

# Binaural Beats in Improving Mood in Patients with Mild to Moderate Cognitive Impairment

Athena Rem, Savannah Watson, Ellen Herschel, Alison Wood, Priscilla Perez, Assal Habibi

Dept of Psychology, Bridge Institute, University of Southern California, Los Angeles, CA, USA



Bridge UnderGrad Science (BUGS) Summer Research Program

## Abstract

Binaural beats are an auditory experience in which two different frequencies of sound produce a phantom third. Literature shows these sounds can improve mood and learning and reduce anxiety. This review investigated the benefits of binaural beats and their potential to improve the moods of adults with mild to moderate cognitive impairment. Implications for the present study are discussed.

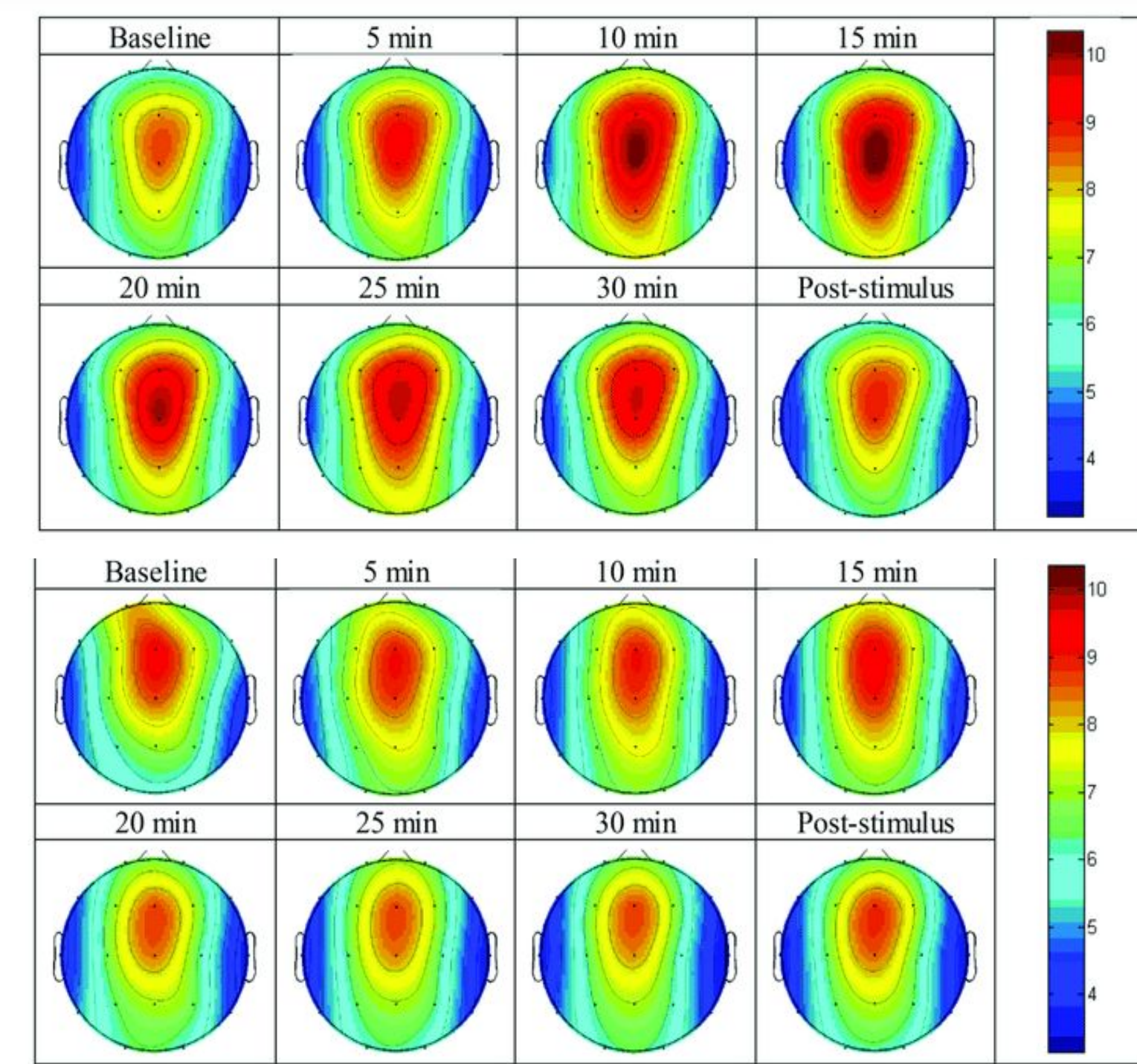
## Objective

To conduct an extensive review of literature regarding the application of binaural beats in mood improvement and anxiety reduction.

## Introduction

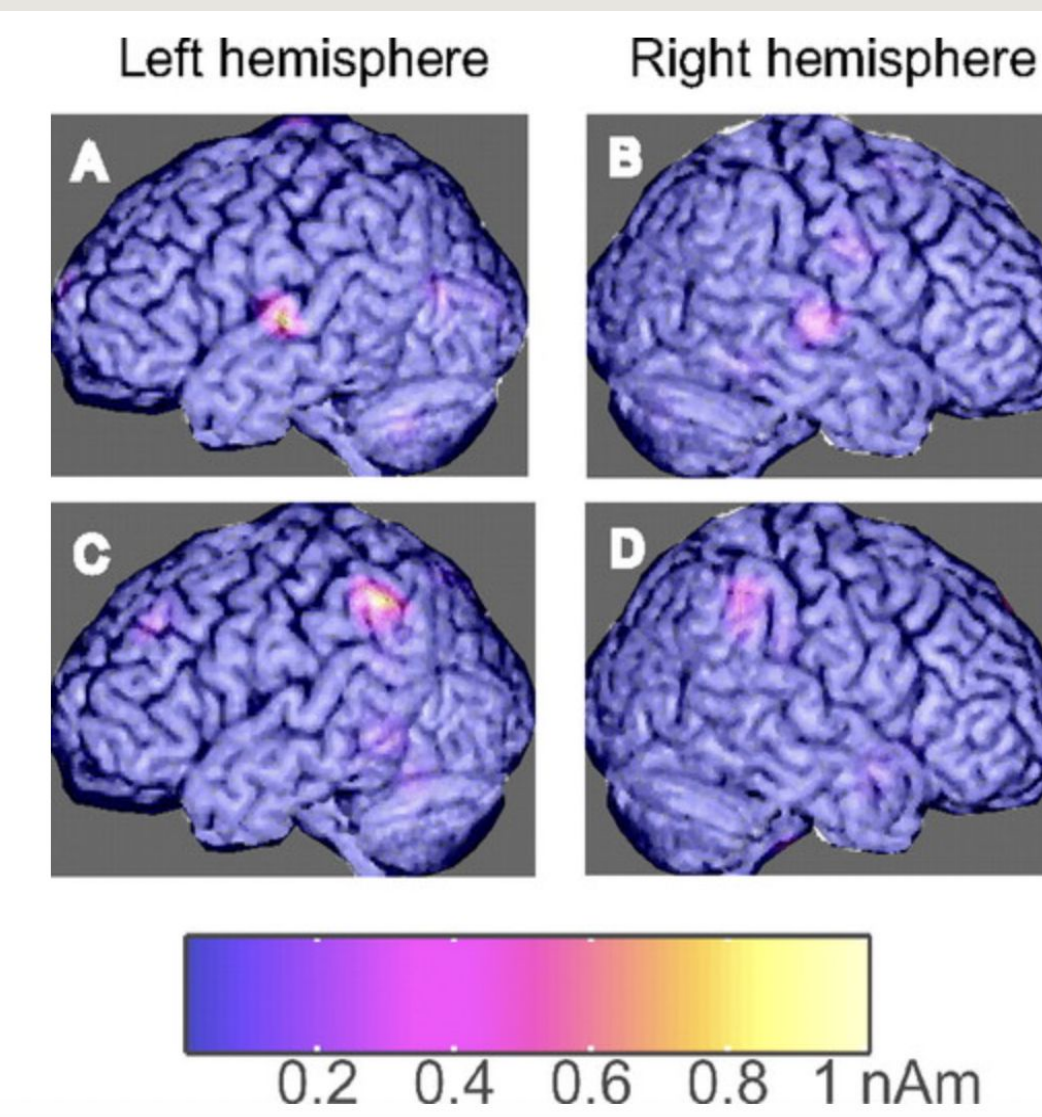
- Binaural beats are two different in-ear frequencies averaging to create a phantom third, also termed “digital drugs” (Baakek et al, 2021).
- These beats prompt neural phase locking, or the stimulation of firing within the brain.
- Past literature draws a link between binaural beats and cognitive function
  - Binaural beats can increase certain memory functions (Reedijk et al).
  - Certain frequencies correlate with improvements in working memory, mood, and workplace performance (Isik et al; Lane et al; Kraus et al).
- Current literature fails to focus on adults with mild to moderate cognitive impairment

## Brain Scans with Binaural Beats



Topographic mapping of theta waves demonstrates greater activity in the experimental group (top) than the control (bottom) up to 30 minutes after exposure to binaural beats

(Jirakittayakorn and Wongsawat, 2017)



Possible areas of origin for binaural beats Auditory Steady State Response (ASSR). Since ASSR measures electrophysiological response to an audible stimulus, it demonstrates neurological response to binaural beats.

(Karino et al, 2006)

## Related Findings and Examples

1. Binaural beats reduced anxiety prior to a dental operation (Isik et al, 2017)
2. Beta-frequency improved mood and task performance, and yielded psychomotor improvements. Since movement and coordination that may be lost in some forms of neurodegenerative disease, this is also a significant finding (Lane et al, 1998)
3. 15 Hz binaural beats increased accuracy of responses, strengthened cortical networks which impact plasticity (can overtake functions of other cells), speech, tasks and learning (Beauchene et al, 2017)
4. Binaural beats imbedded into ocean sounds improved Working Memory Capacity (Kraus et al, 2015)
5. People with a lower eye-blink rate (EBR) benefitted from binaural beats. EBR is connected to flexibility (as ascertained by naming uses for household objects) (Reedijk et al, 2013)
6. Theta-binaural beats suppressed pain severity, which is also a symptom of select neurodegenerative diseases (Zampi, 2016)

## The Present Study

- 30 participants ages 65-80 years old with mild to moderate cognitive impairment (MoCA scores 12-25)
- Random assignment to experimental or control group
  - Experimental: listen to music with binaural beats
  - Control: listen to audiobook
- 30 minutes of listening, 4x/wk for 8 weeks total
- Answer questionnaire about their mood each listening session
- Measure physiological signals such as heart rate during listening sessions

## Discussion

- Correlation between binaural beats and improvements in mood and memory
- Anxiety common among caregivers and individuals with cognitive impairment (Isik et al)
  - Binaural beats may be an effective and accessible at-home solution
- Future research should investigate improvements in memory and learning for various degrees of cognitive impairment

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## CONTACT US

athenarem10@gmail.com  
(917) 703-8000