

[Brattico, E., Alluri, V., Bogert, B., Jacobsen, T., Vartiainen, N., Nieminen, S., & Tervaniemi, M. \(2011\). A Functional MRI Study of Happy and Sad Emotions in Music with and without Lyrics. \*Frontiers in Psychology\*, 2. doi:10.3389/fpsyg.2011.00308](#)

**Summary by:** Nikki Pangborn

### Introduction:

- Positive mood is associated with fast tempo and major modes
- Also associated with staccato articulation and loud intensities (staccato is fast abrupt note onset)

Previous study looked at responses of happy vs. neutral music and found differential activation, such that happy music comparatively activated parahippocampal gyrus, precuneus, ventral striatum (VS) and caudate nucleus (CN)

- Most importantly, CN and VS are associated w/ reward behaviours, pleasure, physiological arousal and motivation to move
- Therefore, in other words, happy music activates neural regions associated with feelings of pleasure, excitement, movement, etc.

However, these typically use instrumental tracks, rather than those with lyrics

- Previous research found that happy music elicits greater self-reported positive emotions without lyrics than happy music with lyrics

This study wanted to contrast the evoked emotions and neural responses of different music genres with or without lyrics

- Hypothesized instrumental vs. lyrical music would yield differential activation, and that happy music would activate auditory areas in the left hemisphere (left side of the brain), where sad music activated auditory regions in right hemisphere (right side of the brain)

Method: Fifteen subjects were recruited, all of which were instructed to bring in an equal amount of happy and sad music from various genres, half of which were liked by these participants, and the other half disliked personally by participants

- The most commonly chosen genre ended up being pop rock

Listening test was initially completed to select music to play during fMRI scan:

- Participants listened to short musical excerpts from songs
- Behavioural ratings were acquired of a one-to-five scale for various traits, which essentially measured feelings of happiness to sadness, and whether participants liked or disliked the music

Participants then listened to 32 total musical excerpts while in the fMRI scan

- This came from 16 different songs, in which the excerpt with highest emotional rating and highest familiarity ratings were selected to be played (2 excerpts from each song)

Other musical experts rated the tempo on a scale of 1-5 of slow to fast, as well as if the songs were in major or minor mode, allowing experimenters to conduct an important analysis of unique features

- fMRI scans were completed for happy and sad music, both with and without lyrics

To measure features of happy and sad music, two primary features were chosen: “attack slope” and “spectral centroid”

- Essentially, attack slope describes the intensity of musical onset, for example striking of a percussive instrument (i.e. drum) or loud plucking of a string (i.e. violin) has a higher attack slope
- Spectral centroid essentially describes perceptual brightness of a song – for example a brighter timbre (timbre is a psychological sensation of two instruments creating different sounds despite having the same loudness and frequency) would essentially make the song sound fuller, as there is a greater balance between high and low frequency sounds, often of different instruments played simultaneously

These features were analyzed in each musical excerpt for later analysis of feature differences between happy and sad music.

Results: Happy music had faster attack slopes than sad music with and without lyrics

- Happy music with lyrics also had the brightest timbres (spectral centroids) – where happy music with and without lyrics generally had brighter timbre than either types of sad music
- Faster tempo was also associated with happy music with and without lyrics, compared to that of sad music
- Happy music also was most often played in major mode
- Happy music WITHOUT lyrics also more often induced a greater positive mood in participants

Additionally, as per the hypothesis, happy music more significantly activated left hemispheric regions associated with different levels of auditory processing

### **Important Takeaways** (*for mood boosting songs*)

Happy music WITHOUT lyrics is most effective to boost mood and induce greater positive emotions!

- Happy music with lyrics still can do so, and generally songs with: faster tempo, greater attack, brighter spectral centroid, and a major key are most effective to boost mood and make us feel happy!

Based on what participants brought in, pop rock seems to be a popular feel-good genre