



PRESS RELEASE

Why does listening to sad music help in times of sadness? IIT Mandi Director's research sheds light on 'Tragedy Paradox'

MANDI, 16th January 2023: Music has a powerful ability to affect our emotions, and it's no secret that people often turn to music to boost their mood or to help them through a tough time. But why do we sometimes seek out sad music, even when we try to minimize sadness in our lives?

Despite our natural inclination to avoid sadness, this particular emotion has a strange and enduring appeal when expressed through art. This so-called "tragedy paradox" has puzzled philosophers for centuries. It has been postulated that the tragedy paradox arises simply because of the aesthetic appeal of gloomy tunes. Is it proof that a thing of beauty is a joy forever, or is there a more profound, biological reason for sad music making us feel better?

A recent study led by Prof. Laxmidhar Behera, now Director of IIT Mandi, set out to answer the above question.

"We wanted to find out how the brain reacts when listening to sad music after having an adverse experience or memory," **said Prof. Laxmidhar Behera.** For this, the researchers used electroencephalography (EEG) to measure the brain activity of twenty people under different conditions. They focused on brain regions involved in emotion and memory processing: the cingulate cortex complex and the parahippocampus.

The twenty participants had no musical training to avoid pre-programmed reactions to the selected music. EEG was measured under three states. In the first, EEG was recorded with no input - the baseline. In the second state, EEG was recorded as the participants recalled a sad experience and wrote about it - the Sad Autobiographical Recall or SAR condition. In the third, EEG was measured when they were made to listen to an Indian Classical Raga, **Mishra Jogiya Raga**. The music was selected by a panel of five music experts and is known for invoking Karuna Rasa (sad emotions).

EEG measures the electrical activity of the brain, commonly known as the brain waves. It is known that brain waves are of five types - alpha, beta, gamma, delta, and theta, representing a different mood/state of mind. Within the current context



Alpha is, for example, associated with cognitive information processing, while gamma is associated with episodic memory processing.

The researchers found that when recalling a sad experience (i.e. during SAR), there is enhanced gamma wave activity, while listening to sad music leads to increased alpha brain activity.

Explaining their observations, Dr Behera said, *“Listening to Mishra Jogiya Raga (sad music) appears to promote processing of emotions and memories in the brain, through a three-channel framework involving the alpha brain wave. These mechanisms include increased global and local connectivity in brain areas involved in emotion and memory processing, and increased alertness.”*

The finding shows that the brain's activity when listening to sad music is unique and distinct from both the SAR state and the baseline resting state. The coping mechanism of sad music arises from better processing of emotions and memories under the alpha state. “The coping effects are not simply due to the aesthetic appeal of the music, as previously believed, but an inherent property of sad music”, explains Mr. Ashish Gupta a Ph.D. scholar.

While it is clear that music can affect our emotions and cognitive abilities, the scientists believe that more research is needed to understand the relationship between sad music and the brain entirely. While EEG studies have provided insights into the brain response to sad music in terms of brain cortical activity, the researchers also intend to study the deeper sub-cortical areas using fMRI scans in the future. “The current study is a part of ongoing work of investigating the effect of Indian Raga on Human cognitive functions.

This work has significance for music therapy, music training, etc. where music is used or can be used as a therapeutic tool.” adds Professor Braj Bhushan.

These interesting observations have been recently published in the open-access journal PLOS One, in a paper co-authored by Ashish Gupta, Prof Braj Bhushan, and Prof Behera.

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IIT Mandi has nine Academic Schools and four major Research Centers. The Schools are the School of Biosciences and Bioengineering, School of Chemical Sciences, School of Mathematical and Statistical Sciences, School of Physical Sciences, School of Mechanical and



Materials Engineering, School of Civil and Environmental Engineering, School of Computing and Electrical Engineering, School of Humanities and Social Sciences, and School of Management. The Centers are Advanced Materials Research Centre (AMRC; set up with an investment of Rs. 60 crores), Centre for Design and Fabrication of Electrical Devices (C4DFED; has Rs. 50 crores worth of fabrication tools), BioX Centre (has acquired research equipment worth Rs. 15 crores), and Indian Knowledge System and Mental Health Applications Centre (IKSMHA Centre).

The Institute offers B.Tech. programs in seven different streams, one M.A. program, ten M.Tech. programs, four Ph.D. programs, and one iPh.D. program. The unique, project-oriented B.Tech. curriculum is centered around its 4-year long Design and Innovation stream. Since the inception of the Institute, IIT Mandi faculty have been involved in over 275 Research and Development (R&D) projects worth more than Rs. 120 crores.

IIT Mandi set up the IIT Mandi iHub and HCI Foundation (iHub; a section-8 company) on its campus at Kamand with significant funding of INR 110 crores from the Department of Science and Technology (DST), Government of India. The iHub is planned to fuel research and technology development, skill development, startup and innovation, and collaborations in the HCI and allied AI/ML areas in India. IIT Mandi is the only second-generation IIT to be featured at rank 7 in the Atal Ranking of Institutions on Innovation Achievements of the Innovation Cell, Ministry of Education, Govt. of India.

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