"Effect of music on the brain cells and waves and its therapeutic outcomes"

Parinaz Lordifard

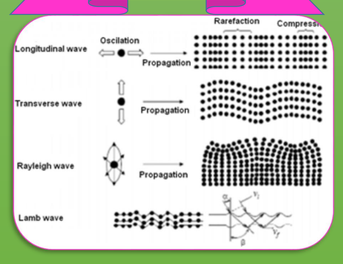
Institute of Biochemistry and Biophysics, University of Tehran, Tehran, Iran

Abstract

Introduction: What human realizes with his hearing sense is called sound. Sound is the result of vibration and whatever substances oscillate more regular, the sounds will become more similar to the musical sounds. Musical alphabet is called Notes and each one of the musical instruments produce the notes frequencies in different ways. The sound waves are mechanical type and their intervention can produce assonant and dissonant harmonics which can realize with the brain. There is a growing correlation between music and brain. The sounds also found in alive molecules and atoms and this is the basis of music therapy.
Methods: The number of volunteers are selected and the music produced from EEG waves is analysed.
Results and discussion: Playing the musical instruments create the link between hands movement and emotional, seeing and hearing reflection and involved different part of the brain.
Conclusion: music is beneficial for the body and soul of the mankind.
Keywords: music, frequency, brain waves, music therapy, EEG

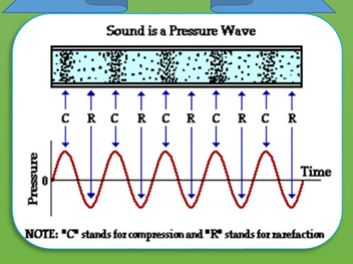
Introduction

Different kind of waves



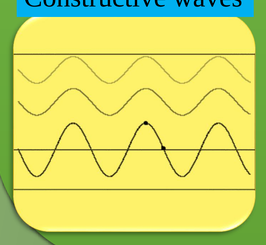
Sound is a mechanical and longitudinal wave

Ellastic environment

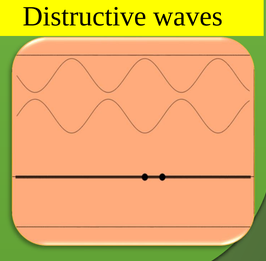


elasticity is the ability of a body to resist a distorting influence or deforming force and to return to its original size and shape when that influence or force is removed

Constructive waves

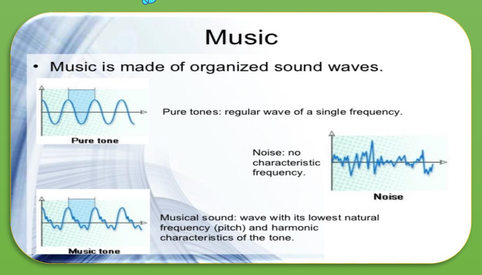


Distructive waves

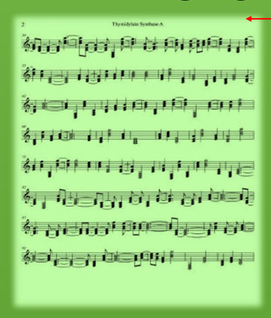


Interference of two waves due to their phase and wave length and amplitude can be constructive or destructive

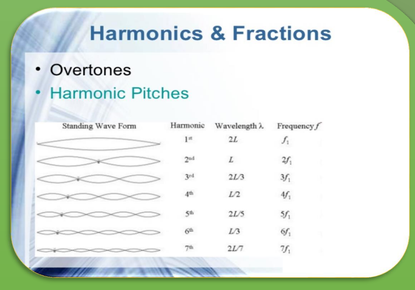
What is music?



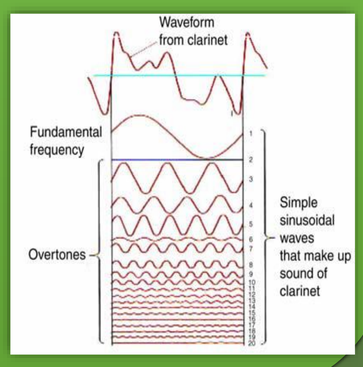
Protein language!



Each protein has an special music and each amino acid can translate to the particular note!!!

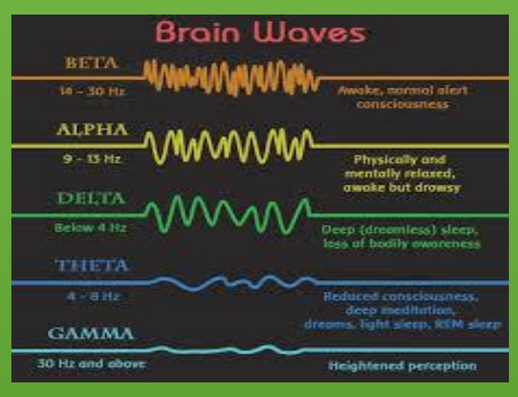


Sound features consist of pitch, duration, dynamics and timber

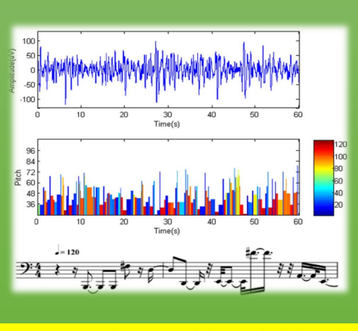


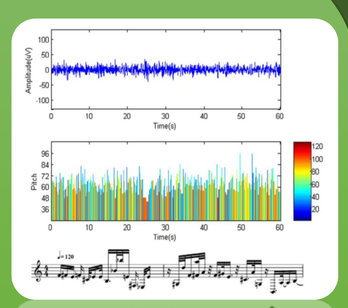
Brain wavws

The brainwaves, the electroencephalograms (EEGs), are the visual plotting of the brain neural electric activities projected to the scalp surface. The earliest attempt to hear brainwaves as music was made in 1934



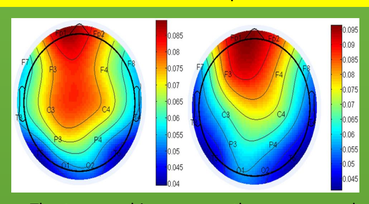
Musical notes obtained from REM and SWS sleep state





I. *The REM music has high-pitch notes and dense rhythm, thus it indicates a high arousal state.*
II. *The SWS music has notes of low pitch, and the rhythm is sparse.*

The topographic map of the probability of electrodes which were represented.



The topographic map was the average probability for all the 40 subjects, the left was the result of brainwave music during eyes closed and the right was that during eyes open.

Mapping rules from EEG to music.

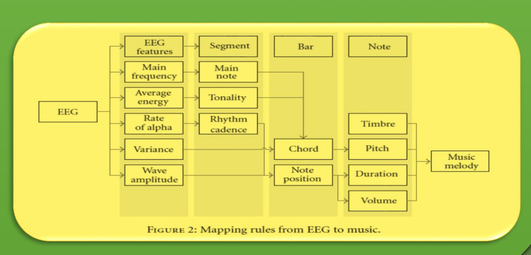
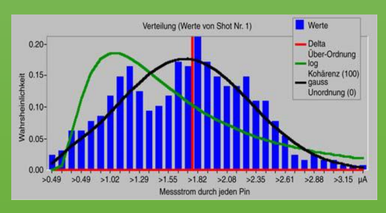


FIGURE 2: Mapping rules from EEG to music.

DanWu,1 Chaoyi Li,1, 2 Yu Yin,1 Changzheng Zhou,1, 3 and Dezhong Yao1. Music Composition from the Brain Signal: Representing theMental State byMusic Hindawi Publishing Corporation Computational Intelligence and Neuroscience, Volume 2010, Article ID 267671, 6 pages

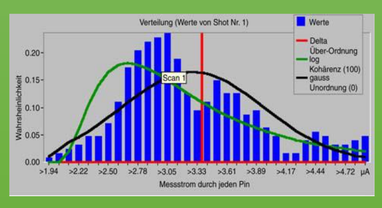
Kinds of distribution of measurement data before hearing Tibet sound bowl (on a computer screen)

Kinds of distribution of measurement data before hearing Tibet sound bowl

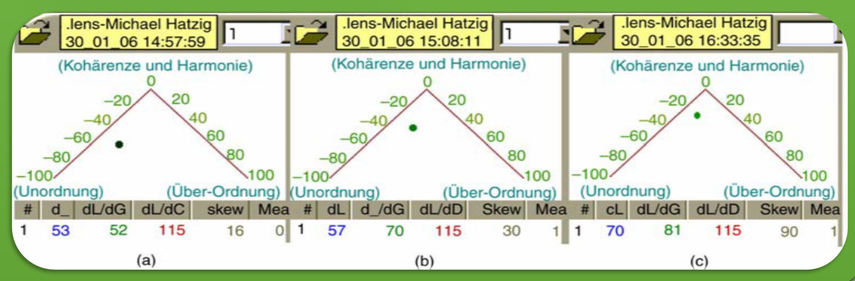


The Tibet sound bowl changes the distributions of electronic measurement data from the same person (after 11 min)

The Tibet sound bowl further changes the distributions (36 min)

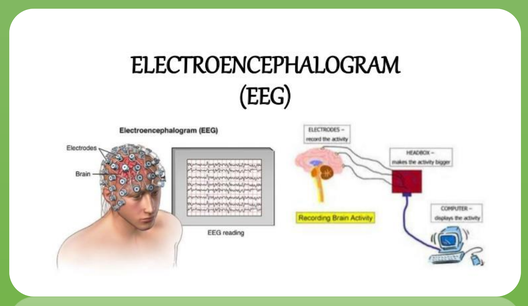


Showing the influence of acoustic wave into a human body in Hilbert space (a) before, (b) 11 min and (c) 36 min



Hartmut Kapteina, Chang Lin Zhang, Music therapy in viewpoint of biophysics, *Int. J. Modelling, Identification and Control, Vol. 5, No. 3, 2008*

methods



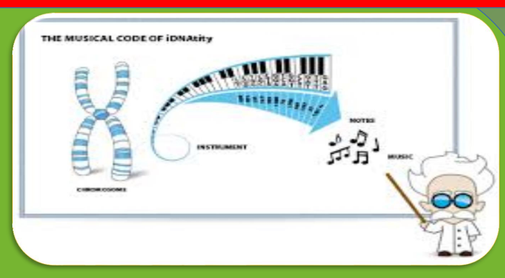
To show the performance of the proposed mapping rules, the real EEG data recorded during the different sleep stages. The data of rapid-eye movement sleep (REM) and nonrapid eye movement were utilized. For the nonrapid eye movement sleep data, we chose segments from both stage 2 (named NREM henceforth) and stages 3 or 4 (the slow-wave sleep (SWS)). The subject was a 25-year-old male, physically and mentally healthy, right-handed. The signals is recorded by a 32 channel NeuroScan system with a sampling rate of 250 Hz and were band-pass filtered from 0.5Hz to 40 Hz.

$$\frac{|x(i) - \bar{x}|}{\bar{x}} > 1,$$

$x(i)$ denotes the value of the EEG signal at the current point i, and x is the average of the data $x(i)$ from the last segment ending to the current time.

DanWu, Chaoyi Li,Yu Yin, Changzheng Zhou, and Dezhong Yao1 Hindawi. Music Composition from the Brain Signal: Representing theMental State byMusic. Publishing Corporation. Computational Intelligence and Neuroscience Volume 2010, Article ID 267671, 6 pages

There is a relation between music and macromolecule



the principle of repetitious recurrence pervades both the construction of coding sequences in the genome, which can be regarded as being representative of nature and musical composition which can then be regarded as the most abstract and therefore the most intellectual expression of nature.'

Amino acid	P	Q	I	T	L	W	Q	R	P	L
Morse code	.--.	--.-	..	-	.-..	.--	--.-	.-.	.--.	.-..
1st digit of the code	.	-	.	-	.	.	-	.	.	.
Note in G Minor	1G	1B♭	1A	1F#	1A♭	1E♭	1B♭	1D♭	1G	1A♭
Piano score										

Result and discussion

Brain waves: The results demonstrate that REM music encompasses a wide variety of note pitches. The fast rhythm and lively melody suggest an active state of the brain in REM. On the contrary, the SWS brainwaves are characterized by a larger amplitude and longer duration, which results in a piece of music.

The scale-free or equivalent power-law phenomenon may be an essential mechanism of the brain. The brain and music both follow the same dynamic principle, the power-law, which may provide the most efficient method for humans to interact with the environment.

Music therapy: It really works because: We have physiologic responses to music

Music taps into our emotions. Music helps improve our attention skills. Music uses shared neural circuits as speech. Music taps into our memories

References

Hartmut Kapteina, Chang Lin Zhang, Music therapy in viewpoint of biophysics, *Int. J. Modelling, Identification and Control, Vol. 5, No. 3, 2008.*

Wu D, Li C-Y, Yao D-Z (2009) Scale-Free Music of the Brain. PLoS ONE 4(6): e5915.

DanWu, Chaoyi Li,Yu Yin, Changzheng Zhou, and Dezhong Yao1 Hindawi. Music Composition from the Brain Signal: Representing theMental State byMusic. Publishing Corporation. Computational Intelligence and Neuroscience Volume 2010, Article ID 267671, 6 pages

Wu D, Li C, Yao D (2013) Scale-Free Brain Quartet: Artistic Filtering of Multi-Channel Brainwave Music. PLoS ONE 8(5): e64046. doi:10.1371/journal.pone.0064046

Peter Townsend (2015) The role of physics in shaping music, Contemporary Physics, 56:3, 269-291.