Timbre and Brain Activation

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ABSTRACT

Timbre is a characteristic of sound perception that aids in the identification of sound quality and source. When a sound is identical in other characteristics of its envelope, timbre is the defining feature that helps distinguish it. It is timbre that allows a listener to hear the difference in sound source when both a trombone and a trumpet play the same note simultaneously. Timbre can be understood as the reason we distinguish between a wave crashing and thunder. There have been numerous studies associated with pitch and timbre processing together, and areas of brain activation between the two. In this presentation, we will be going over the current research that has been done on brain activation in pitch and timbre, and what still needs to be done to further understand the extent of music and the brain.

INTRODUCTION

Pitt –

- Looked at how musicians and non-musicians perceive differences in pitch and timbre when hearing both simultaneously

Chartrand –

- Based on Pitt's study
- Focused specifically on perceived differences in vocal and instrumental timbres with musicians and non-musicians

Shahin –

- Focused solely on pitch
- Wanted to know if the neuroplastic components of the auditory evoked potential are stronger in musicians with a specific musical training history (violin and piano)

METHODS

Pitt –

- Musicians and non-musicians participated in a categorization task and a classification task

Chartrand –

- Musicians and non-musicians participated in a voice and instrument timbre discrimination task

Shahin –

- Pianists, violinists, and non-musicians listened to pitch in pianos, violins, and pure tones under passive attention

FINDINGS

Pitt –

- Was able to find that responses differed when timbre changed, and that it was non-musicians who primarily struggled with this

Chartrand –

- Found that musicians performed better than non-musicians at both reaction time and accuracy in a timbre discrimination task

Shahin –

- Both groups of musicians had larger N1c and P2 responses to the three types of tones (piano, violin, pure)

CONCLUSION

Pitt –

- Musicians are able to process pitch and timbre independently, while non-musicians show an asymmetry in their ability to differentiate

Chartrand –

- Musicians performed better on both tasks
- Explained by a longer verbal-auditory memory

Shahin –

- N1c enhancement primarily right hemisphere
- Tuning properties of neurons are in distributed in accordance with musical training

WHAT'S NEXT?

Other potential areas of research related to timbre and brain activation:

- Does the timbre of different instruments effect the location of brain activation?
- Do different areas of musical training (strings, vocalists, etc) score better on timbre discrimination tasks?
- Do non-musicians score better during timbre discrimination tasks with a particular instrument?
- Use Pitt and Chartrand's experiments as an outline to answer the first and third questions, and Shahin's study as an outline to answer the second

ACKNOWLEDGEMENTS

Thank you to the state of Ohio for making Choose Ohio First program available, Cleveland State University for offering the Choose Ohio First program, and both Kendra Helfrich and Kara D'Angelos for leading it here. We also want to thank Youngstown State University for hosting this year's poster conference, and Dr. Tatiana Gracyk for advising our project.

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