Absolute pitch - heredity or practice?

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Abstract. The article presents the importance of auditory perception for musicians, as well as the debate about the genetic influence versus training in the acquisition of perfect pitch. The authors explain that hearing is essential for the musical experience, as music is composed of organised sounds, and the musician's skill is closely linked to his perception and affective memory. There are two types of hearing, relative and absolute, the first of which is related to the ability to identify a note by relating it to other notes, and the second allows you to perceive and define each of the notes that reach the ear. Absolute pitch is rare, occurring in 1 in 10,000 people, and is considered a gift that can be innate or acquired over time with practice. The authors also explain that music mobilises almost all regions of the brain and almost all neural subsystems, which makes this activity very complex. In short, the article presents relevant information about auditory perception and absolute pitch, and discusses the relationship between genetics and training in the acquisition of this musical skill.

Keywords. Absolute pitch, Philosophy, Epistemology, Senses, Sound.

1. Introduction

Auditory perception is part of the life of musicians around the world. Listening, one of the senses, it is essential for human beings, and in the empirical perspective of philosophy, the sensorial experience is the basis of ideas.

According to Edgard Varése, “the music is the organised sound”. Inside this universe of compositions and harmonies, having this extremely appured sense is considered a “gift”, because this talent of the musicist can be intrinsically connected to your perception with the musical instruments and affective memory. During history, talents such as Beethoven, Bach, Mozart and Jimi Hendrix had this “gift”, and revolutionised the world of music.

This article doesn't pretend to approach the several elements connected to the music - height, rhythm, tempo, contour, timbre, intensity, location, reverb, etc - and how our audition can be sharpened enough to differentiate sound notes that reach our ears.

This refined sense can be a genetic facility, so much so that in musician families it is common to find people with this facility compared to the general population. Although, the training can be something more important than a simple heredity, and takes into account the external experiences and culture around the individual. And in this scientific dilemma in which absolute pitch studies are guided: heredity or practice?

2. Research Methods

2.1 The theoretical research

The text addresses the importance of auditory perception for musicians and the difficulty in differentiating sound notes that reach our ears. The research methodology used is the bibliographic review, in which divergent opinions between philosophers and neuroscientists about absolute pitch are conflicted with a new apparatus regarding the senses, especially hearing. It is debated whether the gift of having perfect pitch is hereditary or acquired through practice. For musicians, having perfect pitch is a gift from God, but researchers still aren't sure whether it's an innate or learned skill. The bibliographic review allows analysing different

perspectives on the subject, which enriches the discussion on auditory perception and its relationship with music.

Concepts about the sound wave, musical instruments and types of hearing are presented, and it is highlighted that having a keen hearing is considered a gift by music professionals.

2.2 The philosophy and the senses

As John Locke observed, everything we know about the world comes to us through what we see, hear, smell, touch, or taste; and music would be complete harmony between the senses and cognitive activities. “Musical activity mobilises almost all brain regions that we are aware of, in addition to almost all neural subsystems” [1].

Sound is a wave vibrating in the air, captured and amplified by our auditory system - which amplifies the vibrations and transmits them to our nervous system [2]. Musical notes correspond to the size of this sound wave (or vibration), the higher the vibration corresponds to a high-pitched sound and the lower the vibration corresponds to a low-pitched sound [3].

What you hear is not a pure note, and it depends a lot on the instrument. Instruments are made in such a way that they vibrate in different ways to amplify the sound, which adds some vibrations to the note, which is called timbre.

It is around these concepts that one can define the types of hearing and how difficult it is to have its full capacity. There are two types of hearing: relative and absolute [4]. Relative hearing is the ability to identify a note by relating it to other notes, that is, he needs to hear an arrangement of other notes that are with it in that melody to differentiate it. Absolute pitch, on the other hand, is the ability to perceive and define each of the notes that reach your ear, and this perception goes beyond the musical term, people who have this ability can recognize notes of virtually any sound.

The distinction between musical notes, for those who have this absolute gift, can be similar to understanding the difference between a blue object and a red one. This refined sense is considered rare, studies indicate that it occurs in 1 in every 10 thousand people [5], and among musicians, the number is higher: 4 in every 100 musicians have this ability [6].

For music professionals, this keen sense is considered a gift: either you are born with it, or you can have a relative ear over the years and your familiarity with instruments and music [7]. It is as if it were a priori of the individual, somewhere deep in his mind, and it is the individual who gives him the freedom to think about it or not - this whole perspective of the divine gift of sense is related in a certain way to Descartes' second meditation , where according to him, there are senses and ideas innate to the human being that cannot be considered a pure nothing, and are things that were already inherent in the individual's spirit.

“Apperception […] is the awareness or reflective knowledge of that inner state, but which is not given to all souls, and not always to the same soul either.” [8].

The polymath Gottfried Wilhelm Leibniz, after Descartes' meditations, further structures this innate perspective of the individual: that he has several postulates that the external world only causes them to be awakened. Although both philosophers have a position more related to innatism [9], which disregards sensory experiences (the senses) as a truth and yes, as particular or individual truths - as Leibniz says - it is important to emphasise that sound apperception is being considered here as something hereditary, a priori of the individual.

2.3 Contemporary perception

However, some of the neuroscientists who study the subject say that it is indeed possible to have absolute pitch, and that this would not be linked to any genetic factor. Neuroscientist Daniel Levitin, in his work: The Music in Your Brain, says that the brain shows a maximum degree of receptivity - almost like a sponge - when we are young, voraciously absorbing any and all sounds that are within reach and incorporating them to the very structure of our neural system. As we age, neural circuits become somewhat less flexible, making it more difficult to deeply incorporate new musical systems or language systems.

This whole framework depends on a lot of training, and this auditory capacity is more common in countries that depend on sounds to talk [10] - where the same word with a variation in tone can have different meanings, or that is, a greater phonetic repertoire.

According to John Locke, one of the defenders of British empiricism, experiences provide our intellect with materials for thinking, internal and external experience are the only source of knowledge. Thus, this rare hearing ability would be acquired empirically, where it is believed that the entire cognitive structure is formed based on practical experience, the richer and more intense, the broader and deeper our knowledge becomes.

3. Conclusions

Auditory perception is essential for musicians, since music is organised sound and the ability to perceive notes is fundamental. Music mobilises almost all regions of the brain, in addition to almost all neural subsystems. Relative hearing is the ability to identify a note by relating it to other notes, while absolute pitch is the ability to perceive and define each of the notes that reach your ear. Having a sharp hearing can be a genetic facility, but training can be much more important than simple heredity.

The debate between innatism and anti-innatism is still present today. The entire philosophical framework developed by Locke, Leibniz, Descartes, among others, surpasses time and questions science at all times. Studies regarding absolute pitch have not yet reached a consensus on which of the strands would be correct: a hereditary gift to the individual or its development through external stimuli from the earliest years - the truth is that the mind still continues to be enigmatic, and it should be considered that the neuroscientific field is still gaining space to develop more and more studies on the human mind.

At the same time that this dichotomy exists, there are scientists who believe that this perception is related to both aspects, that there is a correlation between the genetic inheritance and the external sensory stimuli surrounding the individual - the field of constructivism. Where the subject has its own potential and characteristics, but if the environment does not favour this development, they do not materialise.

Epistemology is extremely important for the scientific debate, as it is dedicated to the study of the foundations, budgets and limitations of scientific knowledge. In this way, epistemology allows for a critical and in-depth reflection on business methods and theories in science, which enables a significant advance in the understanding of the studied phenomena. In the case of absolute hearing, advances in neuroscience have been fundamental for understanding the manipulators involved in this skill. Through neuroimaging and electrophysiology studies, it has been possible to identify the acoustic areas that are activated during musical perception and that are related to absolute hearing. Furthermore, neuroscience has also helped to better understand the relationship between genetic and environmental factors in the acquisition of absolute hearing, which may have important emotions in music education and in the development of new therapies for auditory disorders.

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