



Article Type : Research Article
Date Received : 19.12.2021
Date Accepted : 20.12.2021
Date Published : 31.12.2021
e-Issn : 2636-8838
DOI : 10.51576/yegah.1038547

This article has been reviewed by at least two referees and confirmed to include no plagiarism.

IS THERE SILENCE?

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ABSTRACT

This paper focuses on the research question, "Is there silence?" and it is aimed to enable the readers to take action to think and discuss as science aims. This study has compiled documents that will carry out the argument.

It is possible to say that the main phenomenon that causes the emergence of sound is vibration. Sound is produced when the atoms of an agent vibrate back and forth, emitting energy. This vibration makes the air, liquid or solid form around the catalyst vibrate, and the moving air carries the emitted energy in all directions. Incorporating sounds into the definition of music; The perception of compatibility and meaningfulness of a sound varies according to the society in which one lives. Whether the sounds heard are music or noise consists of subjective perception in the context of society and culture. Societies likely perceive sounds that are familiar to them in a genetic or geographical context as music by qualifying them as harmonious and intelligible.

Perception of sound includes the ability to distinguish variables such as duration, intensity and frequency that make up the properties of sound. These features improve the ability of

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individuals or societies to interpret and make sense of sounds. In the relevant experiments in the literature, it has been proven that there is no place in the world that is actually quiet (except for a laboratory-induced vacuum) since sound is a vibration passing through a medium such as gas, liquid, solid. The phenomenon we describe as silence is the sounds that are outside the range of sounds we can hear with our ears. Like this; in real terms, it is possible to say that there is no such thing as silence with our current technological possibilities and brain capacity.

Keywords: Sound, silence, music, noise, hearing

INTRODUCTION

In the news published by BBC News in February 2019; it's reported that Erling Kagge was the first person to reach the North and South poles and the summit of Mount Everest, expressing that we are too exposed to sound to think about the phenomenon of "silence" (BBC, 2019). The motivation for this behaviour was his longing for silence.

So is there such a thing as silence? As music educators and science-loving writers, we deal with the subject in this study. Readers of the article; can take action to think and debate as science intended. We hope that this will happen with the study written for this purpose. We care that new researchers test hypotheses that can be tested by experiments rather than assumptions.

Many people; has a misconception about sound and silence. E.g; Those who think that sound waves are moving waves such as water and light and that they will disappear when they encounter a solid surface (Hapkiewics & Hapkiewics, 1993) or that sound is transmitted through holes and gaps in a way similar to leakage (Driver, Squires, Rushworth, & Wood-Robinson, 1994) are available.

The study; made from the point of view of the physical sciences rather than natural philosophy. It's suggested to read the perspective of the study as a limitation. Because as Zeren (2003) stated; "There is a relationship between music and the physical sciences. And musical things consist of the physics." We would like to give information about sound before the argument.

Formation of Sound

It is possible to say that the main phenomenon that causes the emergence of sound is vibration. Sound is produced when the atoms of an agent vibrate back and forth, emitting energy. This vibration makes the air, liquid or solid form around the catalyst vibrate, and the moving air carries the emitted energy in all directions.

In other words, sound is a physical event that occurs with the fluctuations in air pressure of a vibrating source and stimulates the sense of hearing in humans (Güler & Çobanoğlu, 1994). Our entire environment is covered with waves that will naturally differ from each other.

Although sound waves are one of them, television waves, water waves, microwave waves, earthquake waves are also formed by a kind of vibration movement. A sound wave propagates through the air with the effect of the movements of air molecules. In speaking or singing, the vocal cords exert a force on the air molecules next to them, and as a result, they are separated from their equilibrium positions. Then, by pushing or pulling their neighbours on the side, they also change their equilibrium state. This push and pull movement, which lasts up to the receiver, can be likened to waves on the spring (Parker, 2015).

There is a causal relationship between the intensity of the sound wave and the loudness of the sound. High frequency produces relatively more energy waves. People perceive the pitch difference in music on this basis by comparing them as high and low (Holm, 2020). Perception of sound; It includes the ability to distinguish variables such as duration, intensity and frequency that make up the properties of sound. These features improve the ability of individuals or societies to interpret and make sense of sounds (Gfeller, 2016). To understand the sound wave, a unit called Hertz (Hz) is used, which is equal to one vibration/second. The sound coming out of the tuning fork has a vibration value of 256 Hz. Another important feature of the sound is the period value. The period describes the time it takes for compression or relaxation to move between two successive equivalent points. There is a negative correlation between period and frequency (Parker, 2015).

We can liken the vibrational oscillations that occur in the guitar string, flute or the skin of the drum to the spontaneous undulation of smooth oscillations in a still environment (Bonard, 2000).

Sound in the Context of Noise and Music

Can we call every sound music? The answer to the question will be determined by the social structure and characteristics. Sounds made of natural or artificial vibrations turn into sound waves created by a vibrating object. Whether or not these are perceived as "music" is determined by social consensus, independent of the measurements of their physics discipline (Erol, 2009). Noise differs from music because of the existence of many vibrations with different frequencies that are not perceived in harmony with each other. In this respect, it defines meaningless symbols (Güler & Çobanoğlu, 1994). However, the perception of compatibility and meaningfulness of a sound varies according to society. Whether the sounds heard are music or noise consists of subjective perception in the context of society and culture. Societies likely perceive sounds that are familiar to them in a genetic or geographical context as music by qualifying them as harmonious and intelligible.

Sound and Hearing

Hearing task; basically, it occurs when the brain perceives vibrations using the ear or a similar artificially created structure. While the brain undertakes the main task of hearing, similar structures such as the ear or implant play a mediating role.

If the vibrations are at a level that humans can perceive, the ear as a tool converts the sounds into electrochemical signals that the brain can evaluate. Erol (2009), the phenomenon we define as sound; mentions that there are vibrations that are limited by the threshold of hearing (roughly 20-20,000) in the bio-cultural framework. Another variation; For the formation of sound, factors that can stimulate the ear, environments that transmit these factors uninterruptedly and at a level sufficient to perceive, and an ear and brain that can evaluate the factors are required. In the absence of one of these three elements, what we call sound does not occur (Zeren, 1978). In the human ear, the funnel-like structure of the outer ear canal (pinna) collects sound waves in the air, causing the eardrum to vibrate. Sound vibrations then travel through a complex structure of three small bones (ossicles) called the hammer (malleus), anvil (incus), and stirrup (stapes) to the inner ear and cochlea. Sound vibrations cause fluid in the cochlea to move, which causes hair cells to bend in the inner ear. Hair cells from neural signals are received by auditory nerves (Holm, 2020).

Sound travels at various speeds depending on the medium through which it passes. This is not an absolute speed of sound, as the measured velocity depends on the density of the medium through which it passes. The speed of sound changes under its conditions. Sounds travel faster in solids than liquids and faster in liquids than gases. Two properties determine the speed of a wave passing through a medium: the inertial properties of the medium and its elastic properties. inertia about sound; The inertia of the particles that make up the environment is mentioned. There is a positive correlation between the masses of the particles and their inertia. In this case, their reaction to the air passing through it may vary. In this case; The speed of the sound wave changes according to the density of the substance in the environment (Parker, 2015).

Structures called anechoic rooms, created from walls that do not reflect waves, try to artificially achieve silence. These structures were later restructured as indicated. "This combination means that a person or detector only hears direct sounds (sounds that do not resonate), which simulates being inside an infinitely large room. Invented by Leo Beranek, echo chambers were originally used to refer to acoustic anechoic chambers. More recently, the term has been extended to RF anechoic chambers that eliminate external noise and reflection caused by electromagnetic waves." (mimirbook.com). In other words, it can be used to measure or reduce the sound of a car engine, white goods or an instrument (Holm, 2020).

John Cage, who draws attention as a musician who uses such rooms in his works, is known for his silent work. Silverman (2012) mentions that being in complete silence in the anechoic chamber at Harvard impressed Cage a lot. The piano piece “4 minutes 33 seconds”, composed in 1952 and first performed by David Tudor, consisted entirely of silences. Although this experience was strange at first, it was a step towards thinking about sound and silence. It would not be wrong to say that what is experienced during the concert is not silence, but an atmosphere of silence. The breathing and squeaking of chairs in the environment were involuntarily perceived as sound and heard during the concert.

If sounds are transmitted to the brain by hearing, can't deaf people perceive sounds? Can we say that what they experience is silence? Just because a person is deaf does not mean they cannot receive sensory stimuli that are described as sounds. In this case, hearing can also be mentioned in deaf people. Typically, hearing for deaf people happens in two different ways. The first is vibration through bone conduction. Vibrations are perceived by the person as the sound passes through whatever medium it is passing through. As it is known, Beethoven composed some of his greatest works while he was deaf. This happens by perceiving the vibrational energy produced by the notes played (Holm, 2020). Thus, it is possible to say that sound production is intuitively understood in the case of deafness. The experience of silence cannot be mentioned for deaf individuals either. In addition, when the auditory processing system of the brain is left without stimulus due to deafness or any other reason, the presence of a ringing-like sound and humming in the ear has also been noted (Holm, 2020). In other words, individuals with hearing impairment can perceive sounds through the bone if they do not use an artificial device. They also feel a ringing-like sound inside, which is another source of the sound.

In the report of the World Health Organization on Hearing published in March 2021, based on the data they have; It is predicted that in the next 30 years, it may face significant problems related to hearing (WHO, 2021). This current determination; in addition to the fact that it will create new research topics in areas of learning, communication and health, from the point of view of this research; suggests that we will be subject to more silence “in the context of what people understand” in the coming years.

Audible sound covers a wide frequency range. The perception of airborne infrasound (sounds below 20 Hz) has been documented in a few mammals. While animals that produce vocalizations with infrasonic components like elephants) present conspicuous examples of potential use of infrasound (Zeyn, et. al., 2020). The sounds below (subsonic) or above (supersonic) these sounds, which we can give as an average value for humans, between 20 Hz

and 20000 Hz, may change with the advancement of age (Parker, 2015). Considering that there are constantly vibrating, moving and shifting objects, it would not be wrong to think that hearing the vibrations emitted by these is vital for a living thing. If the silence that can be created artificially in the laboratory were real, we would not even be able to find our way. As you can see, sound is not only the basic element of music but also has a vital function. The presence of the sound in the time and environment can change the functioning.

The place that represents silence is emptiness because there is no medium through which sound can pass in emptiness. Being the first to study this subject and discover that a medium is needed to pass sound through, Boyle conducted an experiment where he set up a ringing alarm clock inside a glass jar and then sucked all the air out of the jar with a pump. As the air slowly faded away, the sound ceased as there was nothing left in the jar for the sound to pass through. In Boyle's experiment, it has been proven that there is no place in the world that is virtually silent (except for a laboratory-induced vacuum) because the sound is a vibration passing through a medium such as gas, liquid, solid (Holm, 2020).

RESULT

As a result; like the phenomenon of silence, the emptiness that represents, is a perception. Even the area called space consists of a gaseous element environment. Due to the presence of matter in such an environment, the concept of space is physically rejected. Wherever there is medium, there will be sound. Hence, we would like to reiterate the information that absolute silence cannot be established even in the laboratory environment, as stated above. So, for now, there is no possibility that there is no sound in terms of the environment.

As long as all existing vibrations stimulate our ears, we perceive this energy as sound. However, as stated, people also only hear sounds in a certain frequency range, although it varies from creature to creature. Even the deaf have bones etc. e mentioned that it detects vibrations through In this case, although the word senses can be used instead of the word hearing, this will not change the presence of the sound. We call the sounds we did not hear as silent.

That's like saying that what we don't see isn't there. However, the current human species needs to make sense of nature in order to understand it. Therefore, human beings described the sounds they did not hear as silence. John Cage's statement "Music is just the act of listening that is constantly interrupted" (Cage, 1985) makes an important contribution to this argument. Thus, it is possible to say that there is no such thing as silence, in real terms, with our current technological possibilities and brain capacity.

SUGGESTIONS

Based on the information in the content of the study; In the relevant course or test names, it is recommended that the expression "musical perception" be adopted rather than "musical hearing". As a research proposal; Experimental studies in which deaf people are included in musical perception tests can be given. In addition, it can be suggested that different frequencies or the perception of silence should be studied causally in the field of psychology. The phenomenon of silence can be studied in the field of philosophy as this study leaves its scope.

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