"FEELING THE MUSIC CAN BE DANGEROUS TO YOUR HEALTH"

A Comprehensive Review
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Long term exposure to excessive levels of High Intensity Low Frequency (HI/LF) sound, such as that produced by highly amplified bass music, airplanes, racing cars, battle field noise, etc. can not only be physically harmful, but can cause complications that can lead to death. Since this statement may first appear to be startling, I would like to more fully elaborate on how I came to this awareness and why it currently interests me.

As a Clinical Psychologist, I have had an opportunity to work with individuals in various settings, ranging from a Medical School teaching hospital (Physical Medicine & Rehabilitation Department) , Mental Health Facilities, to substance abuse programs, etc. As a result, I have been exposed to various medical, social, cultural and occupational information. My a-vocational activities have taken me into the entertainment industry, from production of musical theater, to directing large community events, to the manufacturing of professional loud speakers. As a Reserve Army Officer, I have information on various problems experienced by military personnel both in combat situations and in their every day working activities. And, being the father of two girls who love music, I have been exposed to the current music scene.

As a parent, I have often heard myself repeat what my parents preached to me - "turn down that music, it's too loud". Even to this day, my wife has to remind me at times to turn it down. About a year or so ago, I heard myself repeat this statement, but it wasn't to my children, it was in a large sports arena being set up for a rock concert. I was there to discuss, with the sound technician, his feelings about omnidirectional sound. When I told him I was the president of a loudspeaker company that will be manufacturing this type of speaker, he was quite anxious to show me what type of sound people like at a rock concert. He had me sit in the middle of the sports arena facing a wall of directional speakers. This wall appeared to be the size of a highway billboard. He then proceeded to disappear, leaving me alone facing this large grid of high powered speakers. When he turned the music on, my whole body was hit with a physical wave of sound that initially shocked me. The sound was actually painful to the point of my yelling, "turn it off, it hurts!". When I heard myself saying this, something registered in my mind that I read many years ago that had to do with endorphins and a runners high.

In a book written by William Glasser, M.D., (prominent Psychiatrist and Educator) titled "Positive Addiction" , (1976) he stated that people who run frequently experience physical pain from the trauma that running causes to their joints. When this occurs, the brain causes endorphins and adrenaline to be released into their blood to anesthetize them to this pain and enhance performance. The natural pain killer, (endorphine) acts like a narcotic, not only to dull the pain, but also causes what is called a runners high. This high that runners experience can cause disorientation at times, whereas, the runner may loose sight of his/her environment and my actually run into a car or tree. Neuroscientists say a high caused by the release of endorphins in the brain causes euphoria and peak experiences. Endorphins and enkephalins are concomitants of the "fight or flight" response...they are pain blunting, pleasure enhancing morphine like chemicals whose purpose is to make the body more effective. But in certain situations when they are not related to a "fight or flight" situation, they can have a negative effect.

When I felt the pain from the sound wave at the Sports Arena, I thought to myself, one reason that people would like this experience (HI/LF sound) could be because they are physically being

damaged throughout their total body and they are getting high due to the release of endorphins and adrenaline into their system which accompanies pain. Since the sound wave penetrates their total body, cellular structures are being damaged throughout their body. Medical professionals have known for years that HI/LF sound results in clinical manifestations to auditory and balance functions but for some reason, wider exposure to other body systems has not been emphasized.

The current work of Castelo Branco, M.D. of the Center for Human Performance (Neurological Services of Capuchos Hospital) in Lisbon, Portugal, is quite impressive when dealing with the effects of long term exposure to HI/LF noise and vibration, which lead to the concept of "Vibroacoustic Syndrome", (J.C. Guignard, 1992). He emphasizes other body functions that are effected by the previous mentioned sound waves. His research (The Clinical and Physiopathology Basis Aspects of the Vibroacoustic Syndrome) has indicated visual problems, epilepsy, stroke type neurological deficiencies and psychic disturbances, i.e. anxiety, depression and hostility. Patients diagnosed with Vibroacoustic Syndrome have an increased risk of thromboembolism. Also discovered were central nervous system lesions, vascular lesions with predominant involvement of peripheral small arteries (internal thickening) in almost all areas of the body. Patients also have a degree of mitral valve and pericardial abnormalities. Also, malignancy and the frequency of Sister Chromatid Exchange is significantly increased, as well as other physical problems.

Obviously, the degree of exposure to HI/LF sound and vibration will determine the damage that will be inflicted on the person. In Dr. Branco's research, high levels of sound frequently exceeding 110 db, (db indicative of volume), at low frequency bands below 100 Hz, (Hz reflects sound frequencies ranging from bass lows to high end sound) were registered in environments occupied by individuals who were diagnosed with Vibroacoustic Syndrome. Whole body sound vibrations have been known to be a stressor, to cause homeostatic imbalance (Nakamura H. et al. 1990) and disease (Castelo Branco N.A. et al. 1988). Prolonged exposure to whole body vibration and sound is also known to interfere with human behavior and performance.

When we look at the nervous system, we realize that nervous system impulses occur serially and may be described as frequencies. Much the same applies to the active muscle system which is actually in a state of vibration. It is in this vibratory field that all the bio-electric chemical, mechanical, energetic, thermal, structural, kinetic and dynamic processes take their course (Jenny, 1974). Therefore, when the natural course of frequencies and vibrations are altered by external, HI/LF sound waves that penetrate the total body system, one can see the potential for a breakdown in normal body functioning.

It is well known in the entertainment world that although the law in the United States permits a maximum of 110 db for public concerts, the overall noise levels usually exceeds this limit and varies significantly, depending on an individual's proximity to the large wall of speakers. Many other countries don't have laws for maximum db levels.

I first became overtly aware of the effects of HI/LF sound when initially purchasing stock and later obtained the patent on a omnidirectional loudspeaker. This first involvement with professional loudspeakers occurred when I was asked to write and produce a theatrical show for the International Missing Children's Association in San Diego. The musical comedy was going to be a large production at the Lyceum Theater in San Diego, and we were able to obtain original music from the Charles Schulz's Peanuts producer for the show called "Good Grief, It's Lucy". I set out to find rehearsal space for the large cast and remembered an unused bank building. When I walked into the building, I discovered an engineering group working on some government projects, as well as an in-house omnidirectional speaker. I was able to listen to their largest

commercial speaker which was capable of handling up to 10,000 watts. What I realized was that there were no harsh sound waves that I had experienced in the past when standing in front of a directional speaker. When the engineer told me he was putting 1200 watts into the speaker, I expected to be driven through the wall as the character in the movie, "Back To The Future". But to my surprise, I did not experience the discomfort I anticipated. What I did experience was similar to what one would hear at a live performance where amplification is not used, i.e. in a concert hall. The sound was all around me, with the lows (bass) being pure but not uncomfortable. It was a different type sound that I had not experienced at any other time when listening to speakers. When I asked why omnidirectional sound was not uncomfortable (at high volume), he stated that omnidirectional speakers put an even pressure in the room. Since the human body in this situation is not compressible, there is no discomfort (cell damage). Directional speakers on the other hand (at high volume), send a directional pressure wave that hits the body and moves tissue from front to back causing discomfort (cellular damage at HI/LF).

After that experience, I became more aware of the impact of HI/LF sound that exists in almost all live entertainment venues when amplification is used. I started to associate this pounding sensation with physical pain and not until later, with adrenaline and endorphin release and the high (similar to runners high) that this produces. I remember a friend of my daughters, who was in a band asking me, "How do you become successful as a rock band?". I stated facetiously without hesitation, "Hurt your audience" with loud distorted bass (HI/LF sound). When he asked me what I meant, I explained my theory to him in regard to this type of sound causing a degree of cellular damage that results in adrenaline and endorphin release causing a person to feel "high". As I started to expound on this concept, I remembered a time when I produced a show in conjunction with a major rock group. I remembered the parking lot prior to the show being littered with empty beer and alcohol bottles. I thought to myself, that maybe at a lower conscious level the concert goers were aware of the physical pain they were to experience and were preparing for the concert by anesthetizing themselves with alcohol. (Alcohol was used during the Civil War as an anesthetic - it is the same chemical formula as ether, except it has a few more molecules of water). Now once inside, they were feeling a high not only from the alcohol and/or street drugs, but also from the body's reaction to the damage from the sound.

Another factor contributing to the release of endorphins that impressed me was the fact that, "low frequency sound pulses, at or near a person's heart rate, seem to cause the human system to lock in to the sound generator", (Orr,1996). Once this occurs, changes in the frequency or rate of sound causes corresponding changes in the person's heart rate, as well as changes in other physical functions , a process known as entrainment. What has been indicated in the world of video games is that, the ones with the best graphics are not most popular, but the games that have a low frequency pulse, near the heartbeat rate, that accelerates as the game progresses, are played more often. Try to remember the last time you went to an action movie. As the action progressed, the low frequency sound became more intense and more rapid and before you knew it, you were on the edge of your seat with an elevated heart rate and blood pressure. If the audio in the movie theater went off and you only had video, the physical effects would be less dramatic. This effect becomes obvious when you mute the TV and the home viewing environment changes dramatically. Thus, when auditory entrainment causes a persons heart rate to speed up, and an accompanying production of adrenaline and endorphins takes place, the end result of the movie or video game is that the person is "hyped" and wants more.

Going one step beyond this observation, I began to ask myself if this type sound can be addictive as is the high experienced by runners, as explained by Dr. Glasser, (1976). If a runner

misses a day or two of running, he experiences symptoms similar to withdrawal from drugs, therefore Dr. Glassers concept of positive addiction. At some concerts, as previously discussed, the sound is associated with known addictive substances, i.e., alcohol, drugs and heavy cigarette smoking. Therefore, if one becomes addicted in a concert setting to the natural high experienced from damage created by HI/LF sound, will this addiction persist in other places (i.e., boom boxes, high powered speakers in the home, in cars, etc)? If in fact, there is addictive potential for HI/LF sound causing a person to be disoriented, which is consistent with endorphine and adrenaline release, then what is the possibility of automobile accidents where people often play HI/LF music? Most of us have experienced driving up to a traffic light and feeling the vibration from the music radiating out of a car parked next to us or one several cars away. It would be interesting, if possible, to research the frequency of drivers getting into accidents who have high powered sound systems in their cars. Psychologists Helen Beh and Richard Hirst of The University of Sydney investigated whether loud music interferes with driving. They discovered that "responding to objects intruding on their peripheral visioin, people subjected to 85- decibel rock music were around 100 milliseconds slower then the other groups" in their study. Since many road hazards emerge from the periphery, drivers listening to loud music are less safe. I recently contacted a large insurance company and asked if they would be interested in adding a question to their auto accident report asking if the car had a high powered stereo system or added speakers. The company appeared to be very interested in pursuing this concept.

I was recently speaking about this issue with a Navy Occupational Medicine Physician, who I will be working with as part of the yearly Combat Stress Conference I direct as a Reserve Army officer. He stated that he was curious why sailors who work on the flight deck of aircraft carriers, for no apparent reason, walk off the edge of the deck. He stated they had protective gear for their head and ears. I explained that due to the long exposure of the whole body to HI/LF noise from the jet engines, there would appear to be opportunities for confusion and disorientation from the constant noise. The head gear is limited in protecting an individual from these sound waves which can penetrate into the brain and the rest of the body. I feel that in order to totally protect a person in this situation, you would have to keep the sound and vibration from entering their total body. Therefore, some type of protective suit that would cancel the sound and vibration could be used, similar to material used in multi layered bomb disposal clothing. Without this type of protection, the constant damage to the cells from the noise would result in on going fatigue, since the body is always attempting to repair the damage caused to cells. I further pursued this idea with sailors that actually worked on the decks of aircraft carriers. Their input was consistent with what on crew chief told me about his experience. Cody D. Weightman is now an intensive care nurse, but prior to his current occupation, he was a crew chief on an aircraft carrier. He could now relate his past experiences to what I have discussed in terms of a person being addicted to the body's release of endorphins and adrenaline. He also observed staff being disoriented after long exposure to HI/LF sound from the jet engines.

He described a few situations.

1. "The noise and pressure from an F-14A was strong enough that on take off from a carrier, it would feel as if a large vibrator was placed on your chest. Flight deck crews would purposely stand as close to the catapults as they could to feel the power of the planes". (addictive type behavior-adrenaline/endorphin release).
2. "Most every accident that took place was always the result of personnel not paying attention. Example: Ships crew, flight deck worker, came up from the cat walk at the

edge of the flight deck underneath an F-14A. Without paying attention, the worker walks in front of the right engine intake of the plane while the engines are running, resulting in having his protective helmet ripped off his head and sucked into the engine ruining the engine. The worker ran off the flight deck and was not found for a couple of hours. He was found in a corner shaking and crying" (This person was experienced and not new to the work he was doing. This is a prime example of the disorientation I previously described.).

3. "Working the flight deck was the most exciting thing I've ever done, but I also hated every second of it. Once the planes left the flight deck on flight operations, there was always a let down, kind of like coming down from a drug high. Once the planes returned, your energy level quickly increased" (This observation is consistent with addictive behavior.).

The crew chief's experience reminded me of a concert I recently attended. I was sitting for two hours being struck by high intensity bass waves. I could feel the sound pounding on my body. I actually felt nauseous at the beginning of the show and somewhat disoriented, but after my body adjusted, the feeling passed. Although I was sitting for the total concert, I felt unusually tired the next day. My body was repairing itself from the trauma to the cells. I also remember reading a story in the newspaper about a reporter taking an aerobics class. He stated that he was exhausted not from the exercise, but from the pounding of the loud music. In other military situations, i.e., the Army, soldiers are exposed to continuous HI/LF noise which can produce the same effects as described above. In battlefield situations, significant numbers of personnel experience what was once called battle fatigue or shell shock. These terms are not misnomers if one looks closely at what occurs on the battlefield. An explosion actually produces a shock wave with the force to kill, even if one is not at the center of the blast (ground zero). People at a distance have been found with minimal visible external damage, but significant internal damage causing death. The shock wave hits with such force (the air becomes a solid) that it accelerates internal organs toward the opposite side of the body with such force causing mortal damage. If you stop and think about this shock wave, you can see that it is basically an extreme form of HI/LF sound, with a sharper edge.

As one gets further away from the explosion, they still feel the HI/LF sound vibration against their total body. With continuous exposure to this low grade cellular damage, you can see how a person can become fatigued (battle fatigue). When the body tries to repair this massive low grade cell damage, the natural result is fatigue, thus, what has been described as battle fatigue is more than a reaction to psychological stress but, an actual physiological reaction to cellular repair. Therefore, shell shock can be seen in a similar light. It would appear to be the disorientation caused by the endorphins and adrenaline released (as well as hyper beta rapid switch to theta) when this low grade cell damage occurs over the total body from the constant HI/LF battle field noise.

A recent presidential committee on the Gulf War Syndrome stated that current symptoms appear to be stress related and were similar to symptoms of all previous wars. If one were to look at these symptoms and compare them with the symptoms resulting from vibroacoustic syndrome, there would be many similarities.

It is known that fighter pilots are told not to exceed mock I (sound barrier/sonic boom) when providing close ground support, preventing damage to their own troops. It is also known that the Nazi's during W.W.II experimented on prisoners and actually tortured prisoners with HI/LF

sound. They even developed a weapon that produced high intensity sound which was powered by compressed air since they did not have the technology at the time to use powerful amplifiers. During the Persian Gulf War, combat stress chambers were used with success. This provided a stress free environment devoid of the high intensity noise previously described. It allowed soldiers, with the use of bio feedback equipment and comfortable auditory and visual stimuli, to change EEG brain wave activity and return to a higher level of functioning. It appears that reduction in environmental noise was a significant part of the combat chambers success along with other neuropsychological factors.

After writing this much of the article, I decided to share all of the above information with various people. A person who is the regional manager for an audio speaker company felt that the information was relevant. He related an incident when his company had a sound demonstration where there were several large sub-woofers in a small enclosed area all playing at the same time. Although he had ear protection on, he stated that after his exposure to this HI/LF sound, he felt like he was "physically beat on" and was exhausted after the demonstration. This exhaustion lasted for a significant period of time. This experience is consistent with cell damage inflicted by the sound waves on the body. It's interesting that the total time of exposure was minimal but the effects were lasting.

Another individual who is a sound technician for large popular music concerts also related to this information in his every day job. Since he only works out of one town and helps sound technicians (roadies), who travel with bands, he has contact with large numbers of sound technicians. He stated that many of the traveling technicians appeared to be "spaced out" (disoriented), even when there is no indication of drug use. He personally identified with his own physical and psychological feelings being similar to what has been described.

When discussing this article with a friend who is a professional counselor, he appeared to be astonished since he felt that he "totally" experienced what I described when he was younger. He stated that along with friends, he attended many extremely loud concerts. He described how they would stand next to the speakers for periods of time and feel high, but at the same time could only tolerate the exposure briefly and retreated to recuperate. After a period of time away from the speakers, they would ask each other if they were ready to return and stand in front of the speakers again (similar to the deck crew on the aircraft carrier). This would occur several times during the performance. Afterwards, when at home, he stated he was exhausted. He also indicated that he had balance problems for days. He indicated it would take a few days to fully recover from the concert, although they were not dancing or drinking (no drug use) at the concert.

He described one of his friends who, as he sees it, became addicted to the loud base sound. He remembered one experience where he went to his home to hear a new sound system. The base was so intense that his friend cracked all the windows in the room in his house. He stated that the sound hurt him and he did not return for further demonstrations.

Although all of the above people did not know what was actually happening to their body, they did instinctively sense it wasn't a normal feeling. One may ask, just what is this low frequency and how do we hear it? When talking to an engineer friend of mine, he explained that you can only hear low frequency down to a certain level and anything below that is not really heard but felt. What occurs below this level is a pressure change in the room that can be felt by the body. HI/LF sound becomes even more damaging when it contains HI/LF harmonics (multiples of frequencies) that can cause rapid physical displacement which can approximate the effects of an explosion. Therefore, at extreme high intensity of low frequency alone, the damage is not as

great as when there are rapid changes, either boosting the amplitude (sound level) or dropping it rapidly - this is when most damage occurs, and at extremes, it can kill you like an explosion. This variable sound level is consistent with highly amplified concerts to the extent of some concerts using actual explosives as special effects (as far back as the 1812 Overture).

At extreme HI/LF sound levels, the body can experience nonauditory effects i.e. (1) physiological responses and health outcomes other than hearing loss, (2) performance and behavioral effects, (3) sleep disturbances and (4) communication interference. These effects would appear to comprise a generalized stress reaction governed by sympathetic activation of the autonomic nervous system, with the physiological and hormonal changes produced by the sound appearing similar to those produced by other physical impacts. Based on existing data, the association between high sound levels and elevated blood pressure is also common. Studies by Medoff and Bongiovani (1945) and Buckley and Smookler (1970) found elevated blood pressure as a result of exposure to several months of intermittent sound. Another 1981 study by E. A. Peterson, J. S. Augenstein, D. C. Tanis, and D. C. Augenstein, using Rhesus monkeys found elevation of blood pressure during 9 months of moderately high sound levels (85 db). The blood pressure did not return to pre-existing levels during a month of post-exposure quiet. Also, the blood pressure changes were produced in the absence of appreciable permanent hearing loss. This strongly suggests that non auditory effects may occur at levels below those which are damaging to hearing.

Work done by Cantrell in 1974 also indicated elevations in cortisol (a stress hormone) and cholesterol when one is exposed to thirty days of short bursts of sound at 80 to 90 db levels. These cortisol and cholesterol levels did decrease upon sound cessation, strongly indicating the effects were sound induced. At the International Society for Neuro-immunomodulation Conference in Nov. 1996, Dr. Philip Gold of the National Institute of Mental Health stated: "In many people their hormones, such as cortisol, turn on and stay on for a long time. If you are in danger, cortisol is good for you. But if it becomes unregulated, it can produce disease. In extreme cases, this hormonal state destroys appetite, cripples the immune system, shuts down processes that repair tissue, blocks sleep and even breaks down bone" (brittle bones more common in women).

How HI/LF sound effects the brain is a question I asked myself as the literature I reviewed indicated one physical problem after another. Some of Dr. Branco's research in Portugal indicated that people with Vibroacoustic syndrome have smaller brain mass. My thinking on this is that since HI/LF sound can cause cell damage over the total body, the cells that do not repair themselves rapidly are brain cells. Therefore, as our cells repair themselves (such as our skin when we get a cut), the ones that don't are brain cells, thus smaller brain mass over a period of time when continuously exposed to damaging sound waves.

When using Electro Encheplagrams (EEG) to measure "brain wave frequencies" we find that at any given time, our brains produce distinct waveforms in four frequency groupings, beta, alpha, theta and delta. When one is "in beta state", (the dominant set of frequencies) we associate this with alertness with the highest frequencies in that range often described as "fight/flight" mode. Alpha frequencies are often associated with "meditation and relaxation: while theta is associated with "dreamy, creative states". Delta waves are strongest when you're asleep.

When discussing the effects of HI/LF sound with a friend who specializes in bio feedback training, he indicated that individuals who are experiencing this type sound are most likely to be, for the most part, in hyper beta and would be hyper vigilant. Since this state is hard to sustain over long periods of time, it is not unusual for the brain to jump to theta state directly as a

protective measure. Since theta is associated with dreamy states, thus the possibility for disorientation and confusion. This may account for poor judgment when one is exposed to HI/LF sound for sustained periods of time. This situation, in conjunction with actual brain cell damage, results in a less and less effective person and one subject to accidents.

My intern, Judith Kemp, who reviewed much of the literature for and with me, had a concern as to what effect HI/LF sound had on the fetus of an expectant mother and on preschool age children, particularly from birth to three years old. As this is a time of rapid brain cell formation and the development of neural networks that will serve as the basis for a lifetime of cognitive activity, what impact might these HI/LF sound waves have on the infant's developing brain? Since the HI/LF sound can cause cell damage, what would occur if the expectant mother is exposed to destructive levels of HI/LF sound when the yet to be born child is developing brain cells. The possibility of birth defects resulting in brain damage (mental retardation, cerebral palsy, etc.) could not be ruled out. There have already been studies stating that children, (much less children not born yet), may be hyper susceptible to the effects of noise (HI/LF sound), and that given noise levels may produce greater effects on children than would be predicted on the basis of previous studies of adults (Mills, 1975). One of the studies described in an article written by Hans Low, "Prenatal Stressors of Human Life Affect Fetal Brain Development", (1994) indicates stress (HI/LF is a significant stressor) significantly affected birthweight and head circumference. When birthweight was corrected, stress remained a significant determent of small head circumference, indicating a specific effect on brain development. Therefore, it would appear that expectant mothers should be warned to avoid environments where there is significant exposure to HI/LF sound. With all of the physical problems associated with HI/LF sound, one may ask the question, "Why would human beings expose themselves to sound that is obviously painful?" If we truly lived in a Stimulus-Response (S-R) world, then one would automatically withdraw from a painful experience, i.e. one would remove their hand from a hot stove. Although most people think we are externally motivated (S-R) to behave, this does not appear to be the case. A prominent psychiatrist/educator I previously mentioned, Dr. William Glasser, best explains human behavior in what he describes a "Choice Theory Psychology". This theory explains that human beings will put themselves into situations that are counter to a S/R situation because they are internally motivated to behave. Dr. Glasser explains his theory as follows:

"Choice Theory attempts to explain both the psychological and physiological behavior of all living creatures. In Choice Theory, these two aspects of behavior are combined and called, Total Behavior. This theory maintains that all we do from birth to death is behave, and all our behavior is Total Behavior. Total Behavior is made up of four components, acting, thinking, feeling and the physiology, which always accompanies the other three components. Acting and thinking are always voluntary; feeling and physiology can only be changed through changing how we act and think.

Choice Theory explains that all Total Behavior is chosen and all the choices are an ongoing attempt to change the real world so that it coincides with a small, simulated world that we build into our memory called the Quality World. The Quality World is the core of our lives. We are continually in the process of modifying it so that it reflects what we want now. We build it, starting shortly after birth, from all we have perceived that feels very good. What feels very good is anything we do that satisfies or in the case of addictions, seems to satisfy one or more of five basic needs built into our genetic structure: survival, love and belonging, power, freedom and fun". (Glasser, 1996).

Since most of us grew up in a society heavily influenced by music, we can associate the music

with meeting the psychological needs that Dr. Glasser discusses. Music is almost always thought of when enjoyable involvement with other people occurs. How often do we hear an old song and think back to the people and experiences that tie into the times in the past that were pleasurable. Music is strongly built into our memory (quality world) and is associated with when we were meeting our needs for belonging, fun, freedom and power (self worth). Since music becomes such a large part of our life due to it being need fulfilling in the past, why not continue to use music to continue meeting our needs now and in the future. On the surface, this relationship with music is both pleasurable and healthy, except when the music is delivered in a HI/LF format.

Although the HI/LF music (sound) may physically hurt a person, they associate the experience with memories of belonging/involvement, fun and freedom. The power they now experience from HI/LF is now more associated with endorphins/adrenaline and not necessarily the earlier quality world pictures. But they may actually be thinking it is related to a normal healthy experience. As Dr. Glasser states in his description of Choice Theory, "...in the case of addictions, seems to satisfy one or more of the ....basic needs" (Glasser, 1996, p.1). A person can actually become addicted to the release of their own natural pain killers (endorphins) as runners do in what I previously described as a runner's high from the text "Positive Addiction". Think about how much of today's music is HI/LF and how people are constantly looking for this type of sound in the CD's they buy and the concerts they attend. I recently discovered in an audio magazine that there are CD's for sale that only produce Bass sound. When inquiring, the distributor of the CD's told me that individuals between sixteen and twenty five years of age are the primary customers for these CD's. In my discussion with the distributor, I was told that the new digital sound technology on the CD's can produce lower Bass frequencies than any musical instrument ever produced. He also indicated that some states in the United States have laws that limit the amount of wattage (high intensity) one can have in an automobile. In these states I believe they are more concerned about one's ability to hear outside traffic and not totally aware of the other physical damage being done by HI/LF (exaggerated Bass) sound. Therefore, one can predict that if this type of sound is withheld, a person my react similar to withdrawing from an addiction. Consistent with this observation is a study done (Fearn , 1972, 1973,) that indicates young people who regularly attend dance clubs and pop concerts show deafness which is dose-dependent upon the frequency of the exposure. Again, if hearing loss is occurring in these situations, then the damage described above (Vibroacoustic Syndrome) is occurring throughout the total body, varying to the degree of exposure. Again, like other addictions, one may actually be subjecting themselves to physical damage and continue on with the addicting behavior.

I don't want anyone to think that music is bad or unhealthy, quite the opposite is true. We have all heard that music soothes the wild beast. There is music therapy, bio feedback for relaxation and many other forms of calming music including vibroacoustic therapy. What I am warning against is the other end of the spectrum, music that hurts, enrages and triggers fight or flight brain reactions, resulting in physiological changes that can be harmful. As N'omi Orr once stated, "Military drums play music designed to make your feet take you where your head never would- Music is almost as dangerous as gunpowder-". If we look at history, as far back as organized warfare can be seen, there has been attempts to enrage soldiers into battle by beating drums first slowly (consistent with heart beat) and then more quickly as troops enter battle. The sound of the drums is low frequency and is as high intensity as the instrument would allow at the time.

If one looks now at some of the behavior displayed to current HI/LF music, we can see resemblance's to our ancestors going into battle, such as the slam dancing (mosh pit) where people are actually hurling themselves at others, inflicting physical pain. This is a prime example

of a fight or flight brain response to the HI/LF sound. But even if you are more civilized in this type of sound (HI/LF) environment, the body's physiology is still changing to accommodate to the sound wave damage to the body. When your body reacts to protect itself from this cell damage, it is in every sense a fight or flight brain response.

This protective old brain (neo cortex) response (survival response) causes the blood pressure to increase and heart to beat faster so blood (oxygen) can be pumped to the muscles to fight off the perceived saber tooth tiger. The blood thickens so that if scratched or bitten in the battle, you won't bleed to death (cholesterol increases since it is thickening agent to stop bleeding), we experience hyper brain wave activity to be more vigilant, the palms of our hands get sticky so we can hold the club to beat off the beast and the bottoms of our feet get sticky, as well, so we can get traction to run away and escape the attack. But we aren't fighting a saber tooth tiger, but merely listening to music (the old brain only reacts to protect the body to survive). If we aren't physically fighting or fleeing, then what happens to our body when all of this physiology is occurring and we are sitting inside a car (listening to HI/LF sound), sitting in a concert or home environment. What is happening, to varying degrees, is the body is responding in a way that may be adverse to your health. To paraphrase the words to an old song, "Killing me loudly with his song, killing me loudly" is a reality that is not far from the truth. References

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