



# Electrophysiological Dynamics of Auditory-Visual Sensory Substitution

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- Previous brain-imaging studies<sup>1,2</sup> have suggested that auditory-visual sensory substitution training can lead to increased activation in visual processing areas in response to auditory stimuli.
- It is currently unknown, however, *when* in the sensory process activation of visual areas occurs.
- Here, we examine electrophysiological (ERP) changes due to auditory-visual sensory substitution training.

Essentially, our goals were to examine how learning to “hear shapes” changes the way the brain processes sensory information, and when in the time-course of stimulus processing these changes occur.

## Stimuli

### Meijer Image-to-Sound Conversion Algorithm<sup>3</sup>

1. The vertical dimension of the image is coded into frequencies between 500Hz-5000Hz, with higher spatial position corresponding to higher pitch.
2. The horizontal dimension is coded into a 500ms long left-to-right panning of the sound.

## Methods

## References

<sup>1</sup>Striem-Amit, E., et al. (2011). The Neural Network of Sensory-Substitution Object Shape Recognition, *Funct Neurol Rehabil Ergon*, 1(2), 271-278.

<sup>2</sup>Poirier, C., et al. (2007). What neuroimaging tells us about sensory substitution, *Neuroscience & Biobehavioral Reviews*, 31(7), 1064-1070.

<sup>3</sup>Meijer, P. (1992). An experimental system for auditory image representations, *Trans. Biom. Eng.*, 39 (2), 112-121.

## EEG Results - Auditory

## EEG Results - Visual

## Conclusions

## Future Research

- How long does Meijer training last; does extended training further enhance these ERP effects?
- Are visual cortical responses to auditory stimuli (post-training) automatic or do they require attention?
- If ERPs were recorded for novel stimuli, how would the current pattern of results change?
- Are the ERP effects observed here mediated by mental imagery or direct cross-modal da(†cTc -0.001 Tw Ou1