The Role of Stimulus Anticipation in an Age-Related Top-Down Suppression Deficit

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Introduction

Top-down modulation refers to our ability to focus our attention on task-relevant stimuli while ignoring irrelevant distractions by differentially enhancing or suppressing neural activity in sensory cortical regions. Top-down modulation shares an intimate relationship with memory, as the focus of attention will restrict content to relevant information and limit interference from irrelevant stimuli. An age-related decline in working memory has been associated with a neural suppression deficit to unanticipated irrelevant stimuli. In the current study, we assessed the role of anticipation in top-down modulation during visual processing and working memory.

Background

Younger and older adults display neural enhancement (attend > passive). Older adults do not display neural suppression (ignore > passive) at later stages of the event-related potential. Suppression is observed in both age groups at later stages of processing in the alpha band. Does apriori knowledge of stimulus relevance alleviate the suppression deficit in older adults?

Methods

Cue Stimuli: Remember face, ignore scenes, remember scenes, ignore faces
Delay: 3, 5, 10 sec
Probe: 3 sec
Subjects aged 60-85 years, N = 21
64 EEG electrodes sampled at 1024 Hz
Artifacts removed via ICA & +/- 50 μV threshold
Event-related potentials (ERPs) filtered 1-30 Hz
ANOVA & T-Tests at an electrode of interest, p < 0.05

Results

Accuracy:
- Replicated original MAP experiment
- Slight improvement with apriori knowledge (Sequence)
- No significant delay as originally observed (MAP)
Response Time:
- No significant delay as previously observed

ERPs: Faces

P1 amplitude and N1 latency suppression deficits are apparent when stimuli relevance is known (MAP) or known (Sequence)

Conclusions

Current results indicate that anticipating irrelevant information does not alleviate the suppression deficit observed in older adults.

Working memory accuracy results were replicated. Anticipation of stimulus relevance produces a slight benefit.

P1 amplitude and N1 latency displays a suppression deficit, regardless whether stimulus relevance is known apriori.

Late alpha activity indicates that the suppression deficit occurs only at early stages of processing.

References


