

# Long-term cognitive effects of music as loud noise

## *The need for research*

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Many of the effects of very loud music are now known, but not the long-term cognitive effects. This is an important question, since loud music is now ubiquitous. Investigation is called for, including the collation of research that is currently hard to find. Two hundred teenagers aged 12-19 completed a questionnaire on 'Very Loud Music' and their responses are discussed.

A change in modern life never experienced before in human history is the amount, degree and types of ambient and often loud music in the environment. Millions of people are involuntarily as well as voluntarily exposed. This global mass experiment has escalated in the past fifteen years as modern technology has increased the mediums for music and the intensity that are possible. It is becoming more difficult to avoid the rise in decibels. Nobody can escape other people's music, even in traffic jams, and a great deal of it, especially at raves, discos and festivals is loud, very loud, louder than is permitted in factories – amplified to pack electronic punch, with drumming and percussion as automatic repetitive beats, and of clatter in music as background noise to speech. The now ubiquitous phenomenon of heavy beat drumming in music is relatively recent, and requires separate inquiry for other reasons as well as possible cognitive effects, but this article concentrates on loud noise as entertainment.

There is now widespread awareness that very loud music carries risks of deafness and tinnitus (1). Recommendations to avoid hearing damage are made on the personal level, rather than how to reduce the risks generally: take ear-plugs to parties. In city areas where gigs can be very loud, objecting residents may be advised to move home.

It is also known that loud and continuous noise in general can cause or exacerbate stress and its related psychophysiological disorders (2). There is some evidence that very loud rock music is associated with emotional and behavioural effects (3).

However there does not appear to be the same concern whether excessive exposure to very loud music could be deleterious to aspects of intellectual functioning in the short or long term, when our society needs higher intelligence, not less. Yet this is a mass global experiment. How are human brains adapting to those decibels? Are long-term effects being monitored? At a time when we need brains that can work at capacity, is there any evidence for the suspicion that long-term exposure to very loud music might affect abilities such as being able to think of more than one thing at a time, connect ideas, reason, concentrate, be intellectually curious, or mental stamina itself? Are some people more vulnerable than others? This article seeks to flush out research that may very well exist but is hard to find in the public realm, and is not known even to researchers in the field of noise itself (4).

Experts on noise have asked me to tell them if I find more about cognitive effects of very loud music – because they themselves do not know, although they suspect that while the ear accommodates itself to very loud music,

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the brain may not. Our public ignorance on this is striking compared to the well-established research showing long term risks of deafness. Cognitive functions that could be affected over time by exposure to very loud music include connected thinking, social judgment and intellectual curiosity. Are any groups benefiting or more vulnerable? What is the role of adaptation? What are the attractions of high decibels, electronic throbbing and repetitive drumming for so many people? Examples of exposure in public places are raves, gigs, shops, restaurants, public spaces and events, and even hospitals and old folk's homes. Many individuals listen to loud music for long periods via modern technology such as Sony Walkmen and ipods, DVDs and ghetto blasters. Lyrics can become accessories to the impact of the sound. We ourselves may be singing less – even the age-old lullabies to sing babies to sleep – where are they?

What relevant research is there? There are difficulties of research in this complex but important field. There is some problematic research on whether

classical music can improve intellectual functioning (5). The effects of other types of environmental noise have been more thoroughly investigated, such as industrial and traffic and aircraft noise, but the emphases have been on damage to hearing and effects of stress.

Baroness Susan Greenfield is concerned about effects of 'excess' exposure to new electronic stimuli (6). Many people note the shift of our culture from being based on words and language, to being based on images and pictures, and how this may affect thinking. But there is also a switch from delight in the spoken language to more focus on music – seen, for example in the Australian Broadcasting Corporation's Radio National, where the director of radio is reported to have described the ABC talks as 'batshit'. In broadcasting, the human voice is increasingly given noise backgrounds, including music not always appropriate. This not only disadvantages an estimate of 15% of listeners, including the elderly (7) who have difficulties in discriminating voices from background noise, but may also affect normal

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hearers in attention and memory for what is heard. These interfering backgrounds contrast with the back-up effect of music when it is complementing words in songs in rhythm and metre. Is any investigation of this possibly deleterious trend publicly available?

I have been able to find scrappy items such as rats recovering from ecstasy and mice who don't learn (8), and children under flight paths with poor reading comprehension (9). A 2004 study found that loud music reduced reaction time and decision-making ability, and recommended lower decibels when driving (10.) Not just ruptured eardrums but a few cases of ruptured lungs at musical events have been attributed to the booming bass frequency of loud music – the lungs may essentially start to vibrate in the same frequency as the bass (11).

What long-term cognitive research there may be, should surely be readily available to reassure or to worry. Instead, commercial ads for 'brain music' guarantee to make your neural connections grow and work better, so that all sectors of the temporal lobes will cascade movement into frontal lobe regions (12). And so on.

Are there any longitudinal experiments with proper controls and proper measurements of brain function response to a phenomenon that is far more widespread than thalidomide ever was, and yet is not within the ambit of any Food and Drugs Administration?

TV, Sony Walkmans, i-pods, car radios, DVD players, home entertainment systems and Muzak in almost every public place provide constant ambience of musical noise. Loud music is used as torture in interrogating prisoners (13). However teenagers are most exposed – does it make them any different from how teenagers have always been?

I made an accidental survey of 200 teenagers aged 12 to 19 who to my surprise returned, completed, a questionnaire I had sent to their school when it had warned the neighborhood of an imminent arrival of a fairly loud disco. Their responses are relevant for many reasons. Here are 200 Australian adolescents receiving a top-drawer education with high academic standards, and as contented a group of young people as you could find. Seventy percent described themselves as 'Very happy' or 'Cheerful', as well they might, and 65% said they were doing very well



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at school, or had no problems, really. Only 7% 'wished they were happy' and only 6% reported they were not getting on well at school at present.

The survey showed the extraordinarily important part that music played in their lives, hardly less than sport, their astonishing knowledge of a very wide range of modern music genres, their lesser interest in other hobbies or concerns, and the reasons they gave for their musical tastes. Music filled a large part of their time, not only at the many parties, raves, discos, and school performances which they enjoyed. 87% liked to have music on when they studied, and of these 49% had it on often. 95% liked to listen to music when they were travelling, and 36% liked to have it always if possible.

58% liked loud music, 33% of these liked it extremely loud, 'louder than adults can stand'. The rest 'did not mind it' except for four girls and eight boys whose other responses showed that they were clearly non-conformist oddballs (14).

**WHY IS VERY LOUD MUSIC SO POPULAR?**

The most common reason the teenagers gave for liking very loud music was that it stopped boredom (65%). Over half gave reasons such as it calmed them down, or it excited them, and it entertained them. 37% used it to forget their troubles. Over half of those who liked very loud music said they felt 'pumped', 'pumped with energy', 'high', 'energised', buzzed up', 'hyperactive', 'hyper', 'hypo', 'exhilarated', 'awesome', and 'Whee!' Afterwards they mostly still 'felt good' but 20% said they felt ill effects, such as 'sleepy', 'tired', 'dizzy', 'headaches', 'deaf', 'my ears hurt', 'my ears bleed', and 'argggh!'

The 34% who were not so enthusiastic, merely liking loud music, or didn't mind it, also felt energetic, pumped and excited, but more of them reported ill effects, such as 'a bit dizzy', 'dizzy but I think its the lights', 'jumpy', 'tired', 'shell-shocked', 'like my ears have exploded', 'exhausted', 'headache', 'tired and annoyed', 'ringing in my



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ears', 'sometimes my ears hate it'. One solution was to 'go outside to talk to my friends'.

Reports of feelings next day were mixed, many felt 'over the top', or 'refreshed', but 37% reported ill effects 'like I was smashed in the head with a brick', 'my head buzzes', 'sore neck', 'sore but I felt great at the time'. Do any of these negative effects have longer consequences over repeated exposure? We know that there can be long-term cognitive consequences from accumulating subclinical damage for boxers, and for alcoholics who have never actually been drunk (15).

**WHY DO THEY THINK PEOPLE  
ENJOY VERY LOUD MUSIC?**

Some gave practical reasons such as 'it's good to dance to', 'people enjoy listening to their favorite bands' and social approval - 'makes them feel cool!' 'like everybody else', or 'because their parents do', but the overall reason given was that it made them feel good, because it excited and energised them.

Blocking out as an aim was mentioned by all groups. 'It lets you blank out', 'coz it blocks out everything

else', 'it lets you forgot about other stuff', 'drown out thoughts', 'block out other sounds', 'because they don't want to hear anything else'. And 'so they don't have to talk'.

Two teenagers came up with psychological theories. 'Once it reaches a certain amount of decibels, it stimulates happy chemicals in the brain!' 'It gets rage out.'

The cynics who did not like loud music thought that others liked it 'to feel the base', or 'because they are angry', 'they think its cool', 'so they don't have to think or talk'.

Even some who liked music very loud mentioned deafness as a reason for liking music to be louder. 'Because then they can hear it', 'Hearing Problems!!', 'because they're slightly deaf', 'they have bad hearing', 'they might not have as good hearing as us', 'they hate their eardrums', 'because they can't hear soft', 'You can hear it'.

Other responses were tautologies or incoherent - 'It's better', 'coz its good', 'The kind of people who are major fans, it suits them', 'Its good', 'music not really but maybe', 'it's a disco', 'because', 'Because they do', 'Don't know', 'yes', 'gets into it more'.



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35% of those who liked loud music said that they disliked silence or could not stand it.

Responses to the questionnaire showed some possibly interesting relationships to other interests and hobbies, including reading and concern about current affairs, that might be taken up in more formal studies.

I would like to find answers for questions arising.

Is what many devotees find really attractive about loud music not the music itself, but the physical sensation of banging on the eardrums and bone around the ear, made by the thumping and reverberation? Long-term exposure to the vibrations in very loud music is experienced by many as desirable sensations, even if with ‘morning after’ effects. But may cognitive functions be affected? Is there a problem when the explanation of pleasure is that it numbs the mind, so that it blots out awareness of other things in life (16)? Can very loud electronic music become an addiction to the noise itself rather than the music?

Does becoming accustomed to intense stimulation make boredom more likely without it? Are limens raised so that gentler experiences cannot be appreciated, and more excitement is needed? How much is it just adolescent love of excitement that tempers with growing older, and which is not finding other expression in adventurous living?

My worry about effects on thinking are based on anecdote, not experimental laboratory research. A personal impetus is that I cannot think when music is blasting or is reverberating later in my head. I wonder whether bands have indeed lost their thinking powers when they refuse to lower the decibels when 90% of people in a public place request it, justifying their refusal ‘Because people would not like it’. How is it that they refuse to consider infants when they are present, sitting in their prams, possibly stunned, if not deafened?

Healthy people can seem immune

to dangerous effects of many noxious stimuli. The weak and vulnerable risk damage. The less you have, the more easily it is knocked off you. The Australian MP, Peter Garrett, former leader of Midnight Oil, is seen to be still full of functioning neurones.

Many students, including some high-flyers in memory tests, claim that loud background music helps them to concentrate when learning (17). I can see how it could help to literally drum or provide mnemonics for rote learning, but what about learning that requires understanding and reasoning? There are psychological laws about incompatible responses – the difficulty in attending to two very different tasks at once – and problems when there is overload of information, multi-tasking, and the need to block out stimuli.

Today the State worries about the growing numbers of ageing people about to burden the young. The elderly are recommended to keep the brain active and avoid going senile by doing puzzles. But some researchers think that one likely contributor to age-associated decline in cognitive ability could be presbycusis, the loss of hearing, especially of high frequency sounds, as people grow older, which can be increased by long-term exposure to intense sounds such as power tools or loud music (18).

Humans survive through their adaptability, but adaptation to harmful pleasures usually comes at a cost. What alternative pleasures could teenagers find to prefer to ghetto-blasters?

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- pain and hearing fatigue;
- hearing impairment including tinnitus;
- annoyance;
- interferences with social behaviour (aggressiveness, protest and helplessness);
- interference with speech communication;
- sleep disturbance and all its consequences on a long and short term basis;
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and

[http://www.schillerinstitute.org/programs/pro gram\\_symp\\_2\\_7\\_98\\_tchor\\_.html](http://www.schillerinstitute.org/programs/pro gram_symp_2_7_98_tchor_.html) (1998)

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JUNIATA WIND TURBINES

Juniata Township (PA) supervisors are ready to buy a pair of noise meters at the request of three residents disturbed by wind turbines near their properties. The township's ordinance specifies that the noise created by the turbines cannot exceed 45 decibels, a level that has been compared to the hum of a refrigerator. The noise has been a lot louder, residents Todd and Jill Stull told supervisors. Neighbour Clair Chappell agreed. "It bothered us all summer," Jill Stull said. "You can hear it inside my house, even with my windows and doors closed." The Stulls, who asked supervisors in March for help, said they documented dates and times when the turbines were noisy and offered that information to representatives of the company managing the wind farm. With no action, they appeal again to supervisors for help. Supervisors David Kane and David Rimbeck said they have been on the Stull property and on neighbouring properties and have yet to hear any disturbing noise. Gerald Young, 85, who lives next to Chappell, told supervisors he has heard wind turbines. "I have a 74 percent hearing loss in one ear and a 75 percent hearing loss in the other ear," Young said. "If I can hear them, somebody else has got to be hearing them." Kane suggested asking Babcock & Brown, the company managing the wind turbine farm stretching over the Blair and Cambria borders, to set up a noise meter. Solicitor Michael Routch advised against that and suggested the township acquire its own. "It's not a belief issue," Routch said, "It's a proof issue." His suggestion led into a debate over who should buy the noise meters, with supervisors voting to spend up to \$1,200 for a pair of meters. Todd Stull told supervisors the purchase is their responsibility so they can enforce the ordinance adopted last year.

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SCHIPHOL

An ambitious plan involving almost all the major players of the Dutch aviation sector should expand the accessibility and increase the sustainability of Schiphol Airport in the coming years. The initiative is to be presented by KLM, Air Traffic Control Nederland, the National Aerospace Laboratory (NLR), Schiphol, Stork Aerospace, technical research centre TNO and Technical University Delft. The new approach will enable Schiphol Airport in the short term to better anticipate developments in international air traffic and at the same tackle growing environmental problems. The plan aims to reduce noise nuisance and CO2 emissions caused by aircraft on the ground by 20 percent during a single parliamentary term. The parties that took the initiative feel that the plan can be realised since it has players in the Dutch aviation sector. The parties involved want to create pyramid-like sound berms in the area around Schiphol Airport. These devices can largely put a stop to annoying low frequency noise levels. The plan will also involve the installation of devices at homes close to Schiphol Airport so that sound waves from aircraft can be neutralised in the near future. Another aspect of the plan is the development of a so-called ultra green, very environmentally friendly aircraft that scientists of the Technical University Delft have been working on for months.

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