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Cultural Effects on Musical Preferences: An fMRI Study

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Background in cultural studies: Cultural effects on musical preferences are thought to have multi-dimensions in cultural studies of music. While in early studies race, gender, ethnicity and class are considered as cultural identities in relation with both musical practices and preferences (Shuker, 1998), (Middleton, 1991), more recent studies regarding daily life (Denora, 2000), (Hesmondhalgh, 2002) reveal a more complex relation between culture and musical preferences.

Background in physiology and biology of music: Although there are number of neurological studies on music and emotions, very few of them consider cultural issues. These studies mostly rely on pleasant and unpleasant emotions which music is thought to evoke (Blood, 1999), (Koelsch, 2006). However studies considering cultural issues, take culture into account only regarding nationality (Arıkan, 1999), (Morrison, 2003), (Brown, 2004).

Aims

In this study, primarily we test the accordance of musical preferences declared by the participants, and their functional Magnetic Resonance Imaging (fMRI) scans taken while listening to musical excerpts, regarding their cultural backgrounds. By using both foreign and national musical excerpts of different genres, we hope to enhance the current findings of the neurological studies on music. Secondarily we also research whether musical preferences evoke singing mechanisms.

Participants:

- 24 healthy citizen (Republic of Turkey)
- 12 female, 12 male
- Mean age 29,4 (range between 22-37)
- 14 student (7 student in musicology, 7 student in fine arts)
- 10 from various professions

Stimuli:

- Participants are not informed about the excerpts before the experiment
- First 2 minutes of 4 musical excerpts from 4 different genre:

1. Johann Sebastian Bach –Well Tempered Clavier, C major Prelude Book II (Western classical)
2. Orhan Gencebay – Bir Teselli Ver (Arabesque)
3. White Snake – Still Of The Night (Rock)
4. Emine Akmeşe - Kaşlarının Karası (Turkish Folk)

Materials & Method:



Procedure:

1.fMRI

- 3D FLASH sequnce (176 slices antomical images) (6min)
- Gradient field mapping (7-8 min)
- fMRI (GRE EPI sequnce)
  - TR: 3890 TE:50 FA:90
    - Delay in TR: 500 ms
    - Number of Slices:36
    - Slice thickness: 3mm
    - Matrix: 64 x 64
    - FOV:192mm
  - Paradigm size: 16 (1 ignore- 7 baseline- 1 ignore- 7 active)
  - Measurements: 64 (4 blocks)
  - 30 s. Rest -30 s. Music
  - Each excerpt lasts 4 min. (Total 2 min. Rest-2 min. Music)
  - 4 excerpts in 1 run
  - Short breaks between each excerpt: (5-10 s.)
  - Total time : appr. 40 min.

2. Interviews

- Cultural background of musical preferences of participants
- Participants rated the exerpts:

Hate	(1)
Not like	(2)
Neutr	(3)
Like	(4)
Much enjoy	(5)

Equipments:

- Siemens Magnetom Symphony Maestro Class 1.5T MRI
- Yamaha CDX–596 CD player.
- Modified Sennheiser HD 265 Linear headphones

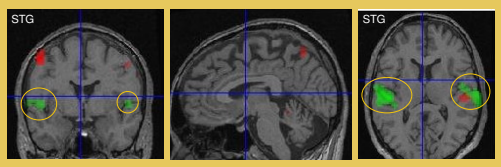

Figure 1. G.E.'s activations of superior temporal gyrus (STG)

- Red color-unpleasant - Turkish folk excerpt
- Green color- pleasant-rock excerpt

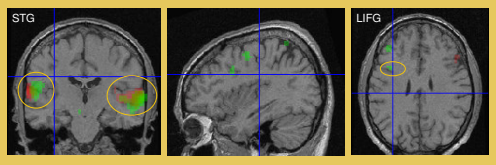

Figure 2. F.O.'s activations of superior temporal gyrus (STG) and left inferior frontal gyrus (LIFG)

- Red color-unpleasant- arabesque
- Green color- pleasant-western classical

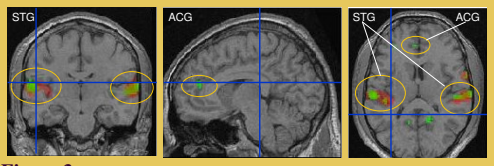

Figure 3. A.K.'s activations of superior temporal gyrus (STG) and anterior cingulate gyrus (ACG)

- Red color-unpleasant-rock
- Green color- pleasant- western classical

Analysis:

fMRI results and results of the interviews were evaluated concordantly.

1. fMRI

fMRI data were analysed using Statistical Parametric Mapping (SPM2) software (http://www.fil.ion.ucl.ac.uk/spm) .

2. Cultural

After each session each participant was asked for his/her emotional experiences while listening and their familiarity to the excerpts. Interviews also included musical history of each participant in relation with the events and periods of their life. Interviews demonstrating the cultural background of some participants revealed that their musical preferences, declared are not reliable. For example arabesque music is considered as a "lower" musical genre by the dominant ideology of the state while western classical music is considered as "high" status musical genre in Turkey. So we observed that participants' declarations about their musical preferences reflects such ideological hesitations.

3. fMRI versus Cultural

The cultural contradiction of some participants made it hard to obtain statistical analysis of the experimental data. The study turned to relying on the cultural analysis of participants' musical preferences instead of relying on the participants' declerations, as stated in the Aims section. This new situation required new analysis which is still being carried on. On the other hand figures 1, 2 and 3 shows the results of sample participants whose declerations are found to be reliable. Table 1 also demonstrates a general overview of the whole experiment.

New Results :

In all subjects fMRI findings revealed a greater activation on the *superior temporal gyrus (STG)* for the musical preferences *obtained from the cultural analysis of interviews*, which are also considered as pleasant music. Additonal activations with the pleasant music are found on the left inferior frontal gyrus (LIFG) *which can be attributed to the singing mechanism (Koelsch 2005; Menon 2005). 10 of the participants also shows activations for the pleasant music on the anterior cingulate gyrus (ACG) which can be attributed to reward circuitry of the brain (Menon 2005). Table 1 shows activation percentages of participants for the relevant brain regions.*

Conclusions:

Familiarity to genre and/or musical excerpt, taken alone, did not imply a direct relation with pleasant emotions, or vice versa. Musical preferences evoking pleasant emotions reveal a dynamic character rather than static in relation with cultural backgrounds of listeners.

Implications:

While cultural effect on musical preferences seems to be one of the major topics in cultural studies, neurological studies can be said to be in its infancy, in this sense. However few studies in collaboration of both discipline has been sufficient to open a new perspective. We hope that our research would contribute to widen this perspective both for cultural study of music and neuromusicology, and for future works.

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Cultural associations of excerpts: (fMRI experience of the participants)

1. Johann Sebastian Bach (western classical):
Piano playing/lessons, Dancing/ ballet,Peace/peaceful places

2. Orhan Gencebay (arabesque):
Smile/laugh, Turkish films, Admiration, Buses/publis taxis

3. White Snake (rock):
Dance, joy, energy, motivation, 80s, Concerts/Rock bars, playing guitar/drum

4. Emine Akmeşe (Turkish folk):
Meaningless, meaninful, joy, laugh, family, TRT chorus, wedding, dance

Table 1. Activation percentages of brain regions of all participants

Brain Regions	Activation Percentages (%)
RST (right superior temporal gyrus)	79
LST (left superior temporal gyrus)	74
ACG (anterior cingulate gyrus)	42
RIF (right inferior frontal gyrus)	30
LIF (leftl inferior frontal gyrus)	29

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