

From Mozart to MJ: the life and science of music – the good, the bad, and the ugly

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Death is such an indispensable fact of life. It is not the ultimate tragedy in itself, but rather a paramount triumph of life. What would be the meaning of living without dying? To live perpetually without having to kick the bucket makes no biological sense at all. Yet death is the most unwelcomed encounter for every organism. It has been known from experience that music brings pleasure to life in humans. It has been further scientifically demonstrated that music is clinically beneficial to those inflicted with diseases, even terminally ill patients. However, on the bleak side of it, gifted musicians are at greater risk of mortality than non-musicians. A wealth of scientific data posits that committed musicians have relatively low life expectancy. A variety of causes have been attributed, of which aggressive life style and reckless behaviors appear to be the dominant factor. If you want to live fast and die young, become a rock star, statistics says.

Music is Great

The ancient Greeks have it that there were bird-women called the Sirens, who lived on an island, used their mystical music to decoy approaching sailors. Sailors who happened to sail near their island were enchanted by their ethereal music and voices, so much so that they were compelled to shipwreck on the surrounding rocky coast. Their song meant death. Of course we know of one who survived the hard way. Odysseus imposed all his sailors to plug their ears with beeswax and he himself be tied to the ship's mast while they cruised pass the Siren's lair. When he heard the captivating song he writhed in agony to be freed, but no crew could heed his plea.

According to the German folktale, Frankie Gammyfoot alias The Pied Piper of Hamelin deposited countless rats infesting the town, and fur-

ther lured away all the children of the town when he was denied the price of his pesticial charity; all with the use of his musical pipe, by which rats and children alike swayed to the symphony of destruction.

The Israelites have the chronicle of their conquest of Canaan, their God's promised land, a land flowing with milk and honey. With Joshua as their leader, the seven priests blew seven trumpets made of rams' horn, and the soldiers shouted in unison with all their might. The impenetrable fortress of Jericho fell flat, and the city was acquired.

So on and so forth, stories and legends of the power of music resonate through every culture of the world. And science has a thing or two to say.

Especially for Health

There has been a tremendous explosion in the clinical studies of music therapy, and a number of studies demonstrated that music listening (and even more so music production) activates a multitude of brain structures involved in cognitive, sensori-motor, and emotional processing. For example, music engages sensory processes, attention, memory-related processes, perception-action mediation (“mirror neuron system” activity), multisensory integration, activity changes in core areas of emotional processing, processing of musical syntax and musical meaning, and social cognition.¹ It is likely that the engagement of these processes by music can have beneficial effects on the psychological and physiological health of individuals, although the mechanisms underlying such effects are currently not well understood.

Recent investigations have shown pain-reducing effects of music listening during medical procedures,^{1,2} as well as for beneficial effects of music therapy in the treatment of tinnitus or attention deficit disorders.³ Music can connect individuals with their emotions and bring about a sense of self-awareness that improves the quality of life for older adults, both physiologically and psychologically. Music is a safe, inexpensive, and easy-to-use intervention that nurses can implement independently to help older adults cope with pain, acute confusion, and functional deficits.⁴

Music therapy can be defined as the controlled use of music and its influence on the human being to aid in physiological, psychological and emotional integration of the individual during the treatment of an illness or disease.⁵ By its very nature, music has strong connections to both attention and memory systems. Brain imaging studies have shown that listening to real polyphonic music calls for rule-based analysis and combination of sound patterns from multiple auditory streams, which naturally recruits bilateral temporal, frontal and

parietal neural circuits underlying multiple forms of attention, working memory, semantic and syntactic processing, and imagery.⁶

Recent evidence suggests that listening to music that is enjoyable but unrelated to the cognitive task may even temporarily improve performance in tests of spatial-temporal abilities, attention, verbal fluency and creativity in healthy subjects.^{7,8} Randomized controlled trials have also shown that active music therapy or music-based exercise improves general cognition and verbal fluency in dementia patients,⁹ symptom scores in schizophrenia patients,¹⁰ and communication skills in autistic children.¹¹

A pilot study revealed that pre- and post-music therapy measures were obtained from hospitalized children with cancer ($n = 65$) and parents indicated significant improvement in children’s ratings of their feelings from pre- to post-music therapy.¹² The measures consisted of children’s ratings of mood using schematic faces, parental ratings of the child’s play performance, and satisfaction questionnaires completed by parents, children and staff. Another data showed that 64 women who were planning to have a cesarean delivery were randomly divided into an experimental and a control group with respect to physiologic measures, level of anxiety, and satisfaction during cesarean delivery. Compared to the control group the experimental group had significantly lower anxiety and a higher level of satisfaction regarding the cesarean experience.¹³

Music therapy is also demonstrated to be an effective tool for stress relief and analgesia in patients undergoing gastrointestinal endoscopic procedures. Rudin *et al.*¹⁴ observed that patient provided with selected music, delivered through headphones, may provide maximal benefits while circumventing potentially undesirable exposure of the medical staff to that particular music. Study

of 48 children allocated to either a music intervention group or an untreated control group showed that music can reduce aggressive behavior and improve self-esteem in children with highly aggressive behavior.¹⁵ A single-blind, randomized, and controlled trial of 60 patients with a left or right hemisphere middle cerebral artery stroke patients who listened daily to self-selected music or audio books recovered significantly faster in the domains of verbal memory and focused attention than in the control groups. The music group also experienced less depressed and confused mood than the control group.¹⁶

Traditional music such as Indian classical music are also found to have profound sedative effects during surgical operations.¹⁷ Listening to Turkish classical music was demonstrated to decrease the dose of sedative and analgesic medication required during the colonoscopy as well as patients' anxiety, pain, dissatisfaction during the procedure.¹⁸ Patients were randomized into either listening to music (Group 1, $n = 30$) or not listening to music (Group 2, $n = 30$). Anxiolytic and analgesic drugs (intravenous midazolam and meperidine) were given according to the patients' demand. The mean satisfaction score was higher in group 1 compared to group 2 (87.8 ± 3.1 vs 58.1 ± 3.4 , $P < 0.001$). The mean pain score in group 1 was lower than group 2 (74.1 ± 4.7 vs 39.0 ± 3.9 , $P < 0.001$). Therefore, it is a simple, inexpensive way to improve patients' comfort during the procedure.

Japanese doctors have also established the molecular basis for the stress-reducing potential of music.¹⁹ Their study from 87 patients with cerebrovascular disease revealed that regular music perception significantly reduced plasma cytokines (interleukin-6), adrenalin and noradrenalin levels compared to patients without music therapy. Therefore, music therapy enhanced parasym-

thetic activities and decrease congestive heart failure by reducing blood cytokines and catecholamines, high levels of which are the signatures of stress.

Including the so-called Mozart Effect

The temporary increase in performance on spatial relation tasks following listening to the renowned German composer Mozart's music has been anecdotally known; such phenomenon has been dubbed the Mozart effect. The idea for the Mozart effect originated in 1993 after the work of Gordon Shaw and Frances Rauscher of the University of California.²⁰ In their seminal work, 36 students were subjected to three situations, namely, 10 minutes of (1) listening to Mozart's Sonata for Two Pianos in D major K. 448, (2) listening of a relaxation tape, and (3) silence. The students' spatial reasoning was tested using the Stanford-Binet intelligence scale. Results showed a significantly improved performance in situation (1), and the IQ score declined from 119, 111, and 110 under situation (1), (2), and (3), respectively (Figure 1). Therefore, a firm scientific basis for Mozart effect was revealed.

Another experiment that agrees with the claim was made by psychologists at Bellarmine College. To make sure the Mozart effect was con-

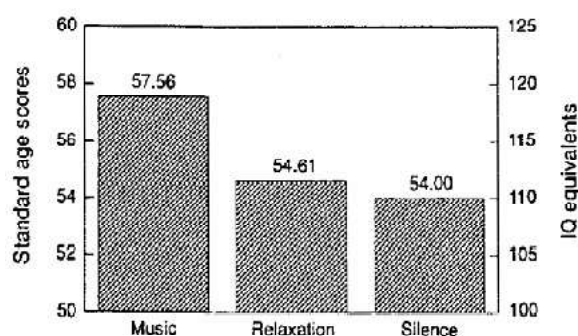


Fig 1. The Mozart effect. Improved IQ in students listening to Mozart's sonata.

sistent, they tested the spatial reasoning of the participants in a study by having them complete pencil-and-paper mazes of varying complexity. The students were given eight minutes to complete as many mazes as possible. Of the 22 volunteers, the average student completed 2.68 mazes in 8 minutes after listening to Mozart's music. After listening to different types of music, the average student only completed 2.2 mazes, and after being in silence, the average student completed 1.73 mazes.²¹

In another test, 24 graduate and undergraduate students listened to either Mozart's Piano Sonata in D major (K.448), or to Albinoni's Adagio in G minor. The participants performed significantly better on the spatial-temporal task after listening to Mozart's Sonata than after listening to the Adagio.²² Mozart's Sonata for Two Pianos in D major K.448 has also been known to reduce the number of seizures among 29 epileptic patients. After listening to the piece for up to 300 seconds, 23 of the 29 patients experienced significant decreases in epileptiform activity, even from patients in comas.²³ A 56-year-old man with refractory gelastic epilepsy who began listening to Mozart was observed to have regularly experienced improvement in seizure control.²⁴ In a recent study, 86 high school students were randomly assigned to Mozart or control conditions, they assessed on arousal levels and spatial reasoning. Those in the Mozart condition had higher spatial reasoning scores, but were not systematically more or less aroused.²⁵

It must be borne in mind that as a general skeptical insight, the Mozart effect is a momentary phenomenon. This is important because many absurd commercial claims have come up from people looking for money but not the science behind such experiments. Many investigations have found no long-term benefits.^{26,27} The Mozart

effect can be attributed to temporary changes in mood and arousal that result from prolonged exposure to music (e.g., 8-10 minutes). Not all music generates the Mozart effect, however. The music must be perceived as having an energetic and positive emotional quality.²²

But being a Musician is not

Music is definitely beneficial to health but those who make a successful business and recognition out of music are actually having much less life span compared to the general non-musician population. Famous musicians generally failed to live to a ripe old age. Even the man Wolfgang Amadeus Mozart (1756-1791) himself could barely make into the annals of music and by that, history of the world, as a legendary composer. His momentary but fruitful musical career was prematurely cut short at the age of 35 by a severe illness.

One of the greatest composers of all time, of the same German blood, Ludwig van Beethoven (1770-1827) was hardly 57 years when he died of ill-health. In fact, by 1814 Beethoven was totally deaf, his hearing had been deteriorating since his early age. But that did not deter him from his music career, and once visitors saw him play a loud arpeggio and thundering bass notes at his piano, he remark with wry humour, "Isn't that beautiful?" A precocious genius composer Fryderyk Franciszek Chopin died at the age of 39 in 1849 due to pulmonary tuberculosis.

If you blame the poor medical situation of the previous centuries for short lifespan of these musicians, you might regret to learn that our modern world famous musicians are no better. Ritchie Valens was a professional singer for only 8 months, though he is well remembered with his hit "La Bamba" but died tragically at the age of 17 in 1959 in a plane crash along with music gu-

rus such as Buddy Holly (age 22) and the Big Bopper (age 28). Other early musicians of the same trade to die young include Johnny Burnette (30), and Eddie Cochran (21).

Hank Williams, a noted country musician died of accidental overdose of morphine and alcohol at 29 in 1953. It has been incessantly argued that Bob Marley, who advanced the music genre of reggae to worldwide recognition, would not have died of melanoma (skin cancer) which started in his toe and eventually spread to lung and brain. He died at 36 in 1981; his refusal of medical treatment (amputation of his toe) was blamed.

Jazz music might be perhaps the most lethal of all music professions, because musicians are subjected to prolonged physical strains while playing jazz instruments, they fail to keep up with good health.²⁸ Charlie Bird Parker is widely regarded as the Messiah of modern Jazz; he died at the age of 35 due to lobar pneumonia in 1955. John “Trane” Coltrane, more than any other player, legitimised the extended jazz solo. Addicted to drugs and alcohol, he died of liver failure at 41 in 1967.

In particular, scientific investigation has revealed that professional saxophone players were observed to be significantly more at risk of death than other musicians.²⁹ In total, 813 musicians born between 1 January 1882 and 30 June 1974 were identified. Of these, 349 (43%) died during the follow up period to 15 February 1998. Hazard ratio was highest among saxophone players (2.47%) (Figure 2).

Especially being a Pop/Rock Star

The worst is yet to come. In popular music, especially in rock music industry, dying young has famously been described as a good career move (Table 1&2). But the good side of it is, dead icons

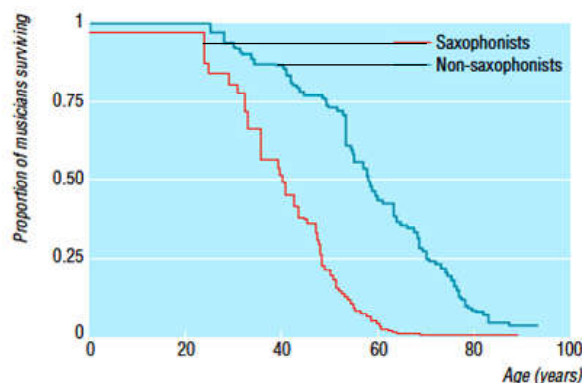


Fig 2. Survival curves of saxophonists and other musicians (from Kinra and Okasha, 1999).

often sell more than they ever did when they were alive. Believe it. Michael Jackson’s album ‘Thriller’ is still the unsurpassed bestselling album with a staggering 110 million sales, followed by ‘Back in Black’ of AC/DC with 49 million sales. On individual aspect, Kurt Cobain is still earning an astronomical \$ 50 million a year, followed by Elvis Presley with a humble \$ 42 million. In fact they are the highest earning dead celebrities, outstripped by only few alive. Yet they were dead in their heyday.

John Lennon of the Beatles was shot dead in 1980 at the age of 40. Alleged ‘the King of Pop,’ the record making Michael Jackson recently died of cancer at the age of 51. Michael Hutchence of INXS ended his own life while his music business was at its prime in 1997; he was 37. A rock vocalist of extraordinary ability, Freddie Mercury of the Queen died of AIDS in 1991 at 45. Randy Rhoades, the superb guitar axe-man of Ozzy Osborne met his death at 26 in 1991 in an airplane crash. Otis Reading had met the same fate at the same age in 1967. The screaming and screeching singer of AC/DC, Bon Scott died of alcohol in 1980 at 30.

Drug overdose is a familiar cause of death.

The King of Rock and Roll, as history will aptly remember, Elvis Presley died of excessive drug use in 1977 at his burgeoning year of 41. Keith Moon literally died over his drums in 1978. Shannon Hoon of Blind Melon was a rising star when he died in 1991 at the age of 28. Hillel Slovak of Red Hot Chili Peppers died in 1988 when he was only 25.

It is not a mere superstition; the age of 27 is a practical dead end for some of the biggest rock musicians ever born, and there even exists a site in their tribute, suitably named *forever27.co.uk*. The legendary Jim Morrison of the Doors, who shaped so much of rock music, died of heart attack in 1971. The guitar maestro Jimmy Hendrix took too much of drug that he gave up life in 1970. The same fate was shared by Janis Joplin, perhaps, the most powerful women rocker the world

has ever seen, in 1970. Brian Jones, attributed to have named the Rolling Stones was found dead in swimming pool in 1969. Jimmy Maculloch of Wings had a heart attack in 1979. Alcohol took the better of Ron McKernan of Grateful Dead in 1973. The front man of Nirvana, Kurt Cobain, who revolutionized modern alternative rock music, shot his head off in 1994. They were only 27.

Premature tragedy abounds, tragic stories of popular musicians are endless.

Pop/rock stars are frequently characterised as indulging in high-risk behaviours, with high profile deaths amongst such musicians creating an impression of premature mortality.³⁰ An extensive report was made on the survival rates of famous musicians ($n = 1064$) from their point of fame and compares them to matched general populations in North America and Europe.³¹

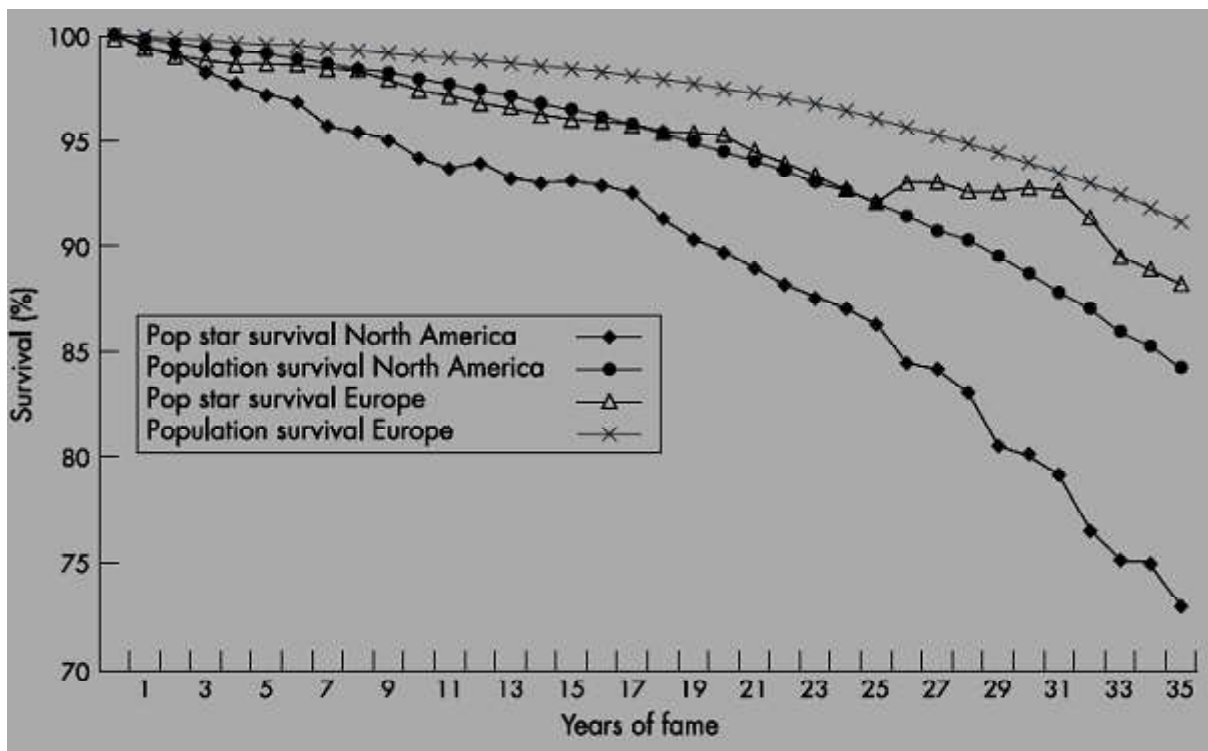


Fig 3. Comparative survival curves for North American and European pop/rock stars and demographically matched general populations.

Table 1. Mortality of rock stars compared to general population.

Population	Region	Years
General [†]	World	66.57
	Europe	78.67
	North America	78.47
Rock stars [‡]	Europe + North America	36.9*

[†] CIA World Factbook; [‡] The World Almanac and Book of Facts; * Significantly different ($P < 0.05$, ANOVA) compared to general population.

Table 2. Major causes of premature death among rock musicians.[* $n = 317$]

Sl. No.	Cause of mortality	%*
1.	Cardiac arrest	13
2.	Drug overdose	12.7
3.	Suicide	11.4
4.	Other medical failure	11.7
5.	Motor crash	10.7
6.	Cancer	8.2
7.	Plane crash	7
8.	Unknown/disappeared	6.6
9.	Murder	5.7
10.	Alcohol	3
11.	Accident	2
12.	Stroke/choke	1.6
13.	Drowned	1.6
14.	AIDS	1.3
15.	Brain tumour	1.3
16.	Poisoned	1
17.	Electrocuted	1
18.	Fire	1

From 3 to 25 years post fame, both North American and European pop stars experience significantly higher mortality (more than 1.7 times) than demographically matched populations in the USA and UK, respectively. After 25 years of fame, relative mortality in European (but not North American) pop stars begins to return to popula-

tion levels. Our results show that at between 2 and 25 years of fame, both North American and European pop stars tend to experience two to three times the risk of mortality expected in an average population matched by age, sex and, in North America, ethnicity (Figure 3). Rock stars can suffer high levels of stress in environments where alcohol and drugs are widely available, leading to health-damaging risk behaviour.³⁰

Acknowledgement

To all famous musicians who laid down their lives while leaving a little bit of something to listen to for the rest of us alive.

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