Adaptive Sensorimotor Training for Amnestic Mild Cognitive Impairment Patient: A randomized and controlled study of a tablet-based sensorimotor home training (tBSMT)

Fransisca Hapsari[1], Stefano Silvoni[2], R. Bekrater-Bodmann[2] , A. Löffler[2], L. Frölich[3] L. Hausner[3], S. Desch[2], D. Kleinböhl[3], Herta Flor[2,4]

[1] University of Kaiserslautern, Germany
[2] Department of Cognitive and Clinical Neuroscience, Central Institute of Mental Health, Medical Faculty Mannheim, Heidelberg University, Mannheim, Germany
[3] Department of Geriatric Psychiatry, Central Institute of Mental Health, Medical Faculty Mannheim, Heidelberg University, Mannheim, Germany
[4] Department of Psychology, School of Social Sciences, Mannheim University, Mannheim, Germany

TECHNISCHE UNIVERSITÄT KAISERSLAUTERN

Zentralinstitut für Seelische Gesundheit

Introduction

- Amnestic Mild Cognitive Impairment (**aMCI**): A reliable early sign of dementia and Alzheimer's disease
- Limitation of cognitive and pharmacological intervention: because of moderate temporary effect and only address single dimension
- **tBSMT** is based on brain-plasticity principle (e.g., "last in, first out" rule, phylogenetically and ontologically) and operant conditioning paradigm (shaping)
- Research questions:

(1) Is sensory acuity positively correlated to episodic memory performance at baseline?
(2) Will tbSMT group have superior sensory acuity improvement than the pure cognitive training group?
(3) Will tbSMT group have higher memory improvement than the pure cognitive training group?

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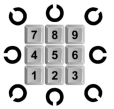
Methods



Participants:

- 42 aMCI patients (55-85 years old, 19 female) without other neurological or sensory impairments.
- Pre- and post-assessment were double-blinded

Trainings:

- Both took 90 days, divided into 3 stages, accomplished for 20 minutes every day at any time they preferred.
- Adaptive algorithm modulated trial-by-trial difficulty

Stage / Month	Sensory / tBSMT:	Cognitive / CogniPlus:
1.	Unimodal (Visual, Auditory, Tactile – V,A,T)	Attention + Spatial WM
2.	Bimodal (VA, AT, VT)	Visuospatial WM + Visual WM
3.	Bimodal + Motor (handgrip, ergometer, balancing tablet)	Divided Attention + Spatial WM

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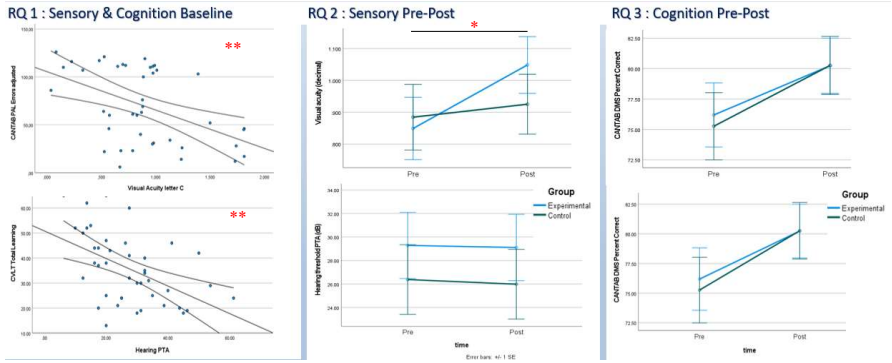
Results



Note. $*P < 0.05$, $**P < 0.01$.

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Discussion

- It confirmed the strong relationship between sensory and cognitive functions -> novel in aMCI elderly patients.
- Visual and auditory improvement was comparable for both groups, with significant progress in their visual acuity, but not auditory threshold -> probable uncontrolled factors: many having mild tinnitus and/or used hearing aid
- Despite insignificant results, both groups showed a slight improvement in cognitive performance -> might be due to novel multidomain sensorimotor training, indirect measurement (EM instead of WM), or amnestic severity or cause.
- Future research:
  - More participants, study trial arms (including inactive control), and intensity
  - Cluster analysis

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