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# Sustainable Urban Sound Design

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# **Sustainable Urban Sound Design**

An Interactive Qualifying Project Report

submitted to the Faculty

of the

**WORCESTER POLYTECHNIC INSTITUTE**

in partial fulfillment of the requirements for the

Degree of Bachelor of Science

by

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Date: May 20, 2004

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This report represents the work of one or more WPI undergraduate students submitted to the faculty as evidence of completion of a degree requirement. WPI routinely publishes these reports on its web site without editorial or peer review.

## **Abstract**

This project looks closely at vibrations of various forms including sympathetic and harmonic vibrations. The project then applies the principles of vibrations to the human body, and presents the Theory of Bodily Efficiency. The theory states that when all of the parts of the body work in harmony with one another, energy is used more efficiently thus making for a healthier body. The theory also states that harmony can be disrupted by vibrations from outside sources such as cell phones and radio waves, but that those vibrations can be placed back in harmony through the use of sound. Background music is then studied, and flaws with the current background music are shown. Recommendations for future work are made, including recommending the creation of a new form of healthy background music.

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## **What is a vibration?**

Cars vibrate; cell phones vibrate; radios send out waves send out signals, which are essentially electrical vibrations that travel along a medium. Of course, the fact that all these things vibrate is of little surprise to most people, but what if somebody was told that a rock vibrates? Would they even believe this, much less expected this? Everything in existence vibrates. Everything has to vibrate, because the smallest building blocks of matter, atoms themselves, vibrate.

The fact that everything vibrates hardly answers the question of what a vibration actually is. For the purpose of this paper, a vibration will be considered anything that moves to and fro, or anything that is predictable and repetitive such as a heart-beat. Beats, pulses, and other slowly repeating things will be considered low frequency vibrations.

Frequency is another topic that will be discussed in this paper. Frequency can be defined as the rate of a vibration. In simple terms, frequency is the number of times that something goes to and fro, or the number of times something occurs, per second. In the case of a person whose heart beats 60 times a minute, the frequency of their heart-beat would be 1Hertz (Hz), or 1 beat per second.

Vibrations have the ability to vibrate in or out of harmony with one another. Since a vibration is a to and fro pattern, harmony can best be explained as multiple vibrations which go to and fro at around the same time. In some situations, this harmonic motion can lead to resonance.

## **Sympathetic Resonance and Vibrations**

Have you ever heard stories of opera singers breaking crystal glasses? Perhaps you have made a crystal glass “sing” by using your finger? Both of these scenarios are examples of a phenomenon known as resonance. Merriam Webster online defines resonance as a large vibration that is caused by a small vibration with a similar frequency (Merriam-Webster Online). Resonance, in simpler terms, is when one vibration is applied to another vibration of a similar frequency, and this causes the amplitude of the second vibration to increase. The force, or amplitude of the initial vibration can be large, or small, but the amplitude of the second vibration will continuously increase as even a small force will keep adding to the vibrational energy.

Resonance is not limited to crystal glasses either. A large commercial use of resonance is that of vibratory pile drivers. These types of pile drivers are large machines that are rigidly mounted to the top of a pile. These machines are capable of vibrating at varying frequencies such that they can be tuned to the natural frequency of a pile and ground combination. Once the natural (resonant) frequency is achieved the pile literally sinks into the ground under its own weight (Erofeev).

Sympathetic vibration is when one object causes another object to vibrate without physically touching the first object. When the initial vibration happens to be at a harmonic frequency of the sympathetic vibration a phenomenon known as sympathetic resonance occurs. An example of this can be seen in a piano where the vibration of one string causes all the strings of the same note in higher octaves to vibrate as well. This occurs because the higher octave

strings are overtones of the lower note, or in other words the frequency of the higher note divided by the frequency of the lower note produces a whole number. A simpler way of explaining this is that the higher string is in a “harmonic ratio” with the lower string (Encarta Online Encyclopedia).

## **Circadian Rhythm**

It is possible for the human body to undergo sympathetic vibration. An example of this is jet lag. The culprit behind jet lag is the circadian rhythm, which is an example of a sympathetic vibration. A person’s circadian rhythm refers to their body’s schedule of things to do on a daily basis. For a more scientific definition, circadian rhythms are mental as well as physical changes that happen to the body on a daily basis. Two changes that commonly occur due to circadian rhythms are feelings of hunger during times when your body is adjusted to eating, and overall feelings of tiredness when the sun goes down (Sleep).

The changes listed above might seem to be purely mental or emotional, but there are some physical effects that go along with these feelings. A part of the brain known as the “suprachiasmatic nucleus or SCN” receives signals from photoreceptors in the eye. It is this part of the brain that is believed to control a person’s circadian rhythm. The SCN communicates with the pineal gland, which is responsible for the production of melatonin. At night, when there is less light, the levels of melatonin in the body rise, thus making a person feel drowsy. Other physical effects that are affected by the SCN are “body temperature, hormone secretion, urine production, and changes in blood pressure.” (Sleep)

History tells us that the circadian rhythm is extremely important and should not be ignored. Three major industrial accidents have been partly attributed to “errors made by fatigued night shift workers.” These accidents are the “Exxon Valdez oil spill”, the “Three Mile Island and Chernobyl nuclear power plant accidents.” A different study showed that hospital interns were more likely to misinterpret test results at night than during the day, which could be extremely dangerous to patients (Sleep).

Since vibrations of different sorts can have an effect on the human body, a new area in therapy has developed. This area is known as vibration therapy. It is still a developing field, but it shows a lot of potential for health benefits.

## **Vibration Therapy**

The concept of vibration therapy has become popular since the 1990’s. There are three main areas where it is believed that vibration therapy can help a person. These areas are athletic performance, rehabilitation, and health in general. In the athletic performance field, it is believed that vibration therapy may help a person recover from a strenuous workout more quickly. It is also believed that flexibility may be improved from vibration therapy. For rehabilitation therapy, bone health and ACL injuries are speculated to be improved by vibrational therapy. In the field of general health, whole body vibration may help people with a history of strokes have improved posture control and better balance. Certain spinal cord injuries may be helped by vibrational therapy as well (Grantham).



The idea of vibration therapy was around before 1990, but only in recent years have vibrating platforms hit the market. These platforms are just what would be expected, a platform which holds a person on top and shakes small distances at rather fast frequencies. An example of the amplitude and frequency of a platform is one that moves up and down 3 millimeters (total 6 millimeter from highest point to lowest point) at a rate of 30 Hz, or 30 times a second (Grantham).

Vibrational therapy platforms are being looked at by NASA funded scientists to discover whether they can help reduce the bone mass loss due to a lack of gravity. Stage 1 and 2 clinical trials have been conducted on 60 post menopausal women to see if vibration therapy can help with problems due to loss of bone mass. The trials so far have had positive results, but larger trials are necessary to determine exactly how effective the treatment is (Good Vibrations).

The current trend of vibrational therapy seems to point towards physically moving the body via some sort of device (usually a vibratory platform) which leads many people to believe that the reason vibrational therapy works is due to the body counteracting accelerations from the applied motion. This may very well be the reason why vibrational therapy works, however there are other aspects of vibrational therapy not well explored, namely harmonizing the body and parts of the body to have a more healthy self.

## **Vibroacoustic Therapy**

Vibroacoustic therapy is less common form of Vibration therapy that uses sound as the driving force behind the therapy. Sound waves are pulses of low and high pressure, and due to

sympathetic vibration can act on the body through a medium (air) even though the body is not directly touching any speaker or sound generating device.

Currently, it is believed that Vibroacoustic therapy can at least create an increase in blood flow, have a muscle relaxing effect, and have various positive effects on cell growth. In particular, Vibroacoustic therapy has shown to be an effective treatment for Cerebral Palsy, Multiple Sclerosis, and Cystic Fibrosis (Soundbeam).

Developed in the 1980's Vibroacoustic therapy (also known as low frequency sound massage) is a physically and emotionally relaxing music and pulsed sinusoidal low frequency beats played through speakers built into a bed or chair. The beats range from 20Hz to 70HZ.

A main figure in the development of Vibroacoustic Therapy is Olav Skille. While working with severely handicapped children in Norway, he pressed speakers against beanbags that the children were laying on wanting them experience the feeling of sound. He wanted to know if this action would reduce muscle problems in the children. "He proposed 3 universal principles of sound vibration and music:

1. Low frequencies can relax and high frequencies can raise tension.
2. Rhythmical music can stimulate and non-rhythmical music can pacify.
3. Loud music can create aggression and soft music can act as a sedative."

Because of these three principals, Skille believed that the soft, rhythmical, low frequency music had a positive relaxing effect on the children (Wigram, Anthony L.). Even though Olav Skille and other people have done tests showing that vibroacoustic therapy has potential health benefits, it still has not received much research or acceptance.

## Acceptance of Vibroacoustic Therapy

When any new idea comes around, it is always met with great skepticism. How long ago was it that powering cars using corn seemed silly? Now we have E85 ethanol, which is largely made of corn alcohol. Not all new ideas come to fruition, or work well if they do. E85 has many disadvantages, namely the amount of corn it would take to fuel the country is astronomical.

The idea of vibroacoustic therapy is just met with just as much skepticism as any other idea. How much good can actually be achieved from sound? How powerful can sound really be? Chemistry may be a good place to start looking for answers to these questions. A division of chemistry known as sonochemistry in particular makes a good place to start. When a low frequency is applied to a fluid cavitation bubbles can be produced that then collapse. This cavitation effect of low frequencies can help reactions, or possibly give a better mixing of fluids. These effects are the basis of sonochemistry (Mason, 356).

Despite the potential benefits from sonochemistry, it is not considered a part of mainstream chemistry. This is due to many factors that could also help explain why vibroacoustic therapy is not recognized as a mainstream form of therapy. The first reason that sonochemistry is not widely accepted is that using sound as an energy source for a reaction seems strange to chemists who have never heard of such things. Using sound as energy sources is also more of an engineering idea than a chemical one, and the idea has not made much of a transition into other domains besides engineering. The last reason that sonochemistry is not broadly recognized is a lack of knowledge in general, both on what commercial products are

available that produce low frequency vibrations which could be used in sonochemistry, as well as the actual principles behind sonochemistry. Chemists must be interested enough in the ideas to learn the principles that drive them before they are fully accepted, and this isn't currently happening (Mason, 356).

The same skepticism seen in sonochemistry can be seen in the field of vibroacoustic therapy. Vibration therapy has received much more research and is coming to be accepted, but vibroacoustic therapy is still relatively new. Sound being used as an energy source seems strange regardless of whether it is sonochemistry or vibroacoustic therapy. Just as engineers are seeing that sound may have more potential than is currently being used, there are websites selling a variety of vibroacoustic products such as chairs with speakers, and CDs to use for the experience ([Vibroacoustic Therapy Products](#)), but despite this, the use of sound for more than enjoyment has yet to cross into the field of mainstream therapy. Finally, general interest must be inspired in the field of vibroacoustic therapy if it is to be broadly accepted. One of the ideas that can be found online regarding vibroacoustic therapy is that of body harmony.

## **Vibrations and the Body**

There are many different theories about bodily harmony, and its ability to produce a healthier person. Some of these theories include a variation of string theory, many kinds of healing theories, and theories about vibrations in general. A lot of theories refer to a person's aura, or some other cosmic presence of the body, but generally the amount of energy in each part of the body is what is being looked at.

The variation of string theory noted above theory is called “Membranes of life.” In this theory it describes strings that connect all things together. It describes the body as having an interconnected layer of strings over and around each cell. The strings all vibrate at different frequencies and amplitudes, and the amount of stress or tension in a person’s body changes these vibrations. When strings become loose due to boredom or laziness, or over taught due to stress, the strings become unstable, and negative effects are noted on the body (Aural resonance).

The next theory on whole body harmony is “The Power of Harmonics.” In this theory it describes a person’s aura as being a sort of vibrational signature. This theory states that each part of the body vibrates, and that the compilation of those vibrations makes up a person’s aura. It is also stated in this theory that disease, and other general wellness factors will change a person’s aura. It is theorized that playing sound to the affected area can help restore the natural vibration to that area, thus eliminating the disease (The power of harmonics).

In all the theories that have been researched, the common, yet forgotten element is energy. Vibration, amplitude, resonance, and harmony, all essentially refer to internal energy. Most of the theories that have been found regarding bodily harmony note that higher energy is good, but never seem to go into detail on why.

Is it possible that some cosmic alignment is truly the reason why bodily harmony is healthy for a person? That is for each individual to decide, and will not be speculated on in this paper. Is there any science behind harmony, vibration, resonance, and energy? A resounding yes is the answer to the latter question, though how those phenomenon relate to the human body is yet unknown.

One of the best examples of resonance and harmony (energy) can be seen in parks and playgrounds. When a parent pushes a child on a swing, they push periodically, not continuously, and they always push the child at or around the same point in the child's swing cycle. The result of this periodic push is well known, the swing amplitude and velocity of the child increase, while the effort required to push the child remains constant and minimal. This is yet another example of harmonic resonance. The parent pushes in harmony with the child's swing cycle, due to the fact that they push the child around the same point in the swing cycle, and the amplitude of the child's swing rises, or resonates, even though the effort on the parent's part is relatively constant. Now think about what would happen if a parent pushed their child at random intervals, in whatever part of the child's swing cycle they felt like. This would result in much more effort on the part of the parent (more energy used), and the child's swing would never reach the heights that it would have using harmonic resonance.

Our bodies are not terribly different from a child on a swing. In our body, our organs all work in conjunction with one another, just as the parent works in conjunction with the child on the swing. Our organs also work at various frequencies and optimally, would work together for best physical health. To prove this point, the lungs and heart will be looked at. Your heart beats at a frequency which varies depending on your level of stimulation, running for example will heighten your heart beat, while relaxing can lower your heart beat. Your lungs work in a similar manner, when you are stimulated, your lungs work harder and faster, while at rest they work much more slowly. If a person's heart were to beat fast, but their breathing was to remain constant, the blood flowing to the lungs would take away oxygen from your lungs at a rapid rate, while the oxygen in the lungs would be replenished at a slow rate, resulting in a lower average oxygen level in the blood leaving the lungs, which would eventually result in a decrease in

overall body energy. On the other side, if a person's heart were beating at a normal rate, but a person was breathing rapidly, that person would be exhaling early, before the oxygen levels in the lungs decreased to an unusable level. This means that too much time would be spent exhaling, thus leaving less oxygen rich blood for the body. While typically either of these situations is not a life threatening problem, the oxygen in the lungs is used less efficiently than it would be if the heart and the lungs were simply working in harmony with one another. Inefficiency is merely another way of saying wasted energy, which is exactly what our body is doing when we are not harmonized.

The example above is one case of inefficiency, but it can be reasonably concluded that there will always be a benefit to organs working in conjunction with one another. Dr. Yoshio Manaka a doctor helped publish a chart with the frequencies that different organs vibrate at (Tai Chi). The chart can be seen below.

<b>ORGAN</b>	<b>FREQUENCY</b>
Lung	126 Cycles Per Minute
Colon	108 Cycles Per Minute
Spleen	132 Cycles Per Minute
Stomach	132 Cycles Per Minute
Heart	126 Cycles Per Minute
Small Intestine	120 Cycles Per Minute
Kidney	120 Cycles Per Minute
Bladder	112 Cycles Per Minute
Pericardium	176 Cycles Per Minute
San Jiao (Triple Heater)	152 Cycles Per Minute
Liver	108 Cycles Per Minute
Gallbladder	120 Cycles Per Minute
Ren Mai (Conceptor Vessel)	104 Cycles Per Minute
Du Mai (Governing Vessel)	104 Cycles Per Minute (Yes it is the same)

(Tai Chi)

## **The Theory of Bodily Efficiency**

After reading and researching many theories on whole body harmony, and general well being, a new theory is proposed. This new theory will be called, “The theory of Bodily Efficiency.” This new theory starts with a common physics law, that energy can be neither created nor destroyed. It can, however, change forms. When a person is completely healthy, their entire body works in harmony with itself, thus creating the most efficient state possible. Not just organs, but the entire body, right down to the atoms themselves, vibrates together. This is the optimal state of the body, and lends itself to the healthiest body since excess energy that would normally be wasted by competing organs can be used to fight off infections and diseases.



Many modern inventions produce vibrations. Microwaves, cell phones, computers, radio, television, and cars all produce vibrations that would not have been present hundreds of years ago. Not only does the list of devices that produce vibration continue, but the list of devices that actually broadcast vibrations such as satellite, GPS, Radio and many other things. These vibrations all interact with our bodies in ways that can't be seen, but seen or not they still interact with our bodies. Due to these interactions, it is much harder to harmonize the body than it was hundreds of years ago. Sure, the amount of influence that can be seen by any single one of these devices is negligible as compared to the effect of the sun rising and setting, but even that effect has been diminished due to artificial light. All of these vibrations acting on the body have an impact on the body's harmony, and need to be corrected.

A body that is out of harmony wastes much energy. This wasted energy can be attributed partially to the stomach, intestines and colon all working at different rates, thus meaning that each organ must work harder to perform its job satisfactorily. The heart and the lungs are also competing for dominance, as one must follow the other's lead, thus both are being inefficient and using too much energy. Even organs such as the kidneys, liver and pancreas are all using excess energy. This wasted energy means that a person will be more tired, have less stamina and endurance, and will result in an over-all state of unhealthiness. The wasted energy does not end with a body's organs. Even atoms themselves vibrate, and vibrating in harmony with one another will help preserve energy that would otherwise be wasted.

The Theory of Bodily Efficiency also states that the body can be placed back in harmony with the same amount of effort that was required to take it out of harmony. This means that the further out of harmony a body is, the more it will take to place the body back in harmony.

Vibroacoustic therapy may prove to be an effective method for placing the body back in harmony. Audible sound contains much more energy than radio waves, and GPS signals, and therefore may be used to correct disharmonies produced by the latter. The best way to place the body back in harmony is to play frequencies that are undertones of the body's natural frequencies. This means that when the natural frequency of the specific part of the body is divided by the frequency played, a whole number should be produced. This can best be achieved by playing very low frequencies, for example, the chart shown previously lists 14 different organs, and their resonant frequencies. The greatest common denominator between those 14 frequencies is 2 Hz. It should be noted however, that using the greatest common frequency possible that will be an undertone of the vibrations desired to be harmonized will have the greatest results. The Theory of Bodily Efficiency can be directly applied to background music.

## **Background Music**

To find out how the Theory of Bodily Efficiency can be applied to background music, it is important to look at current background music. To start, a working definition of "background music" needs to be established. The working definition is as follows: Ambient sound played for the purpose of filling silences in various public spaces, but not intended to be the main focus of a person's thoughts (Background Music).

Background music is everywhere, in supermarkets, in department stores, restaurants, theme parks, even on the telephone. Since businesses of every type are subscribing to background music, from hotels to supermarkets, it is very rare to walk into a store and hear no background music at all. Whether or not an individual store subscribes to a service is up to that store, but a majority of big

businesses subscribe to some sort of background music service. By subscribing to a background music provider, businesses don't have to worry about picking songs, or keeping new CD's in the CD player, and awkward silences will never be a problem. A few examples of businesses that subscribe to background music are stores like Hannaford supermarkets, Hotel Vitale (California), and Emily's restaurant (Arizona). These businesses are all completely different but they all subscribe to Muzak (Case Studies).

There have been studies about background music and its effects. Some rudimentary studies date back to wartime factories during World War II (Muzak, Creating Experiences with Music). The general theory behind background music is that businesses believe that if they can create a more comfortable atmosphere for their customers, they can ultimately increase sales. Regardless of the type of business, a person can logically assume that people will be more apt to come to their business if they create a more enjoyable atmosphere, and music is seen as a rather inexpensive, but very important method of doing that (Investment Sales Success). A good example of this would be a hotel that always has background music in their lobby in the hopes that the customer will be more likely to come back. Background music not only keeps customers coming back to businesses but also keeps them there longer due to the fact that it can create a comfortable environment (Volume Control – TIME). Businesses want to avoid prolonged silences which are commonly viewed as awkward or uncomfortable. Background music helps to avoid these awkward silences in hopes that customers will stay in the store longer, and ultimately spend more money (The Positive Impact of Music).

Background music has been around well before any background music companies were created. King and Queens, for example, used to hire live performers at parties. However, it is fair to say that Muzak was the beginning of commercialized and readily available background music. Muzak was actually created in 1934 as a commercial free service that would go to select

locations, mostly private homes that could afford it. It wasn't until William B. Benton acquired the failing company in 1941 that it became the Muzak of today. After Benton had Muzak piped into wartime factories he realized it seemed to increase worker production. Since then Muzak has been a leader in background music providers (Muzak, Creating Experiences with Music).

While background music is not a bad thing, there is one important problem with current background music. It is currently used to sell products, not to create a healthier atmosphere. Background music could be used to improve the health of the listeners but is instead used to try and increase profits and sales.

## **Current Background Music Providers**

A few of key background music providers are DMX, Playnetwork, Applied Media Technologies Corporation, TMCentury, and XM for Business. Each of these companies offers something different than the others. These differences can be large or small, but all of these companies are different in some way or another (Muzak Holdings LLC).

The companies listed all offer unique services. TMCentury for instance tailors their music toward production studios and other broadcast media companies. They typically send out an external hard drive with music that the company can use to make playlists, or fill silences. While TMCentury can be used as a background music provider, they tailor their business towards companies that broadcast music like television studios and radio stations (Jones TM). Due to the fact that TMCentury focuses on broadcast media, rather than commercial businesses, it is believed that TMCentury would not count as a true background music provider.

Applied Media Technologies Corporation (Sirius Business) and XM for Business allow companies to play commercial free satellite radio as background music. These companies aren't tailoring their background music to businesses either. Instead, they allow businesses to use a pre-existing service in a manner of their own choosing. Sirius and XM do not customize playlists to try to heighten employee's moods, nor do they try to lift customer's spirits so they buy more goods. They just offer paid radio without commercials. These companies are not so much "background music providers" but rather providers of foreground music that can be played in the background (XM for Business, Sirius Music for Business).

Playnetwork is a relatively new company that distributes their music through CD-ROM and over the internet. They claim to have hired the best expert music programmers and system designers who are responsible for choosing the music that is played. They have customized video programming and claim to create an in-store experience that is unique to an individual brand. This means that Playnetwork attempts to create a sound experience that can be associated with a particular brand or store (Services).

DMX is the second largest provider of background music. They provide what they call "sensory branding" through the distribution of commercial-free music, video, on-air and on-hold messages, and environmental fragrances to companies around the globe. DMX claims to have the best understanding of music and can figure out the best music to play for each brand. They do not claim to have done any studies themselves but sited The Journal of Marketing and The Gallup Organization as journals that have published studies showing a positive linear correlation between, gross sales, and people's perception of the environment (Integrated).

Muzak has a six step process to decide what music should be played for a particular customer. The first step is to decide if the music should be easy listening music that can make one feel relaxed, or should it be upbeat with lots of energy. After this is decided the acoustics of the environment are taken into consideration. The layout of the area is very important in order to achieve maximum performance. Step three involves the aesthetics and steps four and five involve the schematics and installation of the system respectively. The final step is tuning the system to make sure maximum performance is achieved (Muzak).

Any new background music would need to compete mainly with DMX, Playnetwork, and Muzak. Muzak has been, and continues to be the leader in the field of background music. They started out in 1934 as a small company that brought music into Cleveland households under the name Muzak Corporation. Muzak claims to do the same things as DMX as far as creating a brand and making a memorable experience for each individual brand's customers. They call this Audio Imaging. From the list on Muzak's website it can easily be seen that Muzak caters to some of the biggest business in today's times. Examples of these businesses are Comcast, CVS, World Gym, McDonald's and more. Muzak claims to have the largest music library out of these companies. Like most of the companies described, they can provide their music by satellite as well (Muzak).

The problem with all of the current background providers listed here is that their background music is designed for and marketed to companies, with no regard given to the health of the listeners. This quote from Muzak helps demonstrate this principle:

“Audio Architecture is emotion by design. Our innovation and our inspiration, it is the integration of music, voice and sound to create experiences that link customers with companies. Its power lies in its

subtlety. It bypasses the resistance of the mind and targets the receptiveness of the heart. When people are made to feel good in, say, a store, they feel good about that store. They like it. Remember it. Go back to it. Audio Architecture builds a bridge to loyalty. And loyalty is what keeps brands alive.”

~Muzak

It is clear from the quote that Muzak is attempting to create a larger and stronger customer base for the businesses that subscribe to it. This larger, stronger customer base will ultimately increase sales for a company.

## **Conclusion**

The Theory of Bodily Efficiency may be a new theory that is untested and unproven, but it is based on scientific fact. Sympathetic vibrations, harmonic vibrations, and systems working in conjunction with one another are all principles that are well known and well researched in physics. It makes sense that these same principles can be applied to the body, as the body is really just a complex machine.

Current background music focuses on making money, both for the businesses that produce background music, as well as for the businesses that subscribe to it. The health of the listeners is not currently a major concern for background music companies. The Theory of Bodily Efficiency states that there can be health benefits from sound, if engineered properly.

It is not currently known exactly how the Theory of Bodily Efficiency can be used in the field of background music. Perhaps it would be most beneficial for the current background music providers to start distributing music that is more wholesome than the Beach Boys or

perhaps an entirely new audio design and delivery system is required for a new Background music to be successful. There are however, definitive scientific principles such as sympathetic vibrations and harmonic frequencies that could theoretically be applied to background music.

It is the recommendations of this project group that future studies address the validity of the Theory of Bodily Efficiency, and the effects of sound of varying frequencies on the human body. Those results combined with this paper should be able to point towards a new form of background music that is more beneficial to listeners than just taking away awkward silences.



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