

## Musical emotion and facial expression: mode of interaction as measured by an ERP.

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### ABSTRACT

#### Background

Musical performers often attempt to make good use of their facial expressions to communicate their expressive intention. However, it is unclear whether emotional recognition of facial expressions is integrated into that of music. Music has been believed to express emotion through various elements (e.g. tonality, tempo, timber and so on) in music itself, while it has been increasingly reported that the musical expression interacted with extra-musical factors (Koelsch et al., 2004; Steinbeis & Koelsch., 2008).

#### Aims

In order to reveal how these two emotional processes are processed in the brain, we recorded the electroencephalogram (EEG) of the amateur musicians (n = 12) and non-musicians (n = 8).

#### Method

We presented several pairs of musical excerpts and images of facial expressions, each of which represented “happy” or “sad” expressions. Half of the pairs were semantically congruent (congruent condition), where the emotional meaning of facial expressions and music were the same, and the remaining pairs were semantically incongruent (incongruent condition). During the EEG recording, participants listened to the musical excerpt for 500ms, immediately after the presentation of the facial image for 500 ms.

#### Results

We found that music stimuli elicited a larger negative component in the 250 – 450 ms range (N400) under the incongruent condition than under the congruent condition, notably in musicians. Also, in musicians the N400 effect appeared regardless of the emotional type of music, while in non-musicians the effect was observed only when the happy music excerpts were presented as target stimuli, but not for the sad music excerpts (Figure 1). These results indicated that facial emotional cognition had some common processes with musical emotional cognition especially in musicians. Also it was suggested that the sadness of music was not automatically extracted in non-musicians, although they could judge the congruency of stimulus pairs in the behavioral test. Further analysis showed that a negative component in the 80 – 140 ms

non-musicians. Those ERP components might reflect the extraction of musical emotion, and the difference between musical groups confirmed that the instant comprehension of musical emotion could be learned through musical training.

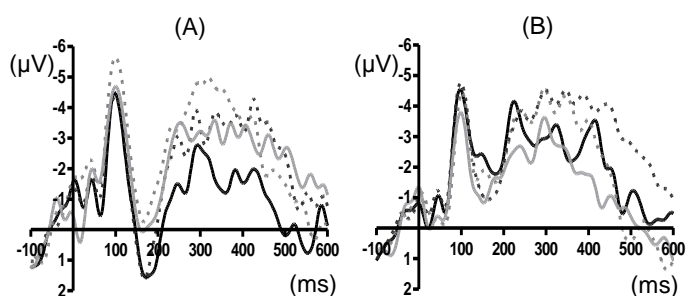


Figure 1: ERP waveforms for the happy face-happy music (black, solid line), sad face-happy music (black, dashed line), sad face-sad music (gray, solid line) and happy face-sad music (gray, dashed line) conditions in nonmusicians (A) and musicians (B).

#### Conclusions

Taken together, results indicated that once the emotional meanings of music were learned, it would be extracted instantaneously, then it would be compared, or integrated with other semantic inputs such as facial expressions, and finally the emotional meaning associated with the music would be consciously recognized.

#### Keywords

Music, Facial expression, Emotion, electroencephalogram (EEG), N400

### REFERENCES

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