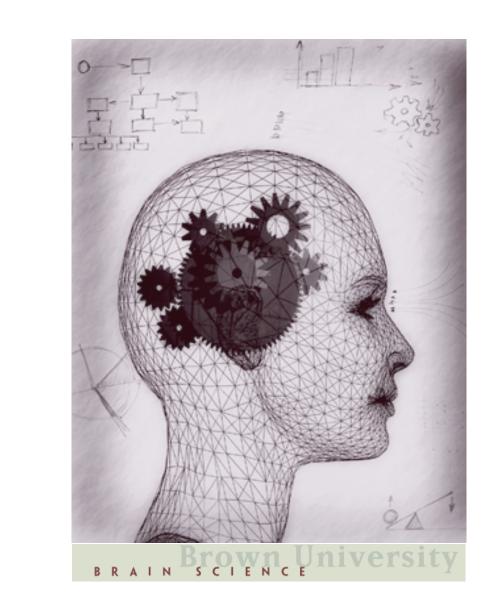


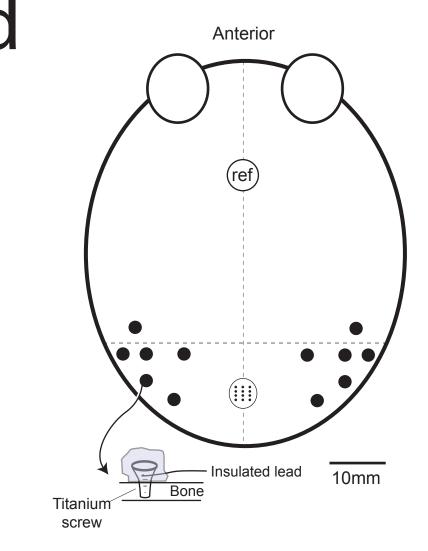
Effects of Long Term Image Familiarity in Monkey Temporal Cortex

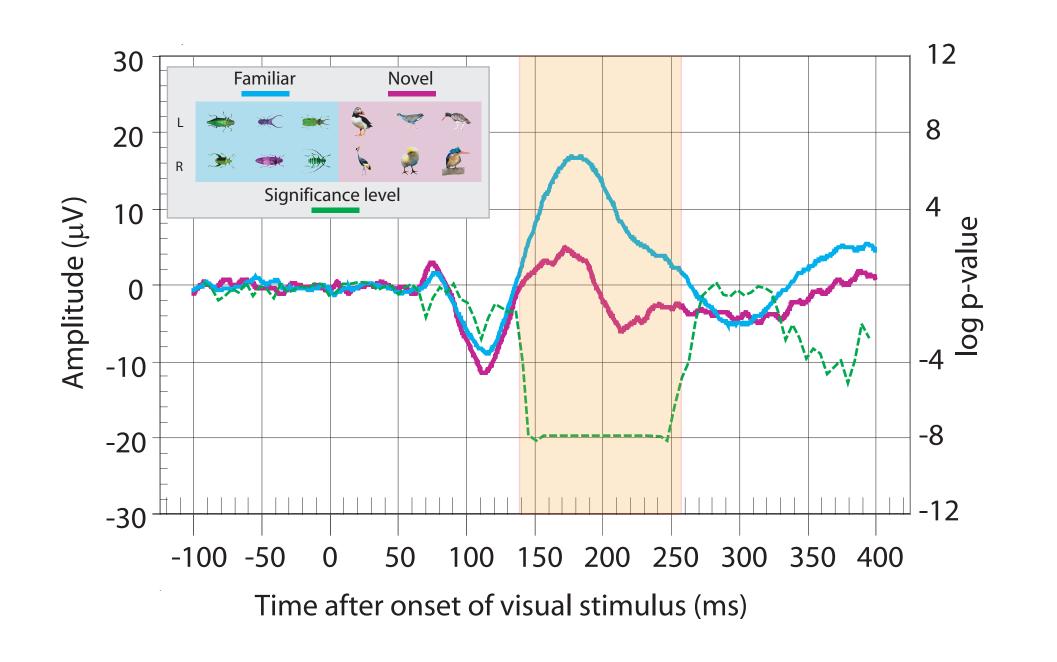
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Background

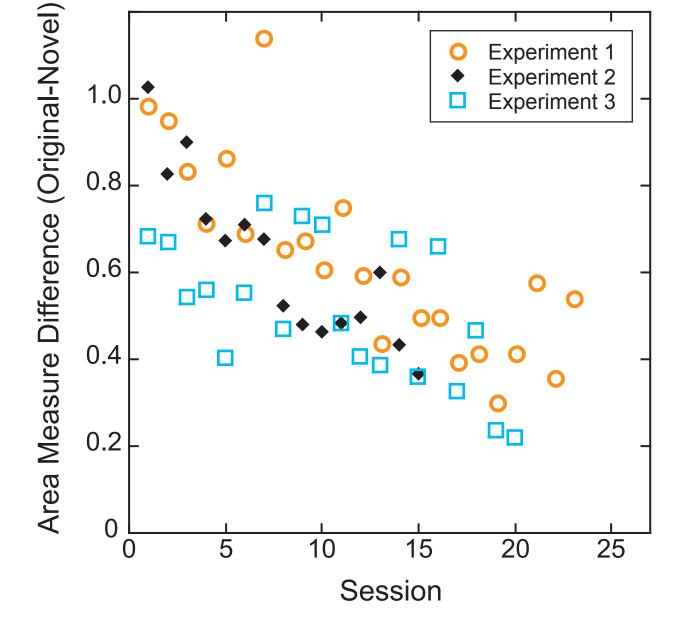
In previous work (Peissig et al., VSS 2004) we examined the effects of experience in monkeys by recording from chronically implanted EEG electrodes over the course of many weeks.





Average evoked responses showed significant ERP amplitude differences between highly familiar and novel images beginning approximately 140ms after stimulus onset.

Over the course of multiple sessions, and for a variety of passive and active discrimination tasks, we observed that these differences slowly decreased with experience.



Questions

To what extent are local field potentials (LFPs) recorded in inferior temporal cortex (IT) modulated by stimulus familiarity?

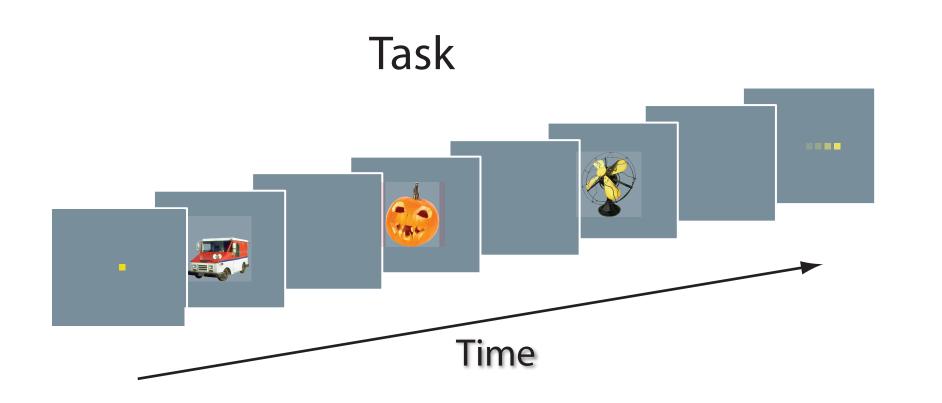
How do effects of long term experience compare to direct physical alteration of stimulus contrast?

Can we link changes in LFP responses to single unit properties in IT cortex?

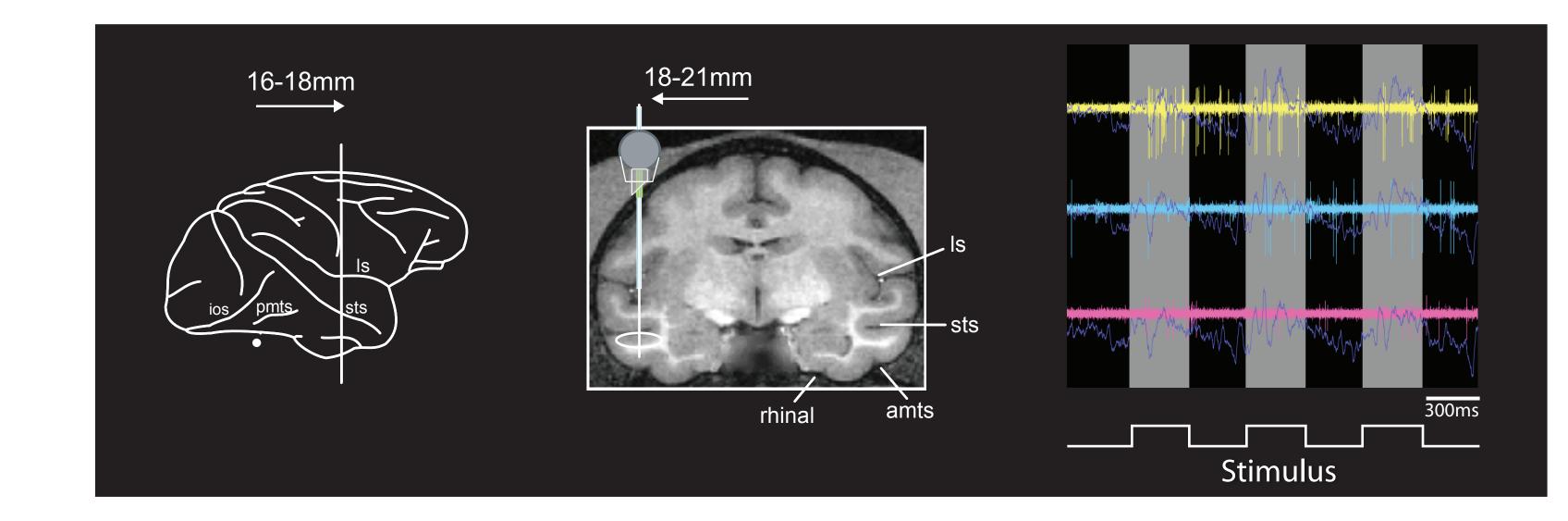
General Methods

Images (Hemera photo objects) were divided randomly into pools of familiar and novel objects for each monkey. Novel objects were first seen on their respective test day. Novel/familiar comparisons were conducted using a viewing only paradigm, during which the monkeys' only task was to acquire and reacquire a small fixation spot.

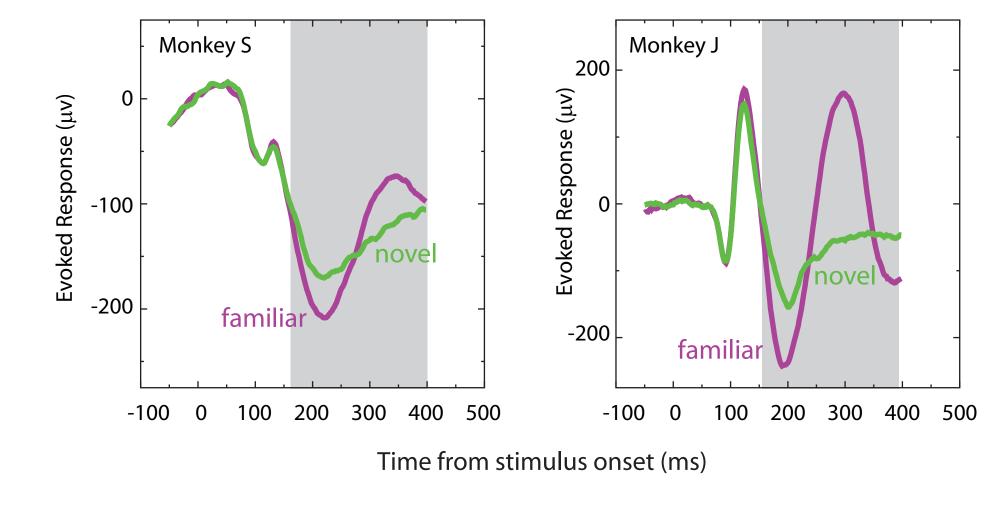


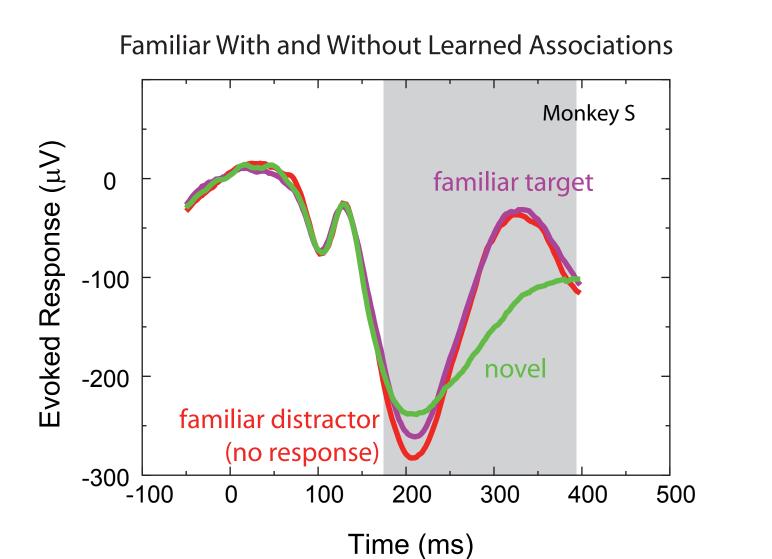


Recordings were made by lowering between one and four electrodes into the inferior temporal cortex. Spike and local field signals were split and filtered independently and streamed to disk for offline analysis.



Long Term Familiarity in LFPs

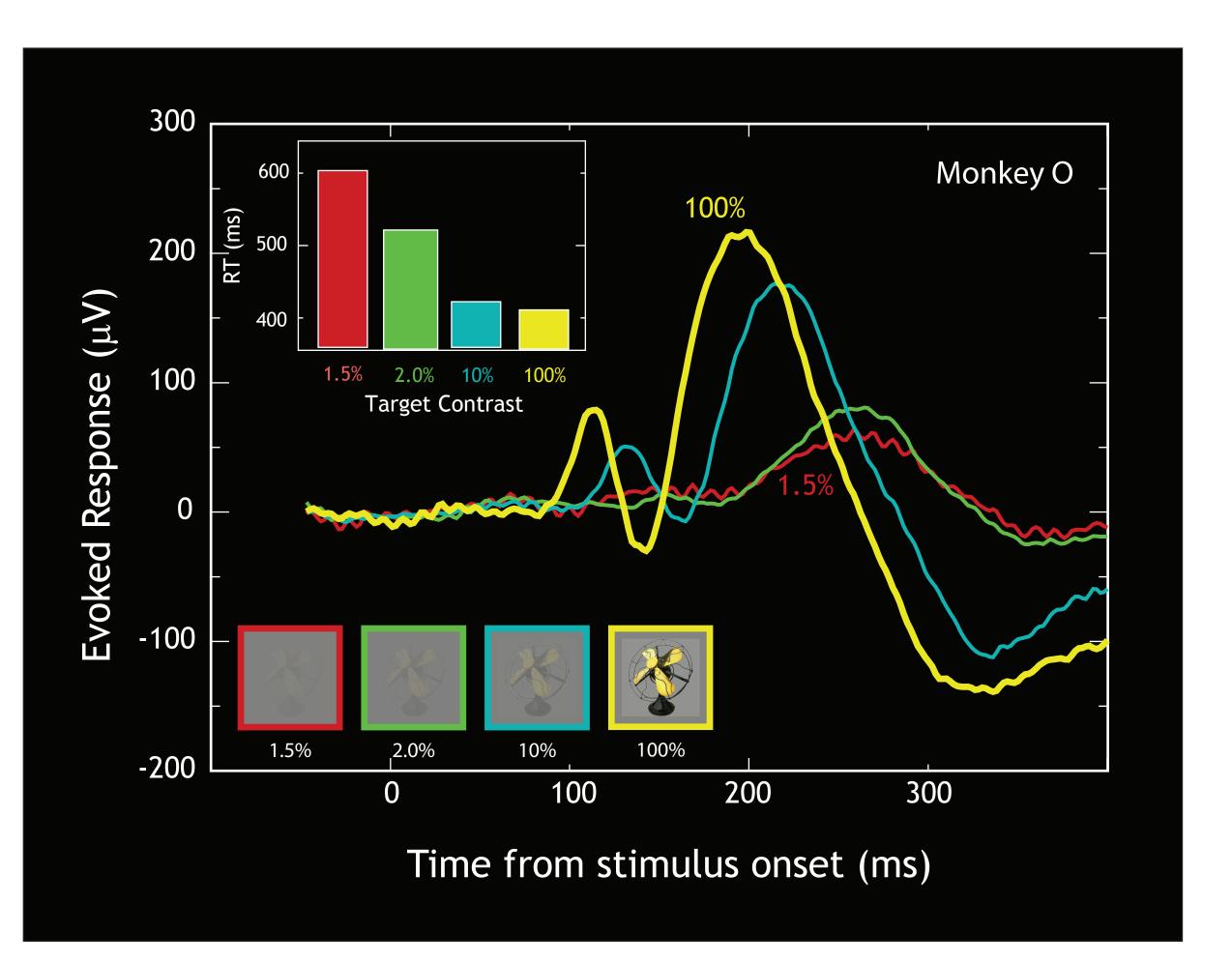




LFP signals aligned to stimulus onset show increased response amplitude for familiar images, compared to novel images, starting approximately 140-160ms after stimulus onset. Each recording session comprised 10 randomly selected familiar and 10 novel test images.

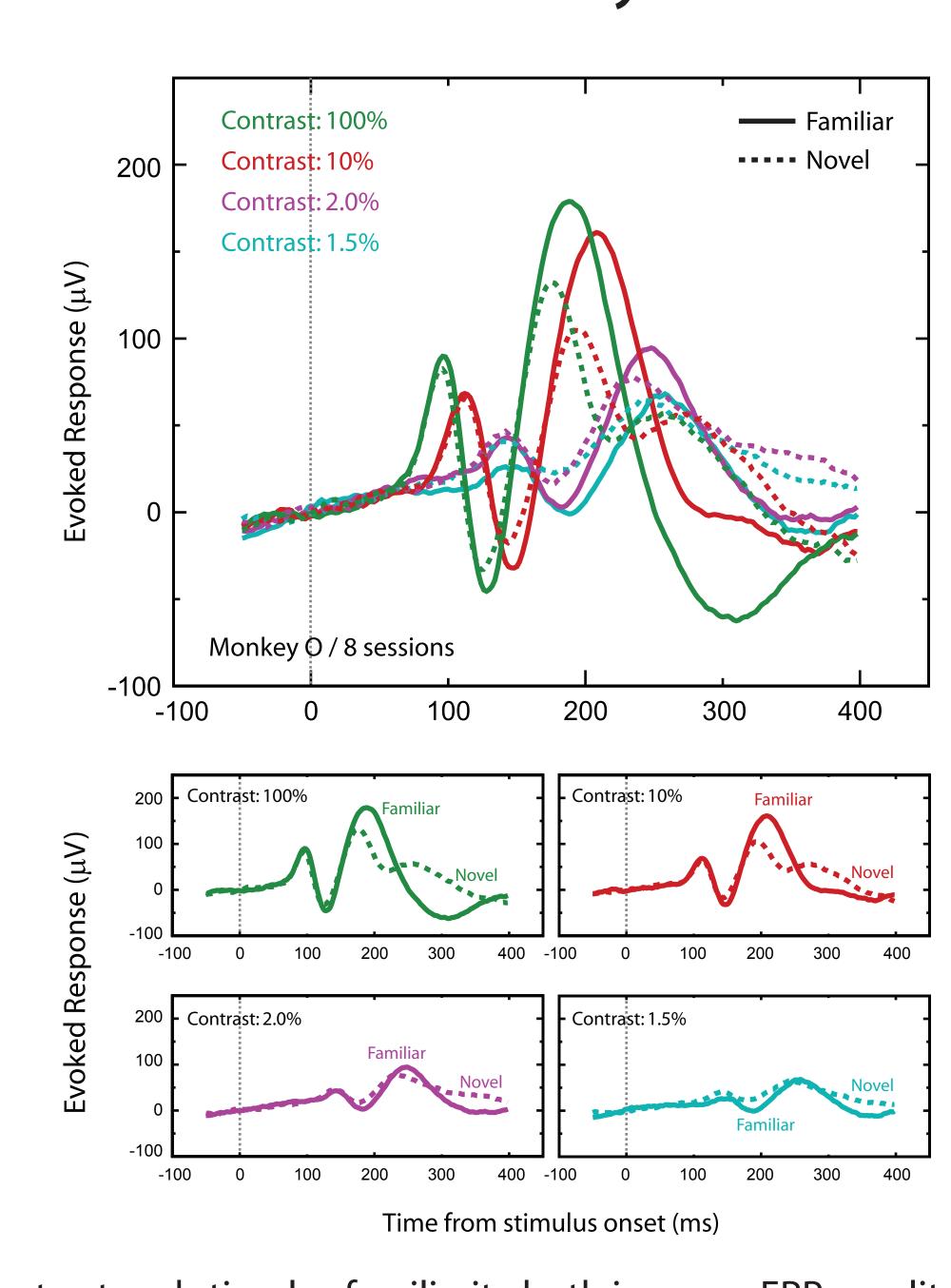
Highly familiar distractor stimuli, for which no explicit association had been learned, also show enhanced response compared to novel images. Therefore response preparation does not seem to explain the increase in signal amplitude caused by experience.

Effect of Stimulus Contrast



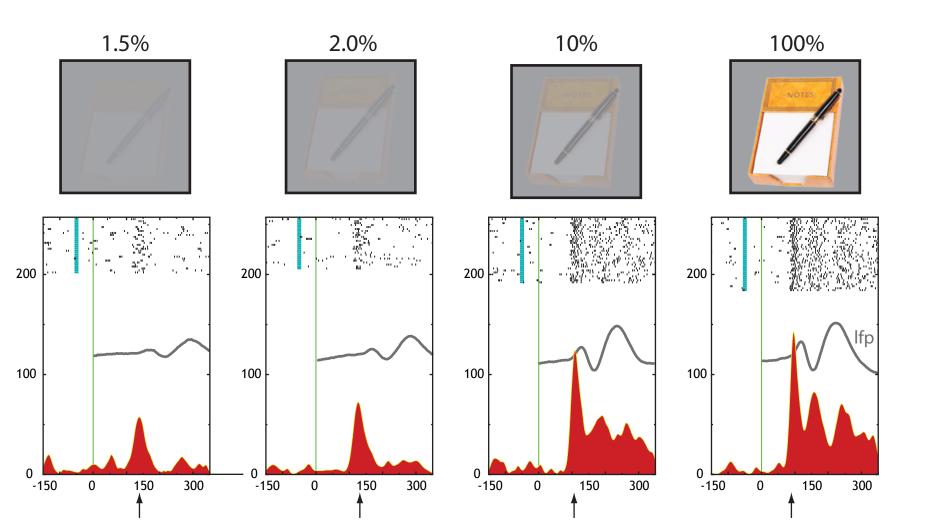
Increasing stimulus contrast systematically increases the amplitude and reduces the latency of the stimulus aligned local field potential. These effects are mirrored behaviorally by systematic decreases in reaction times with increasing stimulus contrast (inset, data taken from separate classification paradigm).

Effects of Familiarity and Contrast

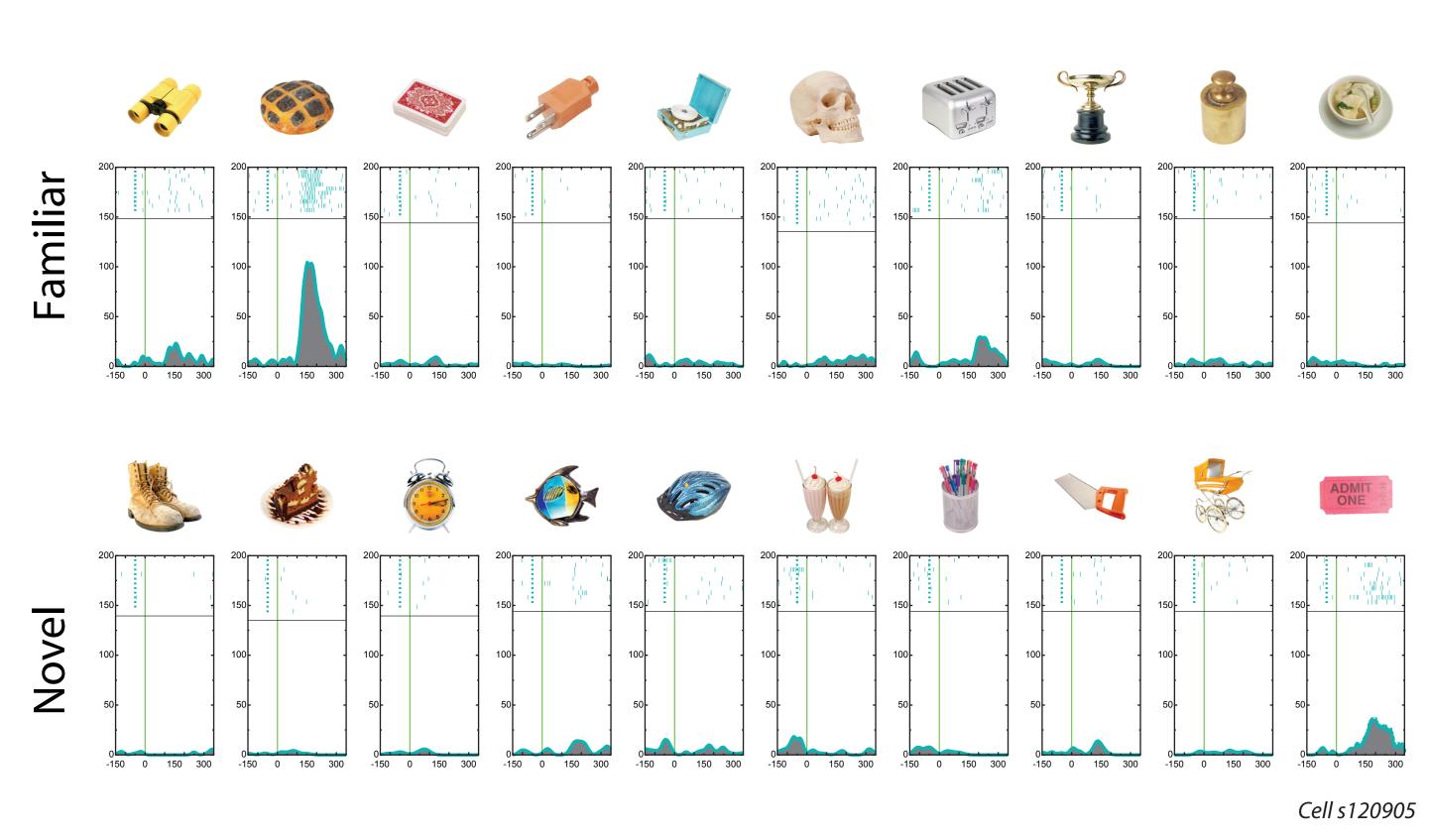


Increasing contrast and stimulus familiarity both increase ERP amplitude. However, only the low level contrast manipulation effects response latency. Unfamiliar stimuli are not just "lower contrast".

Single Unit Responses



For single cells, reducing contrast systematically increases spike latencies and reduces spike rates in response to effective stimuli.



As the selectivity of single IT cells is generally quite high, the use of small, randomly selected stimulus test sets makes characterizing novel/familiar differences difficult. Grand averages over many cells and stimuli invariably obscure specialized response profiles.

Conclusions

Stimulus aligned local field potentials recorded directly from inferior temporal (IT) cortex are clearly modulated by stimulus familiarity, with differences beginning around 140-160ms.

Manipulating stimulus contrast systematically affects LFP signals and spiking activity, but these effects appear qualitatively different from the effect of familiarity.

Linking single unit responses to more global LFP signals is made difficult by the selectivity of individual neurons.

Acknowledgment

Supported by the James S. McDonnell Foundation and NIH-EY014681.