

Critical Perspectives Essay

Is vastness a cognitive appraisal, or an embodied sense?

Cross-disciplinary evidence to support the role of embodied spatial perception in the experience of musical awe.

Introduction

Is a piece of music awe-inspiring because of the properties within the music itself? Or is it the way we think about the music that determines our response? In this essay, these questions will be considered, whilst also exploring a different perspective, whether there is a third interaction taking place between our body, the sound, and the space around us.

In this essay I am going to discuss aesthetic theories that put forward the view that a piece of music has properties that would induce awe in any listener, and I will analyse this view in relation to cognitive theories of emotional responses that suggest that the way an individual appraises or thinks about a piece of music, determines their response. I will then bring in a third point of view, that of the interaction between person and object, and analyse this in relation to theories of spatial perception, and features of music that interact with spatial perception to evoke a sensory feeling of vastness, which enhances a musical awe experience.

This essay seeks to answer the question: Is the sense of vastness a key factor in our experience of a piece of music as awe-inspiring, and is this sense of vastness a result of spatial perception or cognitive appraisal or does it reside within the musical object itself?

The areas that will be covered include the complex relationship between the perception of vastness, musical awe, and how we feel about the spaces we perceive. As well as how proprioception and spatial perception are intertwined with our emotional responses.

Music and Emotion

Music and emotions have been, and continue to be a central area for investigation in music and psychology research (Pilgrim, Norris and Hackathorn, 2017). Music can make us feel a range of emotions including feeling moved to tears, or the experience of ‘frisson’ or chills (de Fleurian and Pearce, 2021). The feeling of being moved (BM) and experiencing thrills or chills (ThCh) are the first two factors of the ‘Aesthetic Trinity Theory’ (ATT) proposed by Vladimir Konečni. The third factor in this theory is Awe or ‘Aesthetic Awe’ (AeA) which Konečni discusses as being a rarer experience than ThCh or BM (Konečni, 2008, 2015).

What is awe?

In Aesthetic Trinity Theory, awe is a response that is said to be induced by something sublime that is outside of oneself. It is the object itself that is said to carry the properties which give rise to the feeling. For example, a piece of music could be said to be objectively awesome and evoke awe in any listener according to this theory. However, in Keltner and Haidt’s cognitive model of awe (Keltner and Haidt, 2003), it is the appraisal that an individual makes about the event or object that is responsible for the feeling of awe. Their model explains awe as the emotional response that results from cognitively assessing a stimulus as something that is vast and difficult to explain; something that requires us to shift our perspective or accommodate new information (Keltner, 2023). This accommodation, along with a sense of vastness is said to distinguish awe from other emotions (Pilgrim, Norris and Hackathorn, 2017; Keltner, 2023).

Is awe within the object or the subject?

Keltner & Haidt’s model allows for variations in the stimuli that people appraise as awesome. This is important especially when it comes to music because this is an area where there can be a range of different responses to the question “what music makes you feel awe?” (Cowen et al., 2020). Konečni’s theory however would state that the same music evokes awe equally for all people. While there are certain pieces of music that have become representative of strong emotions in music; *Carmina Burana* by Carl Orff being a well-known example (Mills, 1997), individual variations are a key feature of our emotional response to music. A person’s individual perception is part of the interaction between object and response and each person

may view the experience differently. As Hume said “each mind perceives a different beauty” (Tschacher *et al.*, 2012)

Interconnectedness

The perspective of Merleau-Ponty may be helpful to consider here as some awe researchers follow a path of trying to uncover who is more likely to experience awe and which piece of music is likely to always evoke awe. Instead, in line with interdisciplinary research in aesthetics and psychophysiology, perhaps a position of interconnectedness may offer a way of embracing both the psychological model of awe experiences and the aesthetic view of the sublime object. As Davis & Hamrick point out in their work on perception, perhaps rather than reduce a subject to its separate parts, we could instead adopt the Merleau-Pontian view of actively embracing the ambiguity and interconnectedness (Davis and Hamrick, 2016).

What would this look like for the topic of musical awe?

In between the sublime object and the cognitive model of awe is our physical body and the space within which we experience an awe event. One of the main features of awe is a sense of vastness (Keltner, 2023). Vastness is about sensing space. This suggests that the awe object triggers a sensation within the person that results in them feeling the space between the object and themselves.

The sense of vastness

In a recent study of musical awe, it was noted that if participants reported the music to have a sense of largeness, and to feel ‘big’ they would also be more likely to report that it made them feel awe (Peck, 2023).

One of the participants in Peck’s study gave an insight into how their experience of musical awe felt for them. They stated that it felt like they were inside an orb and the music filled the space that they also inhabited. Peck discusses that music can feel vast not only because of musical features such as layering of instruments, dynamic effects, rhythmic and volume

changes, but also because of the way that it feels larger than us. Peck points out that this is about our spatial perspective relative to the size of the music.

It's not just that something *feels* like a big sound, but that it feels big in relation to where we are in the space with it. It interacts with us in the space that we also inhabit (Peck, 2023). *We* feel it in the space that we are in. This points to the possibility that perhaps we can perceive more of the space around us than that which we can physically hear or touch. Possibly outside of the peri-personal space boundary which is said to be the limit of the furthest reach of our limbs (Coello and Cartaud, 2021).

In Ataria's work on body schemas and boundaries, it was found that in a group of senior meditators the boundary between their physical bodies and the spaces they reported experiencing was fluid and flexible (Ataria, 2015). The study indicated that when visual stimulation was present there was a sharper sense of me-not me boundaries, whereas with auditory stimuli the boundaries were less sharp. This indicates that the sense of space may be more fluid when visual stimuli are either not present or are not delineating a clear boundary.

In Ataria's study the position of subject-object also seemed to change over time, with participants firstly hearing the sound as 'over there' and then over time feeling that they and the sound were together in space and time, and the initial boundary had diminished. Space and time had synchronised. Our perception of space can seemingly shift and change in response to sound. How are we sensing this space, or are we just thinking that the space has changed?

Is vastness a thought or a sensation?

In Peck's 2023 study, the subjects reported their sense of how big the music was prior to judging their experience as awe. This indicates that the sensory information about size was noticed first, prior to a cognitive appraisal about what they felt (a judgement of awe). The subjects appear to have experienced vastness before they appraised their experience as awe.

This calls to mind the mention of a pre-cognitive 'fleeting moment' that Tröndle et al. discuss in their work on mapping the spatial movements of museum visitors (Tröndle *et al.*, 2014).

Trondle et al's study used a specially adapted glove which was designed to track movement, as well as physiological and psychological data from museum visitors. The glove was intended to be un-intrusive and to not impede the person's movements. One of the main aims of their methodology was to capture moments of presence, when visitors were affected physiologically by the art object. The results of the study showed that there were shifts in the visitors' heart rate variability measures at certain locations in the museums. These shifts correlated with measures of aesthetic judgments of beauty that subjects gave via self-report questionnaires. But there were signs that the physiological measures of activity preceded the aesthetic judgments. The sensory information preceded the cognitive judgement. This study showcases an interesting interdisciplinary method for combining aesthetic appreciation, physiological data, spatial-body mapping, and self-report data. It is a study that bridges the worlds of psychology, psychophysiology and aesthetics.

Sensing our environment

Architectural researchers are looking at the multisensory nature of how we interact with the spaces around us, and they use the term 'hapticity' to refer to the way that we sense our environment through the 'eyes of the skin' (Papale et al., 2016). Much work is being done in haptic perception, particularly in terms of our cutaneous (touch) receptors. But there is less information available on how we can perceive the space that is outside that which we can touch. Awe shows us that we can feel the vastness of space. Vastness is outside of that which we can touch therefore how are we sensing this vastness? How are we feeling it?

Sensing the space

Sensory input is received, co-ordinated and modulated by sensory processing systems in our body and brain. Our vestibular system for example is how we detect motion and orient to our surroundings. It is designed to ensure we are maintaining a level plane; it detects force and stop-start movements all against a backdrop of the constant pull of gravity. It also orients us in a balanced bilateral motion towards a stimulus (Gibson, 1966; Kearney and Lanius, 2022). Although it is often discussed in terms of the balance system within our inner ears, our vestibular network has locations within the brainstem, midbrain and cortical regions of the brain, with the cerebellum (the back of the brain) being an important part of this system

(Kearney and Lanius, 2022). The vestibular system works closely with the somatosensory (haptic) system when it comes to sensing ourselves and the spaces around us.

Our somatosensory system involves our joints, muscles and skin and it helps us to detect movement, pain, temperature, touch and space. Within this system cutaneous (skin) receptors detect pressure, pain, touch and temperature, and proprioceptive receptors detect the movement of our body in space in combination with the vestibular system. The proprioceptive and cutaneous receptors of the somatosensory system are the interface between ourselves and the world (Kearney and Lanius, 2022). Whilst our cutaneous receptors are largely involved in touch stimulation, they are also thought to play a role in ‘sensing’ the space around us when we are actively exploring our environment (Gibson, 1966; Lederman and Klatzky, 2009). In this way, they work together with the proprioceptive (muscle and joint) receptors in assessing an environment.

The hair-like cells of our joints have a key role to play in making fine assessments and detecting the slightest of movements or pre-movements. They operate within the angles of movement in the joint that they inhabit (Gibson, 1966). Gibson discusses how these tiny cells are situated in a geometric pattern within the joint, mapping trajectories from the angles of the joints, out into the space around our bodies. Within this sentence there is the suggestion that we are sensing these trajectories, though the question is, how far can we map?

How do we perceive the space that is outside that which we can touch? If visual stimuli are controlled for, then what would be the actions of the joint receptors, skin receptors and orienting system? If we are detecting this space, how much can we perceive and how does this feel to us? In other words, is this extra-personal space part of our feeling state just as much as physical touch can affect our feeling state? This has potential implications for composing, playing, and listening to music in ways that feel physically expansive and that truly connect us with sound in its spatial sense. It also indicates why spatial sound has such an effect on us.

Sensing sounds in space

The way that we experience music and sound is not only audibly. We feel music through our senses and all of this sensory information is involved in our experience of music (Nagaya *et*

al., 2006). This is not a new idea; however, it has not been able to be fully explored previously due to limitations in human-computer interactive technology.

We have become somewhat habituated to hearing through either headphones or speakers, and indeed audio and music companies have fed back into the same system. In the film and game industry however there has been a move to make sound more immersive. This has led to developments in spatial audio, where we hear sound coming from many different directions. Indeed, sound does operate like that. It does move out in many different directions. When we hear, and feel a sound, we hear it differently depending on where we are in relation to it, and depending on the space within which we hear it. For example, a sound is different if we are behind or to the side of it, or whether we hear it in a bathroom or a garden.

Spatial audio

Contemporary work in spatial audio is a testament to how much more realistic it is for us to *experience* sound in the space around us. Programs such as ‘*Sound Particles*’ and the spatial audio settings in our DAWs allow us to decide where audio will be directed to in order to be heard spatially. As part of developments in this area, sound is also being realised as something that can be felt by the whole body and not only heard by the ears. Spatial audio now involves the rumbling of low frequency sounds that add sensations into the mix to enable you to feel the sound in your lower body. The company ‘*SubPac*’ have taken this idea and created a wearable backpack that enables producers to *feel* the bass and the sub that they are working with. The game industry has been actively working on technology to enhance this felt effect of sound and enable users to experience the feeling of being immersed in the sound.

Haptic technology

This aspect of experiencing sound, as a multi-sensory experience and not only an auditory one is leading to a revolution in term of music listening and creation, with the development of sensory-based technologies such as haptic music gloves and suits. There are several pieces of wearable technology, known as ‘haptic suits’ that are currently in operation. One example comes from a company called ‘*Music: Not Impossible*’ who have developed a piece of wearable technology that looks a little like police body armour. The vest has sensors and

actuators on it and is linked to special headphones and software. It enables the wearer to experience the *sensations* of a piece of music in a very detailed way. The vest supplies sensations that complement the music to enhance the experience for the wearer.

Current technology in the haptic area involves enabling users to feel sensations through either gloves, armbands, seats, vests or whole body suits (Turchet, West and Wanderley, 2021). In terms of music creation there are devices that can enable performers to feel sensations and work with their gestures to compose. The innovative gesture-based haptic feedback technology from companies such as '*Ultraleap*' allows hand gestures to be tracked. These interface with virtual software that can enable the music creator to touch an object in the software environment and receive actual tactile feedback from that instrument or button. A creator can interact using the movements of their body and they can move through space with their instrument. They can receive tactile and kinaesthetic feedback from the software and can use this feedback to inform their next steps.

Similar devices are the '*Sensible Phantom*' which can enable a performer to receive touch feedback and play a virtual instrument (Berdahl, Niemeyer and Smith, 2009). There is also a piece of wearable technology called the '*Corsetto*' (Kilic Afsar *et al.*, 2023), which can enable an audience member to feel the sensations of a singer's vocal movements. This is a fascinating insight into intersubjective haptic possibilities.

Sensing further

These technologies bring music listening and creation into an exciting new area of possibilities. However, these technologies are utilising haptic touch via the skin receptors. The actions of our proprioceptive system via the joint receptors and the sensing of space outside that which we can touch has yet to be explored in relation to music. Yet it seems that the feeling of musical awe is indicating that this could be an important area for discovery.

Awe shows us that there is something mysterious and bigger than us out there, but that we are a part of it. It makes us less focused on ourselves and more on things that are bigger than us (Sun *et al.*, 2023). However, awe does not only make us feel small in relation to something larger than us. It can somehow activate parts of our sensory system that make us feel connected to the space outside of ourselves (Bonner and Friedman, 2011). Awe can make us

feel less alone, less stressed (Monroy and Keltner, 2023; Monroy et al., 2023) and help us manage loss (Koh, Tong and Yuen, 2017). Due to these recent findings, awe is beginning to be researched with a view to how it can help with wellbeing (Chirico and Gaggioli, 2021; Monroy and Keltner, 2023), as well as to enhance the sense of presence and immersion in virtual reality environments (Chirico et al., 2018).

Conclusion

The spatial and immersive aspects of awe are not fully explained by a purely cognitive model of awe, or by aesthetic trinity theory. Neither theory can explain the interaction between person and space that occurs in the presence of the feeling of awe. Awe opens us to the limits of our spatial senses, and this can be disorienting or surprising, threatening, or expansive. Our somatosensory system, and specifically our vestibular and haptic systems are directly involved in our detection of space, via receptors in our orienting system and in our joints, muscles, and skin. If we can physically detect and feel more of the space around us, this has important implications for how to manage the emotions we have in those spaces, how to navigate closed or open spaces as in claustrophobia and agoraphobia, and how to compose, play and listen to music in ways that feel physically expansive and that truly connect us with sound in its spatial sense.

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