



BNAM
2016
Baltic-Nordic Acoustic Meeting
June 20-22 2016
KTH, Stockholm, Sweden

Feeling music vibrations - a vibrosensoric experience

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The concept of feeling vibrations using different vibroacoustic technologies is perhaps applicable for people with a hearing impairment. In 1980s vibroacoustic (VA) technology pioneered by Skille, Lehtikoinen and others enabled people to experience low tone frequencies for different kinds of relaxation techniques which were later used in the areas of music therapy. However, during the course of this research it is clear that some of these origins go right back to Helmholtz's ideas of sensations of tones. This paper examines how these origins can be applied to our understanding of feeling music approaches and identifies the theories in order to deepen our knowledge on a vibrosensoric experience.

The low, middle and high tones can be felt through the body when the music is playing and the area in which they're felt varies according to the frequency. When a person lies on a VA floor and plays their favourite piece of music they will encounter a vibrosensoric experience, where the music creates sensations of tones and physical experiences through the body. Research into how people experience the sensations of tones would enable us to gain a further understanding into how musical tones are experienced physiologically. This paper will put forward some ideas into our understanding of the concepts of sensations of tones as defined by Helmholtz. Furthermore, the approaches will enable people with hearing impairments, including those with multiple disabilities to experience music more fully. This can be applied in areas of music therapy and special education.

1. Introduction

Helmholtz and others [7,11] throughout history have compared different senses to each other. Sounds are made of oscillatory vibrations in the air, just like there are ripples in the water when a stone is thrown in. The sound vibrations can be not only heard but also felt throughout the body. That is two different senses make up a holistic sensation of one single event in time. In the same way when the sun is shining the eyes sense the light while the skin feels the warmth but not vice versa. The simultaneous sensations of the ears and the skin about a sound event is the basis of the notions on feeling the music. The vibrations from the music can be enhanced in different ways, some of which we explore throughout the article. In other words: "How are deafblind or dual-sensory impaired people able to experience or identify different music styles?"

In music the different tones are felt in different parts of the body. That is, low tones are usually felt in the feet, legs and hips, middle tones can be felt in the stomach, chest and arms and high tones respectively in the fingers, head and hair [8]. However, other researchers describe the effects quite differently as can be read from [5:154] "For example, a flute sound is unlikely to resonate our abdomens because 1) the sound isn't penetrating enough, 2) the tone isn't loud enough and most important 3) the sound isn't deep enough to vibrate the mass of the organs in the belly area. On the other hand, low pitch, powerful instruments, such as the tuba or low kettle drums (timpani) are likely to touch the abdomen, because their lower, slower wavelengths of sound and their potential volume of sound." (highlighting original)

The vibroacoustic therapy methods from 1970s and 1980s [11,1] are still used when helping the client with hearing aids or cochlear implants (bilateral or bimodal) to develop the residual hearing. This means when using vibroacoustic (VA) or physioacoustic (PA) facilities there needs to be considerations relating to any magnetic field elements that may affect the hearing aid devices. Furthermore, when playing different music styles, the volume level needs to be carefully balanced, so that the client does not experience any distortion or disturbances that may hinder the experience and create negative results. But if the volume level is suitable it enhances the acoustic hearing and allows the clients' holistic experience from the music. Similarly for those hearing impaired clients who do not use hearing aid devices their musical and vibrosensoric experiences may differ to the other group. One does not always need to have the VA or PA facilities at a loud volume in order to enhance the vibrosensoric experience. Otherwise the vibrations can be uncomfortable or cause discomfort to the body [13].

2. The vibrosensoric experience

"If you have ever listened to recorded music while lying on a wooden floor of a room where the stereo speakers are also on the floor, you have certainly experienced the music vibrating through your entire body." [5:154]

"If you've been fortunate enough to go to a major symphony orchestra concert in a concert hall with a wooden floor, you have experienced the resonances coming into your body most strongly through your feet." [5:154]

"... like the drone... the musical instruments have the power of touching us in specific places. Used either as a drone, or in melody or in harmony, each individual instrument or family of instruments can effect and resonate us specifically." [5:154]

When a person uses VA facilities he/she may encounter a vibrosensoric experience. By this we refer to for example a person lying a dedicated music floor. When playing a particular music style we need to analyse the processes what the person is feeling through their body, the sensations and the different tonal qualities from the music itself. In some cases the way in which a person with a profound learning disability responds to the musical vibrations may differ to others and thus it may be difficult to evaluate or assess due to different communication needs.

If a person has hearing he/she may respond very differently to someone with an impaired hearing. The people with normal hearing are able to hear all the different sounds of the music and at the same time feel the different tones through their bodies, whereas a hearing impaired person is only able to feel the vibrations but not hear the auditive sounds at their fullest. Some of Helmholtz' and Stumpf's theories specify the quality of tones, pitch durations etc. but the feeling may be interpreted differently according to the person. In the case of hearing people they can respond more emotionally especially if the music has an emotional quality or it refers to a past experience in the persons' life. In some cases the person may respond in the way they breathe, relax and how they feel the tones in the nervous system. The combination of all these factors in our view contribute towards having a vibrosensoric experience.

2.1. Hearing aids devices and the vibrosensoric experience

The vibroacoustic element refers to the amount of vibration and amplification of the musical tones thereby varying the intensity or duration of music, which also contribute to the VA experience. The combination of the three factors above therefore enables people to get a vibrosensoric experience. Another point to consider: the people who wear hearing aid

devices, that is HA or CI, the combined sensations they perceive through the hearing aid devices and the VA facilities also contribute to the vibrosensoric experience.

VA and PA facilities have been used in treating different health issues (e.g. muscle toning, pain management and stroke rehabilitation) with good results [13, 9, 14]. This approach, however, concentrates on the experience from music vibrations through the VA facilities, how it enhances the acoustical listening experience or replaces it altogether if there is no acoustical hearing present. Vibrosensoric experience refers also to feeling the vibrations through other means, such as enhancing vibrations with e.g. an inflatable balloon or listening to music vibrations in the air as is, without amplification or enhancement.

In music therapy when working with hearing or dual-sensory impaired clients, they need to experience music by vibrosensoric experience with or replacing acoustic hearing in order to get an equal therapy session with music as their hearing counterparts do. In hearing impaired people the acoustic hearing is not enough but it must be complemented with being able to feel the vibrations. The same methods can be used in listening to music, either live or pre-recorded.

2.2. Soundscapes within the vibrosensoric experience

The reasons for listening to music vary just like in hearing people, with the addition of the need of the vibrosensoric experience, which results in different requirements for the setting. This depends on where the client is experiencing music vibrations and which type of environment they are being exposed to, i.e., home, rehabilitation centre or a concert venue. Various equipment, VA facilities and additional listening devices will need to be set and balanced in the correct manner in order to the client to have a balanced experience. The vibrosensoric experience can be helpful in re-learning sounds and soundscapes as well as enjoying music in a concert setting. The re-learning of sounds and soundscapes might be beneficial when combined with other types of rehabilitation processes. With children, vibrosensoric experiences might support their auditive learning experiences.

People who are introduced with CIs have to go through the rehabilitation process. This mainly focuses on developing and hearing spoken language. The vibrations created by speaking are frequently used in aiding the individual to find the correct manner and place of articulation as well as speech rhythm. However, a large majority of adults especially those who are deafened or have had some musical experience with hearing aids appear to want to have back or enhance their musical experiences. This also helps them with their spoken language intonation patterns.

For example one approach could be to replay some old music LPs, singles, or CDs through a music hifi system (loudspeakers) and to relisten and analyse the music again. In some cases it may be appropriate to adopt karaoke style methods, to sing along to the favourite songs. Whilst listening one can also place the hands onto the music speakers and/or use a balloon to enhance the vibrosensoric experience. This allows a person to develop their new soundscapes to their CIs with the help of the vibrations of the music amplified by the balloon.

To achieve this, audiologists who set up the CI programmes need to consider new soundscapes that may differ to the spoken language perception in order to enhance the music frequencies through the CIs. In some cases some people may have one hearing aid and one CI, this is referred to as bimodal hearing. The soundscape received by the user who has been used to using hearing aids may differ to the CI soundscape. In this case it may be necessary to adjust the hearing aid frequencies nearer or to match the frequencies used in the CI programmes. If this is not done the user is likely to experience imbalance which can cause disorientation or frustration in the hearing environment.

When attending a live concert the music can be felt through the air, either directly as is or with enhancement such as a balloon. Furthermore, sometimes there are structures within the concert hall or other venues which resonate with the music thus amplifying the vibrations. These structures may include metal hand rails, certain type of benches etc. Most of the time these vibrations go unnoticed but by concentrating on them they help in experiencing the music in question more fully. Furthermore, the structures and chairs etc. in a concert venue can be adapted in such a way that they reduce the unwanted, disturbingly strong vibrations. This, however, hinders the possibility to listen to the vibrations through surfaces and structures if wished for. Different types of music create different kind of vibrations: in a classical music concert the vibrations are typically soft and intermingled to represent the complex music texture whereas in a rock or pop concert the vibrations tend to be sharper and of a simpler texture, just like the music itself respectively. That is: the kind of music the kind of vibrations. One could perhaps begin exploring the vibrations with a solo instrument simple music where the vibrations are less intermingled and easier to decipher and feel.

3. Vibro- and physioacoustic facilities

3.1. Music floor designs

VA technology which was originally pioneered by Olav Skille in Norway started with a so-called music bed. Skille's original (1968) vibroacoustic equipment setup and software consisted of: a vibration unit (chair or bed), an audio unit, a

mattress, a 4 channel stereo amplifier (60 watt output, frequency response from 30 Hz) and a set of specially designed audio cassettes [13]. Currently there are different types of programmes that can be used for example for muscle toning and relaxation. A user would lie on the bed/ sit in the chair for about 30-40 minutes. In some cases users may experience some nausea. This is also found to be one of the effects on low frequency noise on human [2,9]. Sometimes a water bed has also been used with the vibroacoustic setup [13, 14, 16].

3.2. The physioacoustic chair by Lehtikoinen

In the 1990s Lehtikoinen went a step further to introduce a dentist style comfortable chair that allows the user to adjust the position of the chair. He set up a laptop-based system of programmes allowing the therapist to control the different areas on the body where you wanted the vibrations to be felt. This was a more flexible system to the original by Skille. Some therapists would use PA chairs for clients who suffered from alcohol or drug abuse along with toning of muscles for sport. Actually Manchester and Derby football clubs had 12 of these chairs for toning their muscles before the game. Sports industry wanted to improve muscle toning to repair possible injuries.

“The key to sound healing would be knowing which sonic frequency should be applied to the body or various physical disorders and how the sound should be applied.” [6: 519].

3.3. Current types of vibroacoustic facilities

In a school centre in Norway a basic Skille’s concept was further expanded for developing a special music floor. The principle here was to have a dedicated room built in a high quality grained pine wood which was put up the wall in planks with specific design. The music floor consisted of magnetic elements built in to the speaker system. You can lie, sit, stand or dance on the floor. This was built during the 1980s using the technology of the period. One can only describe it as lying on your music hifi system.

When playing pre-recorded music you experience the music going through your body when lying down but the sound vibrations fill the room and the music engulfs you in a circular fashion bouncing from the wooden planks on the wall if you are standing up. The wooden environment enhances the quality of the musical soundscape by adding the possibility to enjoy a simultaneous vibrosensoric experience. Also important is that the quality of the amplifiers, i.e. with adjustable volume, bass and treble. Be it noted that a very special venue is a church hall with a music floor in Andebu, Norway. This allows the hearing impaired people to feel the church music through their bodies while sitting on the chairs on the music floor. Thus giving the church goers an additional vibrosensoric experience.

The other vibroacoustic facilities can include the following: a vibroacoustic bed or a water bed with built in speakers, an air mattress with two PA speakers placed in the opposite sides or gym hall with gym mats with the loudspeakers built-in to the floor relaying the vibrations to the individual. A small resonator box made of wood can be used with babies and small children. These are used by music therapists and other professionals. In 1994-5 one of the authors was involved with designing a portable music floor known as a tactile sound system with University of Sheffield. This includes 4 interlinkable modules. They could be used as a bed or independently, all linked to the same music centre. This was used in some deaf schools throughout the UK and abroad. It also won a design award and was included in the exhibition in the Millenium Dome opening [3, 4].

4. Conclusions

It appears that Helmholtz’ original work on tones and sensations is a valuable resource to the understanding of how we can feel musical tones through our body. Furthermore, hearing impaired people are able to gain a vibrosensoric experience using different VA and PA facilities. Whereas previous research work appears to focus on people with normal hearing the area of hearing impairment and how we perceive music is a relatively new field which needs to be explored further. There are benefits of using VA facilities for children who are using CIs and who need to develop their language and musical skills. In addition the changing phase of technologies allows new possibilities and even greater experiences, for example the SoundShirt by Junger Symphoniker Hamburg [17], which appears to provide a new and fascinating way to vibrosensoric experiences.

The musical tone perception may vary from person to person. These are invisible parameters which are not easy to report or illustrate in a visual way. Most of the research here is through observation and analysis from client groups with hearing impairments and other disabilities. In other words, perhaps the way a normally hearing individual perceives music differs from the hearing impaired person’s perception as the role of the acoustic part of the vibrosensoric experience needs further research as well as the combination and the weight of the different components of the process.

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