Neural reactivation of mnemonic interference during associative memory and aging

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Highlights

- Older adults' associative memory is more susceptible to proactive interference compared to younger adults.
- As the level of interference increased, we could observe more neural reactivation of encoding during retrieval. Higher interference was associated with more reactivation and this pattern was shown from both younger and older adults.

Abstract

Reactivation of memory is predicted to play an important role when we try to strengthen, update and retrieve the encoded memory. However, it remains unknown that memory reactivation can be affected by proactive interference. Therefore, the purpose of the present study was to investigate the reactivation of encoded memory during the retrieval under different levels of proactive interference. We conducted representational similarity analysis on EEG data to measure the pattern similarity between encoding and retrieval.

Objectives

- Investigate the memory reactivation of encoding during retrieval under proactive interference.
- Examine the relationship between proactive interference and aging.

Materials & Methods

1. Participants

Measure	Young (n = 24)	Old (n = 25)
Age	24.17(4.32)	69.12(4.65)
Sex (F/M)	16/8	12/13
Education	16.52(1.87)	16.96(1.72)

- For the EEG analysis, we included only 19 younger adults and 23 older adults based on the quality of EEG data.

2. Associative memory task

- There were 4 encoding blocks that objects were paired repeatedly with either faces or scenes. Depending on the interference condition (high, low or no), the associates for the object can be changed across the blocks.
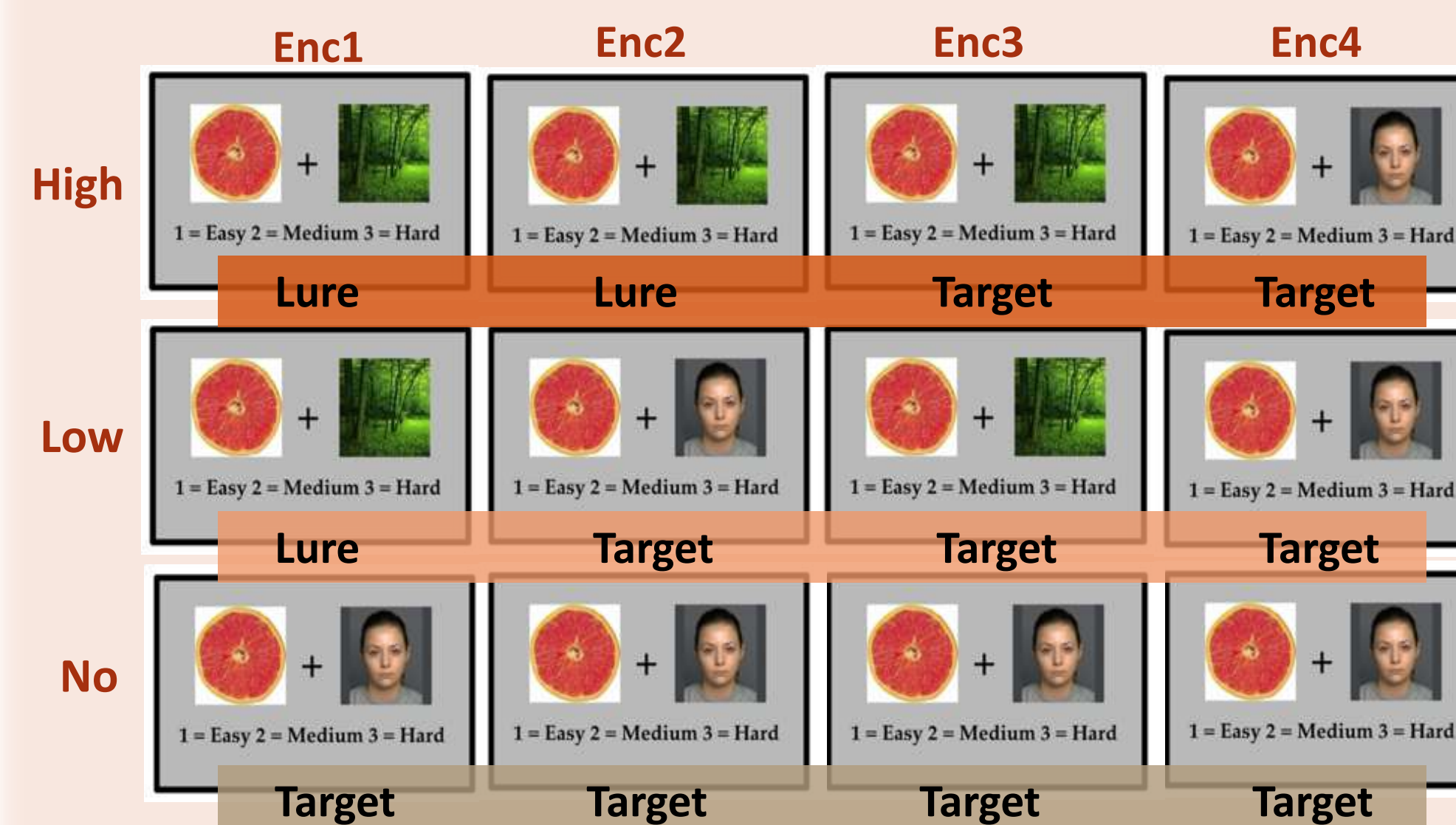

- In the retrieval block, participants made a decision whether a face or scene was the most recently paired with the object (Target).
- The level of interference was manipulated by increasing the number of presentations for the other, least recent, face or scene (Lure).
- Each encoding and retrieval block included 216 trials (72 for each condition).
- EEG was recorded over the encoding and retrieval blocks

3. EEG recording & time-frequency analysis

- EEG data were collected from 128 Ag-AgCl electrodes using an ActiveTwo amplifier system.
- Each epoch was transformed into a time-frequency dimension using Morlet wavelet with 5 cycles in 2 Hz intervals from 2 to 80 Hz.

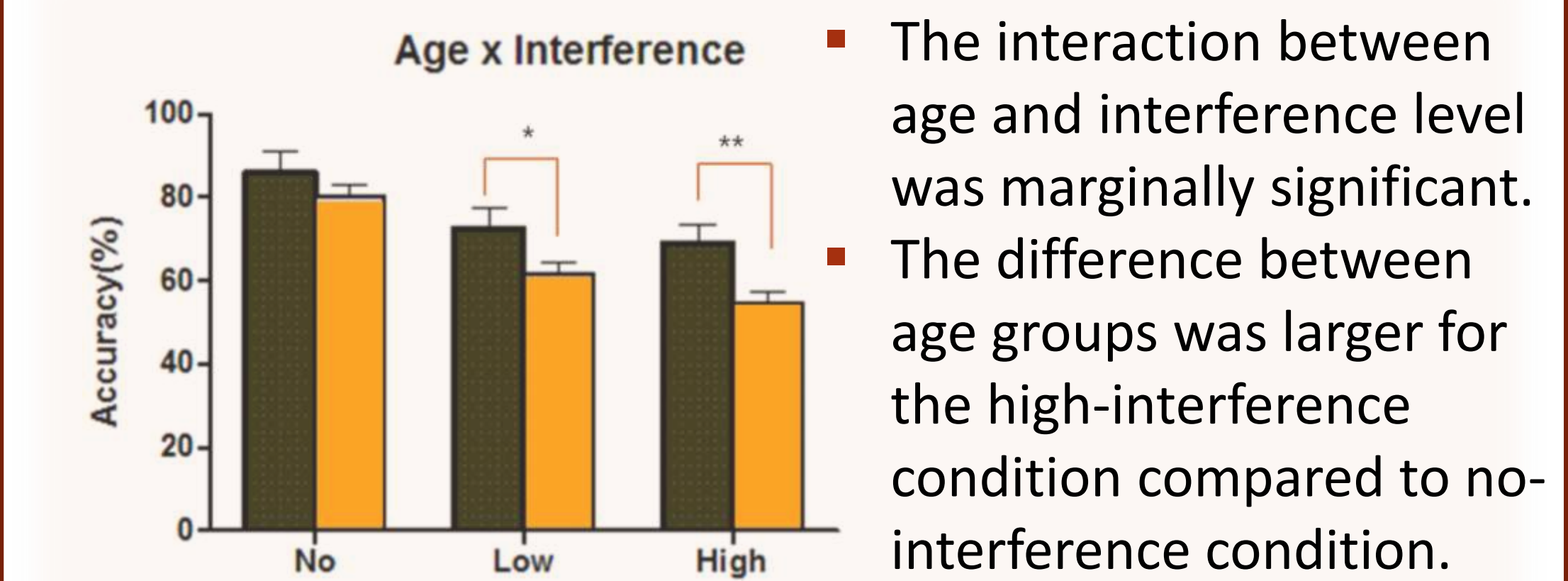## 4. Representative similarity analysis (RSA)
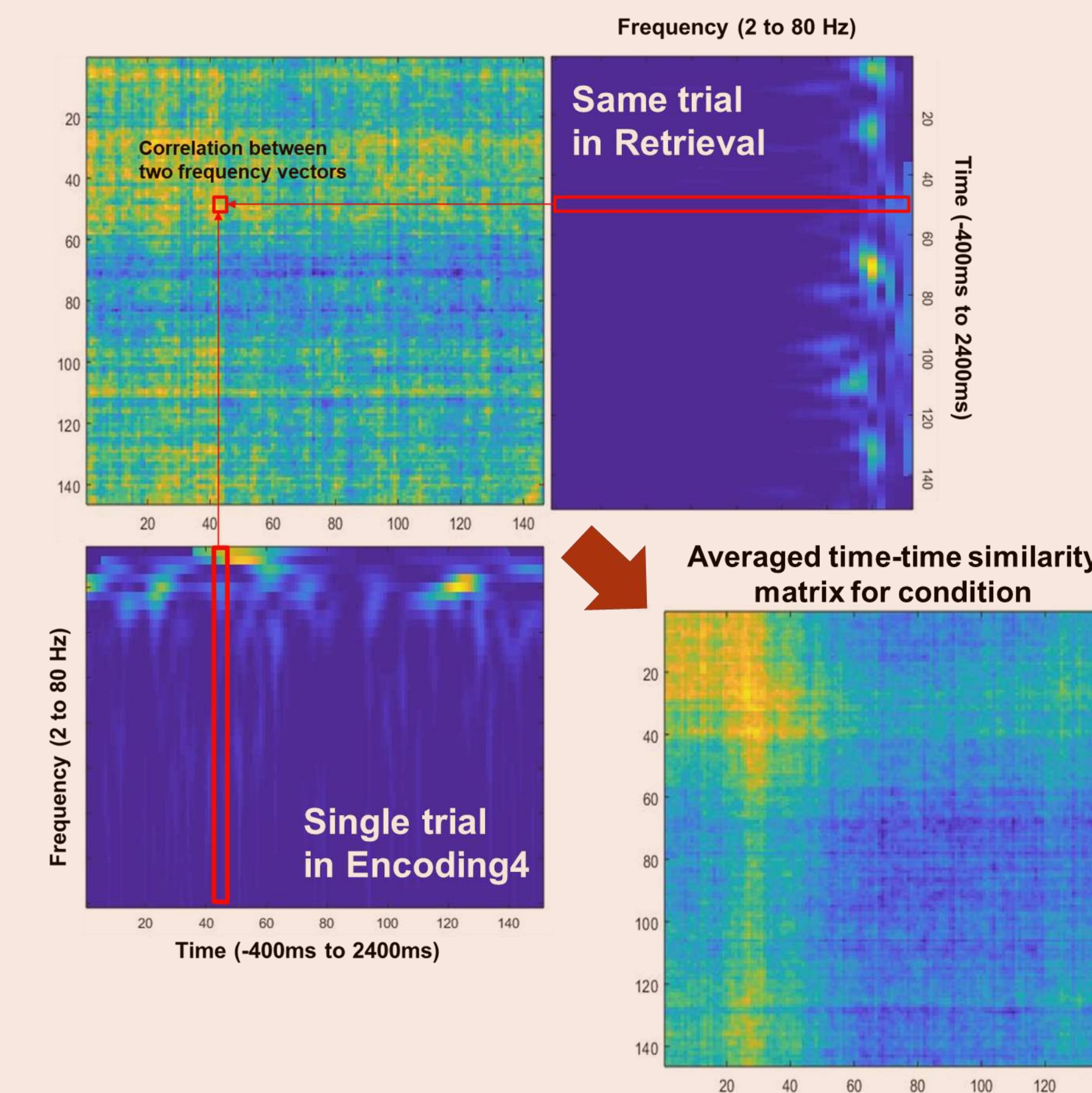
- We calculated the representative similarity between encoding and retrieval to estimate the neural reactivation of encoding during retrieval.
- Time x Time similarity matrix from 8 spatial clusters were generated for every single trials.
- The frequency vector from every time point of encoding trial was correlated with that of retrieval trial.
- Then, averaged similarity matrix were made for each interference condition (High, Low and No).
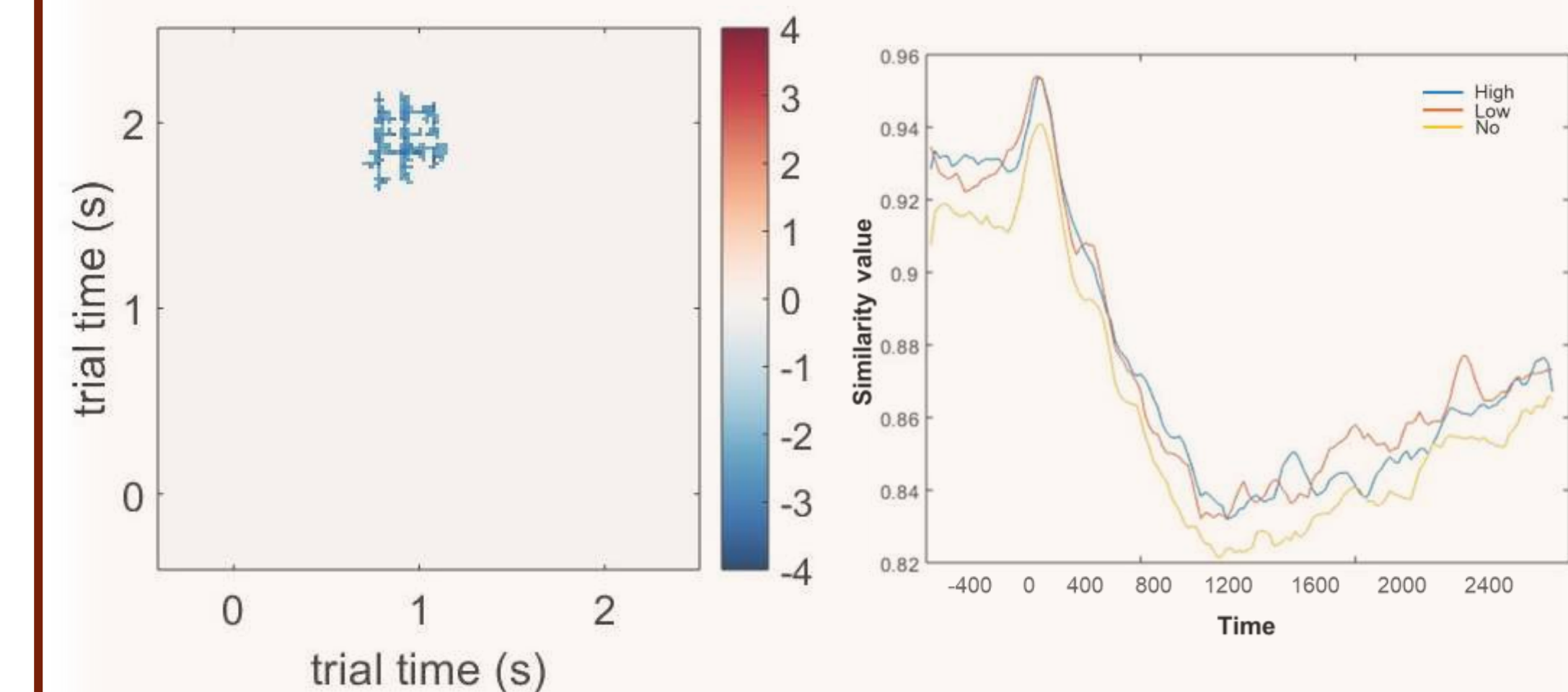
Results

1. Behavioral results
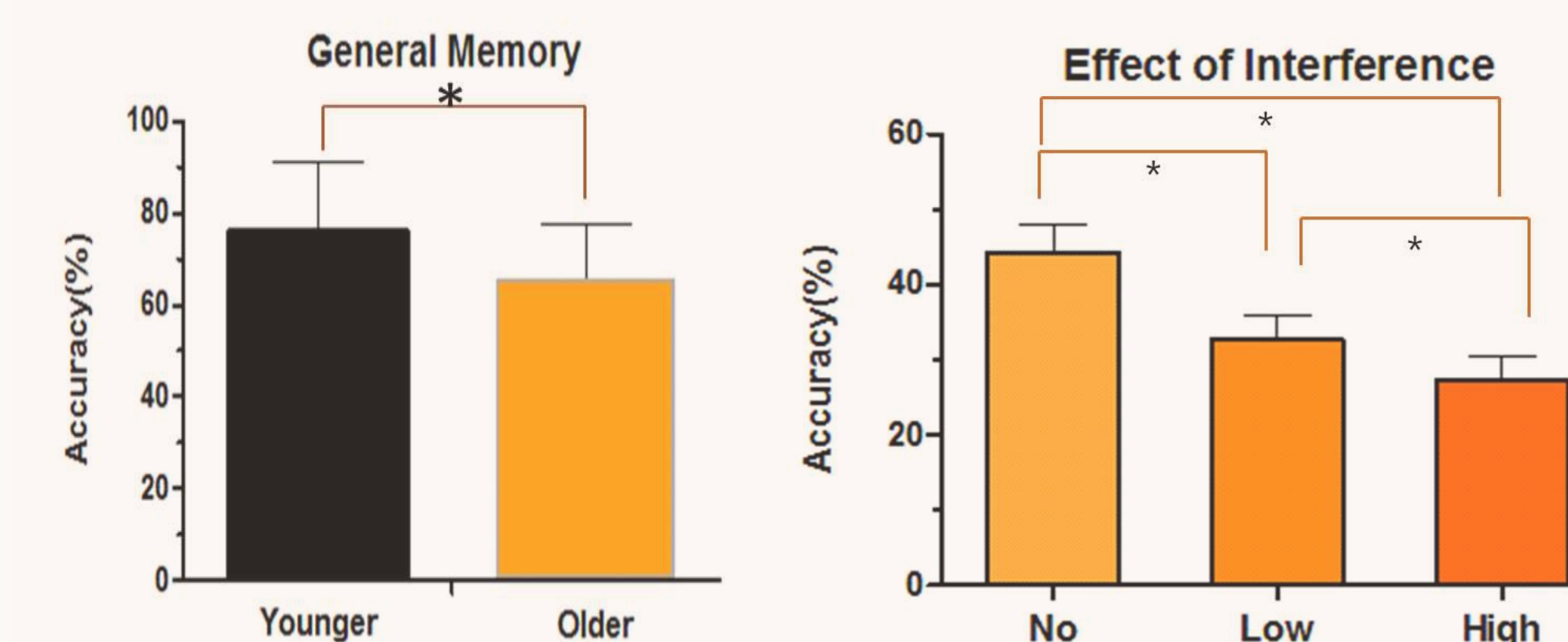
- Effect of age on the subsequent associative memory performance was statistically significant. Younger adults showed better associative memory than older adults.
- In addition, the effect of interference conditions was significant. As the level of proactive interference is higher, the memory performance was lower.

- The interaction between age and interference level was marginally significant.
- The difference between age groups was larger for the high-interference condition compared to no-interference condition.

2. RSA results

- We found a significant negative cluster, which showed that the relation between similarity and memory quality is positive (low < medium < high).
- This pattern was observed regardless of the age group.

Conclusions

- Older adults are more vulnerable to the proactive interference.
- There were more neural reactivation of encoding during retrieval under higher proactive interference.

References

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