Role of schema-based knowledge in reconstructing real-life event sequences

Xinming Xu1, Sze Chai Kwok1,2
1. School of Psychology and Cognitive Science, East China Normal University, Shanghai, China 2. NYU-ECNU Institute of Brain and Cognitive Science at NYU Shanghai, Shanghai, China

Background

- Retrieving temporal order of events could be supported by multiple strategies (Friedman, 1993; D’ubrow & Davachi, 2017).
- Humans are able to reconstruct/infer past event-sequences making use of schemas or causality.
- The hippocampus is known to support recall of specific event sequences (Lehn et al., 2009).
- The postero medial (PM) network is proposed to represent abstract knowledge about sequences (Cook-Sheley & Ranganath, 2017) and real-world event schemas during narrative perception (Baldassano, Hasson, & Norman, 2018).
- We previously demonstrated that narrated order and chronological order of narrative events are dissociable behaviorally using non-linear narratives (Xu & Kwok, 2018).
  - Judging narrated order of events depends on relative memory strength.
  - Judging chronological order of events is based on prior knowledge and inferences.

Hypotheses

- Humans can preserve both the narrated order and chronological order of narrative events.
- PM regions support reconstructing event sequences with schema-based knowledge (during chronological order judgment).
- There are common cortical network supporting both orders.

Behavioral results

- Performance was high in both chronological order task (mean=73%) and narrated order task (mean=64%).
- Chronological order judgments were not biased by narrated order, but narrated order judgments were biased by the chronological order, suggesting that participants regard what happened chronologically earlier as also narrated earlier.

Methods

A. Encoding (95min)

B. Test (~1h later)

C. Conditions

fMRI results (continued)

Discussion & Conclusion

- Prior/schematic knowledge plays a mediating role in event sequences reconstruction.
- Precuesus supports retrieval of real-life event sequences with schema-based knowledge.
- A parietofrontal network showed overlapped activation in both temporal order tasks.
- Parametric distance effects for the two tasks manifest differently in two different sets of brain regions.
- How are temporal positions and distances (narrated and chronological) of events coded in the brain?

fMRI results

Cluster threshold as \( p_{unc} = 0.05 \), significance reported as \( p_{FWE} < 0.05 \) (cluster level).

References


Acknowledgements

Research received support from SCSTSM (16PJ1402800, 16ZR1410200), MOE (16ZC1306006) of China, and the Special Fund for attending International Conference for Graduate Students from East China Normal University.

@KuXinning, @Kwok91681068