

Feasibility of Music-Based Binaural Beats Stimulation for Older Adults With Cognitive Impairment

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FUNDED BY
CiRIS Grant 2024

1 INTRODUCTION

- Cognitive impairment (MCI/Dementia) represents a growing public health challenge worldwide.
- Non-pharmacological interventions are needed for **low-cost, scalable brain health promotion**.
- Binaural Beats Stimulation (BBS)** at 40 Hz (gamma) has shown potential in enhancing neural oscillations and cognitive function.

2 OBJECTIVES

- Obj 1:** Describe feasibility of a 6-week music-based BBS program in Adult Day Health Centers (ADHC).
- Obj 2:** Evaluate preliminary effects of 40 Hz gamma-frequency auditory stimulation on cognition and emotional well-being.
- Obj 3:** Analyze potential for scalability in community settings.

3 METHODS

- Design:** 6-week pilot intervention, community-based ADHC setting.
- Participants:** N = 21, aged 55–95, documented cognitive impairment.
- Intervention:** Twice-weekly 30-min sessions of 40 Hz gamma BBS embedded in relaxing music (6 weeks).
- Feasibility:** Recruitment, adherence, attrition.
- Acceptability:** Exit surveys (1–5 scale).
- Efficacy:** MoCA (cognition), PAS (agitation), GDS-15 (depression), HRV & BP (physiology).

4 RESULTS: FEASIBILITY & ACCEPTABILITY

85%

Recruitment Rate

92%

Adherence Rate

4.6/5

Acceptability Rating

COGNITIVE & BEHAVIORAL OUTCOMES

OUTCOME	COHEN'S D	INTERPRETATION
MoCA (Cognition)	0.77	Strong / Clinically Meaningful
PAS (Agitation)	0.58	Moderate Improvement
GDS-15 (Depression)	0.37	Small-to-Moderate

PHYSIOLOGICAL TRAJECTORIES

BLOOD PRESSURE (SBP)

↓↓

Strong acute & cumulative reduction
See Figure 1

HEART RATE (HR)

↓

Strong acute effect observed
See Figure 2

SIGNIFICANT MOCA SUB-DOMAINS

Abstraction

p = 0.009

Naming

p = 0.008

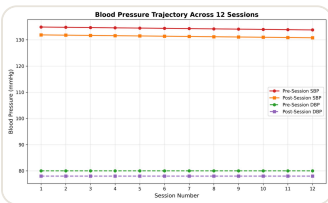


Figure 1: Blood Pressure Trajectory

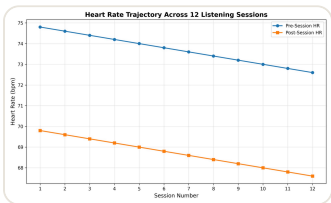


Figure 2: Heart Rate Trajectory

5 CONCLUSION & RESEARCH HIGHLIGHTS

🎵 Dual-Network Engagement

Among the first studies to integrate 40 Hz Gamma BBS into personalized music, simultaneously targeting **oscillatory and reward networks** to enhance both adherence and efficacy.

🧠 Cognitive–Physiological Link

The correlation between acute physiological relaxation (significant BP/HR reduction, $p < .001$) and cumulative cognitive gains (**Cohen's d = 0.77**) suggests a synergistic effect on the executive function network.

🏠 Feasibility in Community Settings

With a **92% adherence rate**, music-based BBS proves to be a highly acceptable, low-cost, and scalable non-pharmacological intervention for diverse community-dwelling older adults.

6 ACKNOWLEDGEMENTS

- Supported by the **CiRIS Grant (2024)**, California State University, San Bernardino.
- We are grateful to all **study participants** and thank the staff at the participating adult day health center for their support.
- We thank our dedicated **student researchers** — Mandy Giang, Stephanie Camarena, Gregory Austin, and Amy Dong at California State University, San Bernardino — for their assistance with data collection.
- We appreciate our **high school volunteers**, Maggie Zhang and Adam Chok, for their valuable contributions.

RESEARCH HIGHLIGHTS

1 Challenge: Current non-pharmacological dementia interventions often suffer from low adherence and unclear mechanistic support.

2 Approach: We embedded 40 Hz Gamma Binaural Beats directly into patients' preferred music to drive neural entrainment in a real-world community setting.

3 Impact: Our 6-week pilot (N=21) showed a **0.77 effect size** improvement in MoCA scores and a **92% adherence rate** — high-impact brain health promotion at very low cost.