**Representing location versus temporal context in visual working memory**

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Successful performance on working memory tasks often requires encoding of an item’s context (e.g., where or when it was presented) in addition to its identity. Recent work from our lab suggests that elevated delay-period activity in parietal cortex may be more sensitive to demands on context-binding than on stimulus representation per se. The present study investigated the effects of varying context-binding demands along two dimensions: high vs. low, and location vs. ordinal position. Healthy young adult humans (male and female) were scanned with fMRI during trials that began with the sequential presentation (500 ms, 250 ms ISI) of three oriented-grating samples at different locations, followed by an 8-second delay, followed by a recognition probe that appeared at one of the three sample locations with a superimposed digit (“1”, “2”, or “3”). A pretrial instruction cue indicated whether subjects were to respond to the probed location, the probed ordinal position, or to ignore context (i.e., “does probed orientation correspond to any of the three samples?”). Multivariate pattern analysis (MVPA) of context-binding requirements (“high” (location-cued + order-cued) versus “low” (ignore context)) revealed strong sensitivity to context binding at sample and at probe – but not during the delay – in occipital and parietal areas. Additionally, delay-period signal in parietal cortex was higher during high context-binding trials. Within occipital and parietal cortex, MVPA could not discriminate location-cued from order-cued trials during delay and probe. Next, inverted encoding modeling (IEM) was used to assess the neural representation of sample and probe location at response as a function of context. In occipital cortex, the neural representation of the probed location was stronger on location than on order and ignore-context trials, suggesting sensitivity of contextual information to attentional control. However, the neural representation of the location of the invalidly probed sample (i.e., of the digit-cued item on location trials and of the location-cued item on order trials) was also active.Thus, although the strength of the representation of context is sensitive to strategic factors, context-binding may nevertheless be an obligatory component of working memory.