During a visual search, the cognitive mechanisms underlying the benefits induced by positive attention templates (i.e., the foreknowledge of target features held in working memory) has been the object of great interest in the field (Fig. 1).

However, the mechanisms underlying negative attention templates (i.e., the foreknowledge of distractor features) are not well understood (Fig. 2).

A recent study has revealed an increase frontal midline theta (4-8 Hz) power after a negative cue compared to a positive cue (de Vries et al. 2019), suggesting that negative templates might rely on a proactive or anticipated attentional engagement.

The goal of this study is to better characterized the relationship between the proactive control and reactive filtering mechanisms induced by negative templates during a visual search.

Fig 2 – Reaction time benefits induced by negative and positive templates during the visual search (Arita, 2012).

METHODS & MATERIALS

14 participants completed a visual search task (Fig. 3) combined with electrophysiological (EEG) recording.

EEG RESULTS

Fig 4. Cue-evoked frontal midline theta power (4-8 Hz) on occipital electrodes (O1-02). A. Time course of alpha power contralateral to the distractor side. Lines represent the differences in power between positive (red) or negative (blue) cue with the neutral cue. B. Student t-test has been performed every 200ms to detect the time course differences against baseline. C. Pearson correlation revealed that participants with higher cue-evoked theta power are those with the faster alpha synchronization contralateral to the distractor side. * p < 0.05

DISCUSSION

- We replicated the increase of the frontal midline theta power after negative compared to positive cues described by de Vries and colleagues (2019) and we specified that no difference exists between the positive and neutral cues on the theta power. Those results suggest that the proactive control engagement is specific to the negative attentional templates.

- The reactive filtering, that was explored through occipital alpha power, appears later after a negative cue (400-600ms) compared to a positive cue (200-400ms). This is consistent with the higher N2pc latency after negative cue compared to the positive cue observed by Carlisle & Nitka (2019).

- Even more interestingly, participants with higher proactive control after negative cues are those with the faster alpha synchronization contralateral to the distractor side, suggesting a relationship between proactive control and the speed of the implementation of distractors suppression.

REFERENCES


Contact: maca21@lehigh.edu