The Seductive (Yet Destructive) Appeal of Loud Music[1]

By Barry Blesser, Ph.D.

Music makes me forget my real situation. It transports me into a state which is not my own. Under the influence of music I really seem to feel what I do not understand, to have powers which I cannot have.

Leo Tolstoy, 1890

Introduction to the Right Question

The scientific literature unequivocally proves that prolonged exposure to loud sound produces permanent damage to the hair cells in the inner ear. In addition to published research articles, the National Institute of Health and the National Institute of Occupational Safety provides public reports and recommendations. Loud music, like a jackhammer or jet engine, destroys hearing. See the review article about the relationship between loud music and hearing loss (Staff, 2006), which contrasts with many of the studies from 1970s (Dibble, 1995). During the last three decades, something appears to have changed in both the music culture and the technology used to support it.

Why is the warning to reduce the intensity of music often ignored? Few psychologists, audiologists, and hearing researchers ask the relevant question: Why do people choose to listen to music at high intensities? Since so many musicians and music enthusiasts are now choosing to use electronic amplification to raise the volume of music, there must be a good explanation for their behavior. I will argue that loud music is not (a) an accident that arises from ignorance of the consequences, (b) the result of being manipulated for commercial profits, or (c) a temporary fad that happens to exist in our culture at this moment in time. Excessive loudness serves a function.

Before beginning the discussion, I would like to relate a personal experience. Several years ago, I attended the awards banquet of a professional sound engineering society, which was sponsored by a company that manufacturers inexpensive ear protectors. A sample gift was placed on each plate. When the music entertainment began, at deafening intensities well over 120 dB, I was the only person in a room of 300 professional audio engineers who inserted the ear protectors. Although this experience is far from unique,

---

[1] Originally published in *eContact! 9.4 — Perte auditive et sujets connexes / Hearing (Loss) and Related Issues*. Montréal: Communauté électroacoustique canadienne / Canadian Electroacoustic Community, June 2007.

See also the expanded article: The Unexamined Rewards for Excessive Loudness, presented to the 9th International Congress on Noise as Public Health Problem, 2008, http://www.blesser.net/downloads/ICBEN%202008%20Final.pdf

one would think that those who depend on hearing for their professional livelihood would be the first to protect their auditory assets. But audio professionals are not unique. One find excessively loud music at elegant nightclubs, sporting events, wedding parties, cinema theaters, popular concerts, customized automobiles, and in the ear buds of kids walking around in a daze. Loud music is a world phenomenon unrelated to social class or cultural status. What function does loud music serve?

Where to Search for the Explanation

Before offering my analysis and explanation for the phenomenon of loud music, I must concede that this subject has received very little attention from academic researchers. Although some provisional results in scientific studies are strongly suggestive, a conclusive answer is not yet available. Moreover, formal research methods are often inadequate for answering complex behavioral questions, and phenomenological explanations using folk science often provide more insight. I start with the assumption that there must be one or more psychological benefits to loud music. Since the actual explanation may vary among individuals and cultures. I will present a catalog of possible explanations, rather than a definitive answer.

There are three separate but related motivations for loudness: social rewards, biological stimulation, and selective aural focus.

Loud Music Transports Listener to Another Space

The concept of aural architecture, which I developed in my recent book (Blesser and Salter, 2007), is directly relevant to loud music. Each sensory modality creates its own sensory space, which need not be consistent with other sensory spaces. A person can exist in a visual space, aural space, tactile space, olfactory space, and so on. To appreciate the difference between an aural and visual space, consider two examples of a box over your head. In the first case, the box is made of glass, while in the second case it is made of black cloth. With a glass box, you have a small aural space but a large visual space, and conversely, with the cloth box, you have a large aural space but a small visual space. When we experience space primarily using our eyes, which provides a clear sense of physical objects and geometries illuminated by light, we are not necessarily aware of other types of space.

Aural space is a harder concept because sound is ethereal. An aural space has boundaries based on those events that are audible; an aural space is determined by the acoustic horizon. Every sound source and every aural event within the listener's acoustic horizon is part of the aural space. The acoustic horizon is determined by the loudest sounds. In a quiet home, you can hear your footsteps on a hardwood floor but in a noisy city, you cannot. Sound chances the size of the aural space. Before a concert begins, you can hear the breathing of your friend sitting next to you, but after it begins, you hear nothing other than the music. Loud music makes a listener functionally deaf to everything but the music. The sound of your friend's breathing leaves your aural space. In real sense, loud music transports listeners into another aural space, moving them from the social space of

people to the musical space of the performers. Loud music also suppresses the internal space of daydreams, overpowering the inner space of self-generated sounds and pictures, and listeners are only in the space of the musicians. Everything else is gone. Loudness is a space transporter because you become functionally deaf to the immediate environment.

Sonic Dominance and Aural Combat

Just as large animals dominate the jungle, loud sounds dominate the experience of aural space. Because our auditory system is active 24/7, and because we do not have the equivalent of ear-lids, listeners have no means of controlling the dominant sounds of the environment. Furthermore, our auditory cortex is connected both directly and indirectly to many other brain substrates. Unlike vision, which has voluntary control to select what is being seen, hearing is tightly coupled to our sense of the environment without control.

At a cocktail party with many equally loud conversations in different locations, an individual can select what to listen to. But when loud music is present, all other sounds are inaudible. Similarly, when the driver in a car raises the volume of music, he is transported out of the space of automobiles and trucks on the road. Listening to music with earphones blocks unwanted environmental sounds, transporting the listener to an entertaining music space. Like many artifacts of evolution, our response to loudness transports us to another world. Advertisers who present messages before movies know that loudness sells because you cannot focus on any other sonic event. You cannot escape physically or perceptually. They own your aural space, and they know it.

An aural space with loud music is often experienced as “exciting” because loudness represents intense activity. Because sound is always associated with a dynamic event that requires energy, loud music is equivalent to intense energy. In our pre-electronic world, creating a loud sound always required intense physical exertion. Loud drums require violent pounding. We respond to the implied physicality of loudness, even though electronic amplification only mimics physical exertion. From an evolutionary perspective, we still respond to loudness as if it represented a big event that was relevant to our survival. Loudness gets our attention.

Live Musicians Inhabit Paradoxical Spaces

Musicians creating live music frequently find that they are simultaneously living in two or more spaces. On the one hand, the sound from headphones embeds musicians in their electronic music; on the other hand, environmental sounds connect musicians to real people in a real space, be it the bartender, audience, or stage manager. How then can a musician transport himself, at will, from one space to the other? To a large extend, the only control mechanism is loudness. The louder space dominates. There is no intrinsic biological means for controlling sound intensity, but electronic amplification allows headphone space to dominate an environment space.

Petersen (2007) argues that in-ear headphone can be used to make the musical space dominate the environmental space by creating sound levels above 140 dB, which is very

dangerous. Such levels are not accidents. Consider the case of a fully packed nightclub with intoxicated listeners, and consider that the musician's headphones do not block out the audience noise. To be exclusively in the musical space, the musician may choose high amplification to mask the unwanted noise.

In some cases, musicians will blast one ear with their amplified music while leaving the other ear for the sounds of the environment. As a species, we are simply not designed to be in multiple spaces, especially when one space is virtual. We can switch visual spaces by changing our point of focus, but we cannot change aural spaces in a similar way. Inventive musicians design ad hoc solutions to supplementing our inability to select an aural space.

On a final note, intensity can function like a flavor enhancer that makes aural subtlety perceptible. Professional musicians and sound engineers often raise the level for just this reason: they can hear more nuances. Music with a very wide dynamic range presents a problem. The amplifier that makes soft nuances audible also makes loud components even louder and very destructive. Many years ago when I was designing artificial reverberators, I would often raise the sound level so that I could detect the unwanted artifacts of the algorithm. But I was oblivious to the damage produced by those loud sounds that I was ignoring. Although I was not consciously attending to those sounds, my inner ear was still being subjected to their energy.

Music Changes the Brain and Body

The phrase "altered state of consciousness" is generally a negative concept that is associated with drugs, tobacco, and alcohol. Moreover, the concept incorrectly implies the existence of a normal state. A more careful examination of the concept shows that our environment is constantly changing our perceptual, cognitive, emotional, and hormonal state. There is no normal. A stimulus that changes our internal state need not be an illegal substance. In fact, when fully disconnected from the environment, as with sensory deprivation, we lose our sanity (Cohen et al, 1965).

Music has always served as a means for changing our emotional state, be it relaxation, excitation, arousal, or tranquility. Blood and Zatorre (2001) showed that pleasurable responses to music correlate with activity in those brain regions implicated with reward and emotion. Raising the loudness of music, like a double shot of whisky, elevates the intensity of the experience. Background music at 40 dB is very different from a pounding rhythm at 120 dB. Listeners respond differently. Loud music can enhance neurological attentiveness, which psychologists call arousal.

While much of the evidence is inferential and speculative, there is no question that loud music is complex stimuli that, under certain conditions, can significantly change the mind body state. Neurobiologists are only now beginning to understand the complexity of our brain. Music interacts with brain substrates that are associated with rewards and emotions (Levitin, 2006). Music is a stimulant, like caffeine, sugar, alcohol, anger, vigorous

exercise, sexual activity and many others. Loud music is a simply a stronger stimulant that soft music.

Loud Music Functions as a Self-Medicating Drug

Fast and loud music has been shown to enhance exercise on a treadmill without changing the perceived effort (Edworthy and Waring, 2006). Musicians exposed to loud music report intestinal distress (Rapid, 1990) Loud music has been shown to extend the influence of the drug ecstasy in rats (Iannone et al., 2006). Loud music has also been implicated in: psychological disorientation, ability to focus on other tasks, increases heart rate, decreases vascular blood flow, increases in the body's core temperature, and distress in the immune system. In one study, researchers found that loud music activated those brain regions that are associated with euphoria drugs, such as cocaine. There is evidence that music elevates endorphins connected with pleasure centers in the brain. Conversely, there is some evidence that when a person is exposed to high level sound, the brain contains chemicals that are also found in patients diagnosed with schizophrenia. Studies suggest that there is an increase in alcohol consumption in environments with loud music (van de Goor, 1990). Perhaps because loud music overpowers the senses and cognitive judgments, people at parities often overeat. In another study, some students who consistently listened to loud music exhibited maladaptive behavioral patterns consistent with substance abuse (Florentine et al, 1998). The American Academy of Pediatrics warns that loud music overstimulates children with attention deficit disorder.

Although the inner ear is thought to be the only means of sensing sound, there are reports that the sacculus (a component of the inner ear's vestibular/balancing system) responds to low frequency sounds that are above 90 dB (Todd and Cody, 2000; Todd, 2001). Furthermore, the sacculus has neural connections to those parts of the brain that are responsive to all forms of pleasure. By activating the sacculus, loud music with a strong beat may be a form of vestibular self-stimulation. Furthermore, since loud sounds trigger the stapedius reflex, which attenuates sound entering the inner ear, the relative contribution from the sacculus would be increased. Dibble (1995) suggested that popular music could only be appreciated at levels of 96 dB or more, which is consistent with the sacculus theory. The range of intensity between pleasure and damage is extremely small.

Social Synchronization of Brain States

Music has been around since recorded history just because it has such a strong influence on human mood and behavior. Religious and political leaders have used loud music to stimulate strong emotions and to suppress rational thinking. Hitler moved Wagner from the concert halls to the streets using large megaphones and amplifiers. Gospel music is a critical component in many religious services. The military uses marching bands, and the old Roman armies used mechanical noisemakers to stir passions and to frighten the enemy. In order to demoralize and disable their targets, the US used highly amplified music in the siege of Manuel Noriega at the Vatican Embassy in Panama, and at the siege of the Branch Davidian compound in Waco. Loud sound has been a weapon of torture. Loudness, especially with transients, is associated with fear. From an evolutionary

perspective, loudness correlates with close distances, violent impacts, and large aural mass. Loud sonic events are bigger, closer, and energetic.

When engaging in a group activity, human beings function as if their brains were connected. Young women who live together find that their menstrual cycles become synchronized. Similarly, rhythmic hand clapping at a concert illustrated sensory motor synchronization. Synchronized brains produce strong group cohesion and a loss of individuality, which is why the military uses marching bands and why political rallies rely on loud music. Dancing to loud music is the obvious synchronization of mind and body. Loud music synchronizes the brains of listeners.

Social cohesion is a critically important part of our evolutionary heritage. We feel safer in a group because the community is more powerful than an individual; groups provide protection against unknown dangers; groups provide food, sexual partners, help with child rearing, and support in old age. Contrary to our cultural bias towards individuality, we were designed to connect to others in groups of 150 to 500 (Dunbar, 1998). Loud music enhances group cohesion. A live concert, even with reproduced music and lip-syncing performers, provides a connection to others in the audience.

Concluding Comments

The social, emotional, and psychological rewards for listening to loud music have not been studied in detail, in part, because such studies would expose listeners to be sound intensities that would damage their inner ear. For this reason, research studies are always indirect, using substitute species, questionnaires, statistical correlations, and anecdotal reports.

Even without a definitive conclusion, it is clear that loud music changes the mood and behavior of listeners, often in a pleasurable way. There may not be consistency among individuals with different temperaments and values, but the seductive attraction of loud music has a simple explanation: it does something pleasurable for listeners even if the details are not known or vary among individuals. But like all forms of pleasure, excess produces damage, and everyone must balance the risk versus reward. And that balance is a personal choice that cannot be legislated. Like every stimulant, moderation rather than excess is often the best compromise.

While the physiological properties of damaged hearing has been documented, there is less discussion about the social and emotional consequence of having a hearing disability. The obvious consequence of hearing damage to those that enjoy loud music is the loss of the ability to enjoy music. A more subtle consequence is the damage to one’s social and emotional health. A half century ago, Roth (1955) reported that undiagnosed hearing loss was the primary cause of mental illness in the elderly, and more recently, Zimbardo et al (1981) demonstrated that simulated deafness in normal individuals produced symptoms of paranoia.

Like every drug, loud music can be very destructive in high doses. But unlike ordinary drugs, it takes years of abuse before the damage is noticeable. That may be the primary explanation for why loudness is ignored. Like a mother who tells her children to brush their teeth to avoid mouth problems as an adult, for most people, the future is too hypothetical and remote to be taken seriously. Immediate gratification can thus produce deafness with a corresponding disruption in social and emotional well-being.

Bibliography

Blesser, B. and L. Salter. *Spaces Speak, Are You Listening? Experiencing Aural Architecture*. Cambridge: MIT Press, 2007.

Blood, A. and R. Zatorre. "Intensely Pleasurable Responses to Music Correlate with Activity in Brain Regions Implicated with Reward and Emotion." *Proceedings of the National Academy of Sciences* 98 (2001). pp. 11818–11823.

Cohen, S., A. Silverman, B. Bressler and B. Shmavonian. "Problems in Isolation Studies." In P. Solomon, P. E. Kubzanski, P. H Leiderman, J. H. Mendelson, R. Trumbull, and D. Wexler (eds.), *Sensory Deprivation, A Symposium Held at Harvard Medical School*. Cambridge: Harvard University Press, 1965.

Dibble, K. "Hearing Loss and Music." *Journal of the Audio Engineering Society* 43:4 (1995), pp. 251–266.

Dunbar, R. "The Social Brain Hypothesis." *Evolutionary Anthropology* 6 (1998), pp. 178–190.

Elsworthy, J. and H. Waring. "The Effects of Music Tempo and Loudness on Treadmill Exercise." *Ergonomics* 49:15 (2006), pp. 1597–1610.

Florentine, M., W. Hunter, M. Robinson, M. Ballou and S. Buus. "On the Behavioral Characteristics of Loud-Music Listening." *Ear and Hearing* 19 (1998), pp. 420–428.

Iannone, M., S. Bulotta, D. Paolino, M. Zito, S. Gratteri, F. Costanzo and D. Rotiroti. "Electrocortical Effects of MDMA are Potentiated by Acoustic Stimulation in Rats." *BMC Neuroscience* 7:1 (2006), p. 13.

Levitin, D. *This Is Your Brain on Music. The Science of Human Obsession*. New York: Penguin Group, 2006.

Petersen, G. "The Quiet Stage." *Mix Magazine* (1 May 2007).

Rabid, Jack M. "The Effects of Loud Music on Musicians." *The Big Takeover* 14 (1990), pp. 33–37.

Roth, M. “The Natural History of Mental Disorder in Old Age.” *Journal of Mental Science* 101 (1955), pp. 281–301.

Staff. “Preventing Hearing Loss.” *Journal of the Audio Engineering Society* 54:11 (2006), pp. 1109–1115.

Todd, N. “Evidence for a Behavioural Significance of Saccular Acoustic Sensitivity in Humans.” *Journal of the Acoustical Society of America* 110:1 (2001), pp. 380–390.

Todd, N., and F. Cody. “Vestibular Responses to Loud Dance Music: A physiological basis for the ‘Rock and Roll threshold’?” *Journal of the Acoustical Society of America* 107:1 (2000), pp. 496–500.

Tolstoy, L. *The Kreutzer Sonata and Other Stories*. New York: Oxford University Press, 1890. Republished 1998.

van de Goor, L., R. Knibbe and M. Drop. “Adolescent Drinking Behavior: An observational study of the influence of situational factors on adolescent drinking rates.” *Journal of Studies on Alcohol* 51:6 (1990), pp. 548–55.

Zimbardo, P., S. Andersen and L. Kabat. “Induced Hearing Deficit Generates Experimental Paranoia.” *Science* 212:4502 (1981), pp. 1529–1531.

Biography

After receiving his Ph.D. from MIT in 1969, Dr. Barry Blesser spent the next nine years on their faculty. For the last 35 years, he has been exploring the influence of cognitive and perceptual psychology on the design and implementation of technology. As one of the pioneers of digital audio technology during the 1970s, he transformed his fantasy of a portable concert hall into the first commercial artificial reverberation system. While Dr. Blesser has focused on creating and implementing technology as a technical and management consultant, he also integrated the arts and social sciences into the design process. As an independent scholar, he has spent the last five years researching the new concept of aural architecture, which led to his current passion: the social consequences of functional deafness when in corrosive acoustic environments.