

Exploring the effect of music and metacognition on memory enhancement in amnesic Mild Cognitive Impairment

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Introduction

Recognition processes in aMCI

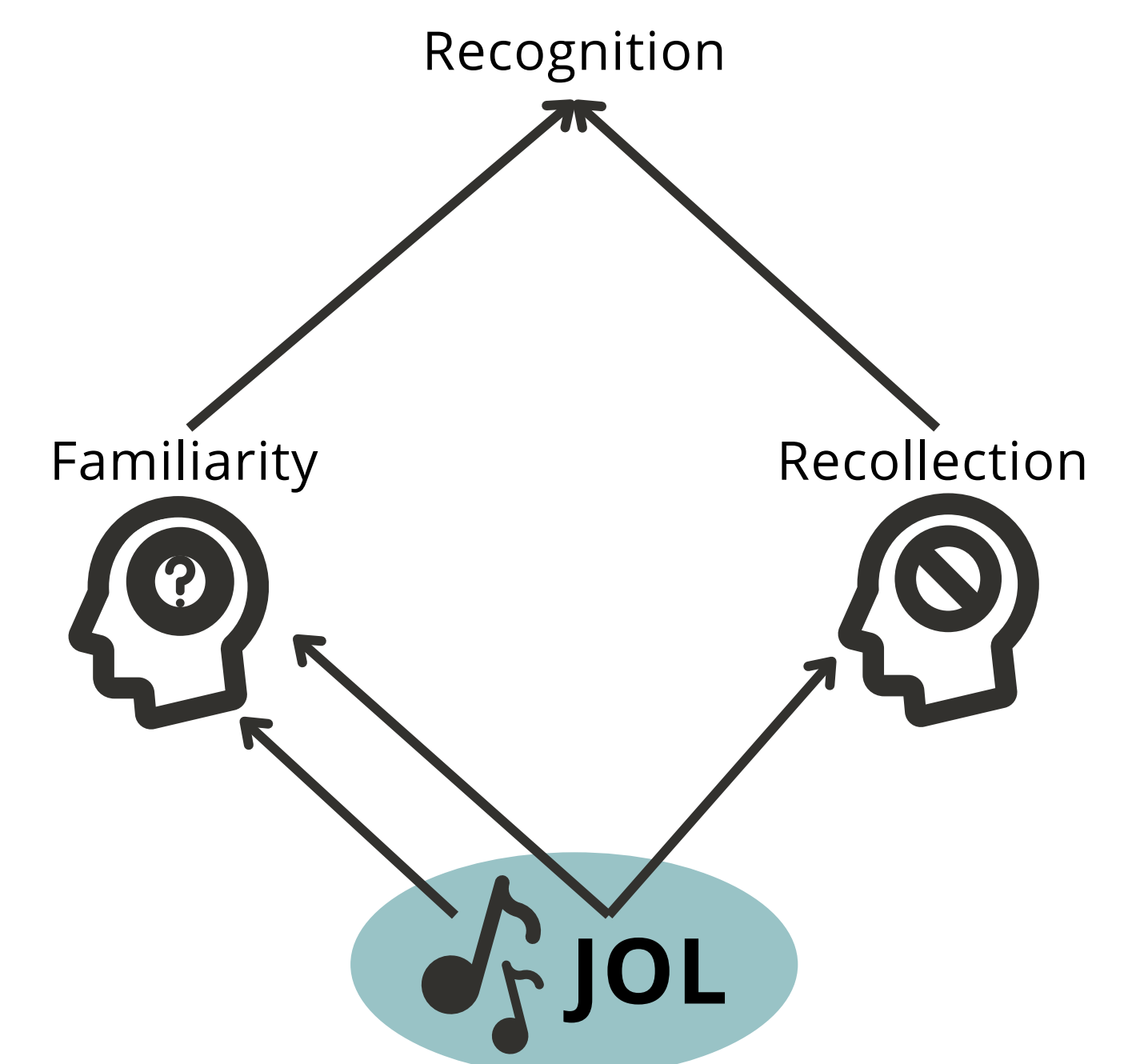
Recognition of previously learned information relies on both the accurate retrieval of contextual details and the vague sensation of "déjà vu", corresponding respectively to the processes of recollection and familiarity. While recollection seems to be impaired in aMCI patients, whether or not familiarity is preserved remains a matter of debate [1].

Music to improve familiarity in aMCI

Through attentional, emotional and facilitative mechanisms, music is thought to contribute positively to the encoding and retrieval of information in long-term memory [2]. In the context of Alzheimer's disease, music would reinforce the feeling of familiarity, thus improving recognition performance [3].

Metacognition to improve familiarity and recollection

Judgment of Learning (JOL) refers to the metacognitive assessment, elicited at the time of encoding, of the likelihood of later recall of learned information [4]. Although the underlying mechanisms are still unclear, JOL appears to enhance recognition, by facilitating familiarity and recollection processes [4].



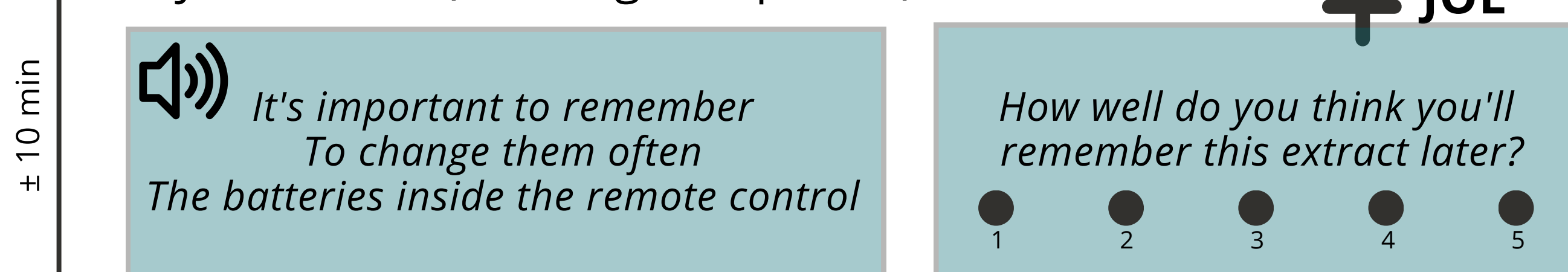
Methods

	Control (N=40)	aMCI (N=22)
Age Mean (±SD)	72.1 ± 6.29	70.4 ± 7.68
MOCA Mean (±SD)	26.3 ± 2.61	22.8 ± 3.66 *
RI-48 z score Mean (±SD)	0.51 ± 1.08	-1.36 ± 1.56 *

* significantly different from control group

1 Study phase

38 lyric stimuli (19 sung/19 spoken)



2 Immediate recognition phase

General Content Recognition (familiarity)

76 yes/no questions (38 old/38 new)

Have you previously heard an excerpt concerning the following theme?

Using the remote control

Specific Content Recognition (recollection)

76 forced-choice questions between two actions

Which of these two actions was associated with the theme?

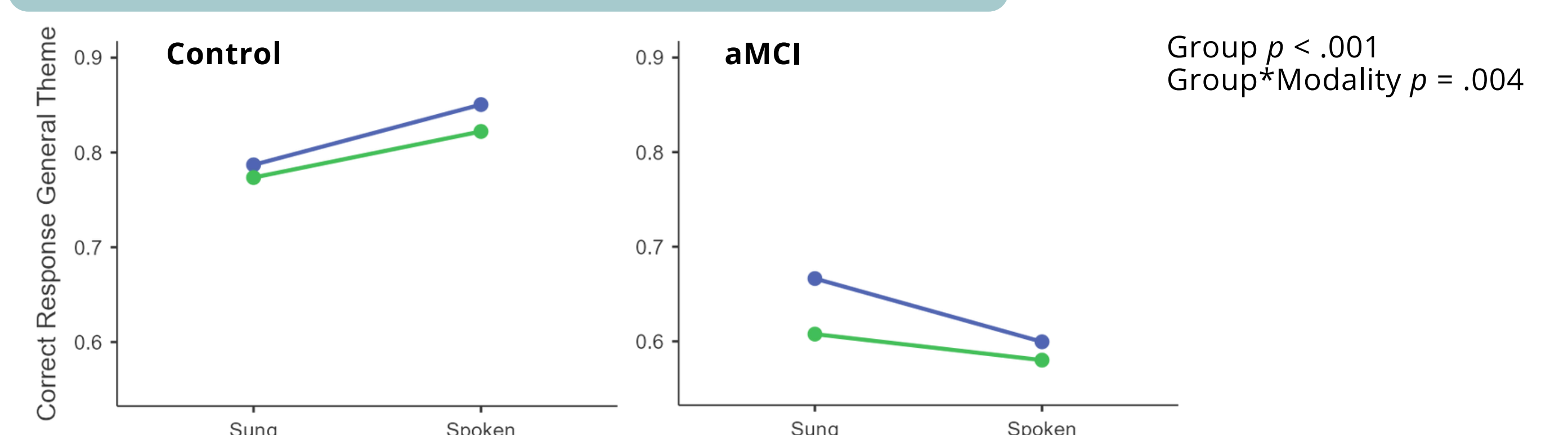
Changing batteries
Find the remote control

Preliminary results

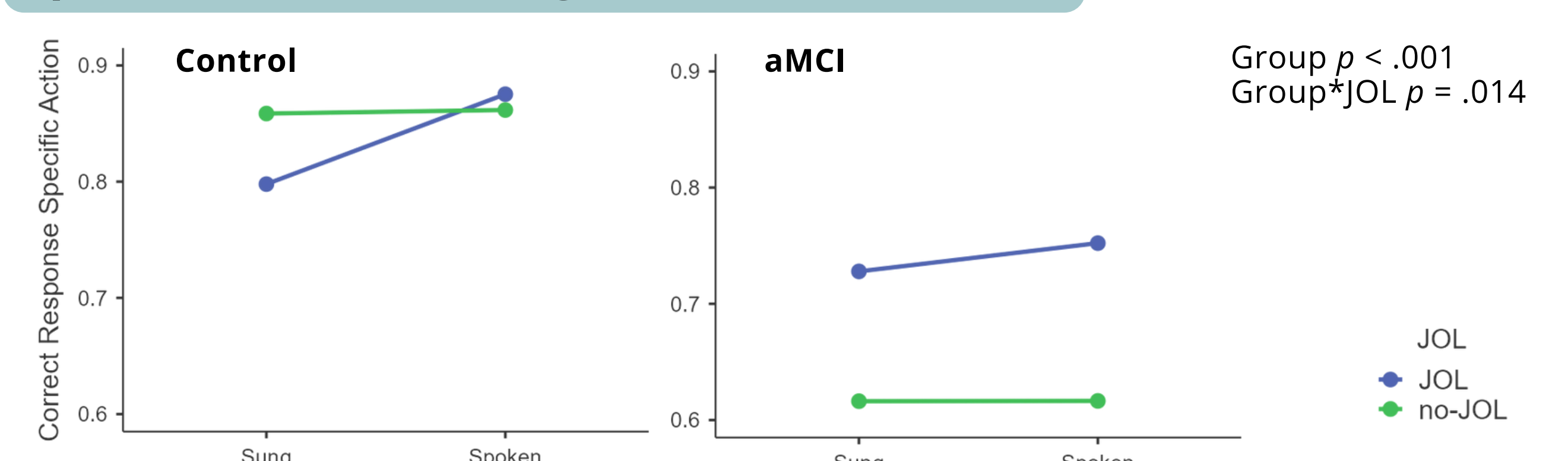
Mixed Model

Fixed effects : group (control vs. aMCI), modality (sung vs. spoken), JOL (JOL vs. no-JOL)
Random effects : participants, general theme

General Content Recognition (familiarity)



Specific Content Recognition (recollection)



Discussion

On average, aMCI participants significantly perform less well in both general and specific content recognition, suggesting impaired familiarity and recollection processes.

With regard to general content recognition, only aMCI participants seem to benefit from musical encoding. Although there was no significant main effect of JOL, there was no significant difference between groups in the theme recognition of song lyrics when accompanied by JOL (10% gain vs. no-JOL).

As for specific content recognition, JOL improves performance in aMCI, but had no effect in cognitively healthy elderly.

- Music seems to reinforce the familiarity process in aMCI, even normalizing their performance when musical encoding is combined with JOL ;
- Beyond its potential effect on the familiarity process, JOL would support the recollection process in aMCI ;
- Neither music nor JOL would benefit cognitively healthy older people, which we attribute to a ceiling effect.

[1] Simon, J., & Bastin, C. (2015). L'impact du trouble cognitif léger et de la maladie d'Alzheimer sur la recollection et la familiarité. *Revue de Neuropsychologie*, 7(3), 177-188. <https://doi.org/10.3917/rne.073.0177>
 [2] Derks-Dijkman, M. W., Schaefer, R. S., & Kessels, R. P. C. (2023). Musical Mnemonics in Cognitively Unimpaired Individuals and Individuals with Alzheimer's Dementia : A Systematic Review. *Neuropsychology Review*. <https://doi.org/10.1007/s11065-023-09585-4>
 [3] Simmons-Stern, N. R., Deason, R. G., Brandler, B. J., Frustace, B. S., O'Connor, M. K., Ally, B. A., & Budson, A. E. (2012). Music-based memory enhancement in Alzheimer's Disease : Promise and limitations. *Neuropsychologia*, 50(14), 3295-3303. <https://doi.org/10.1016/j.neuropsychologia.2012.09.019>
 [4] Zheng, J., Li, B., Zhao, W., Su, N., Fan, T., Yin, Y., Hu, Y., Hu, X., Yang, C., & Luo, L. (2024). Soliciting judgments of learning reactively facilitates both recollection- and familiarity-based recognition memory. *Metacognition and Learning*. <https://doi.org/10.1007/s11409-024-09382-1>