7. CONCLUSION

The barely explored realm of imagination found its foundation in human perception and visual imagery. Research on how human mind works has been applied to the electroacoustic music listening context in which sensation and perception as well as visual imagery tend to get highly stimulated due to our tendency to 'give meaning to things'. The composition, intentionally crafted for the purpose, has been used for the assessment of visual imagery evoked in listeners mind. Questionnaire-based listening tests, as well as literature review resulted relevant for the theorisation of the existence of four imagination layers, each one having a degree of subjectivity-objectivity in relation to the listener or the composition. Results showed that certain defined stimuli present in the composition have been found useful in guiding visual imagination in listeners' mind, therefore giving evidence of the existence of degrees objectivity-subjectivity in the theorised imagination layers. This paper might have practical and theoretical relevance for listeners, composers and researchers in order for them to explore the topic more in depth, running experiments in order to explore visual imagination in relation to electroacoustic music more scientifically, or to give foundations for new composition approaches or ideas.

8. APPENDIX A

A better development of the experiment could have been more fruitful in the evaluation of listening experiences since the one presented resulted limited according to some results. Visual evidences of listeners' face and body reactions during the listening, or breath frequency control would have been useful, as well as a higher number of participants with different qualities taking part in the survey.

The research, instead, could have been expanded at and looked at more in depth without being constrained within the boundaries of time and word limits. I personally will undertake a path of further studies and research in order to go deeper with the subject. Future works and research will be developed during time. Ideas for compositions are in mind, and the proposed application for the 'new gig' concept will be addressed in depth and also experimented. Collaborations and further research are in the pipeline.

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