

# GENERAL PROACTIVE INTERFERENCE AND THE N450 RESPONSE

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## Background

In delay-to-match working memory tasks, interference effects can be produced by manipulating stimulus familiarity and response prepotency resulting in increased error rates, response times, and altered electrophysiological responses (i.e. N450).<sup>1,2</sup> Interference manipulations are assumed to operate over short latencies (2 or 3 trials). However, when only a small pool of stimuli are used (such as letters<sup>3,4</sup>) there is continuous stimulus repetition apart from intended conflict manipulations. This may create a general interference effect.

Hypothesis: Continuous stimulus repetition (from small test set sizes) will show blunted interference effects in comparison to minimal stimulus repetition (from large test set sizes).

## Method

### Participants

20 Undergraduate Volunteers  
14 Female - 6 Male  
Mean Age 19.4 (sd 1.2)

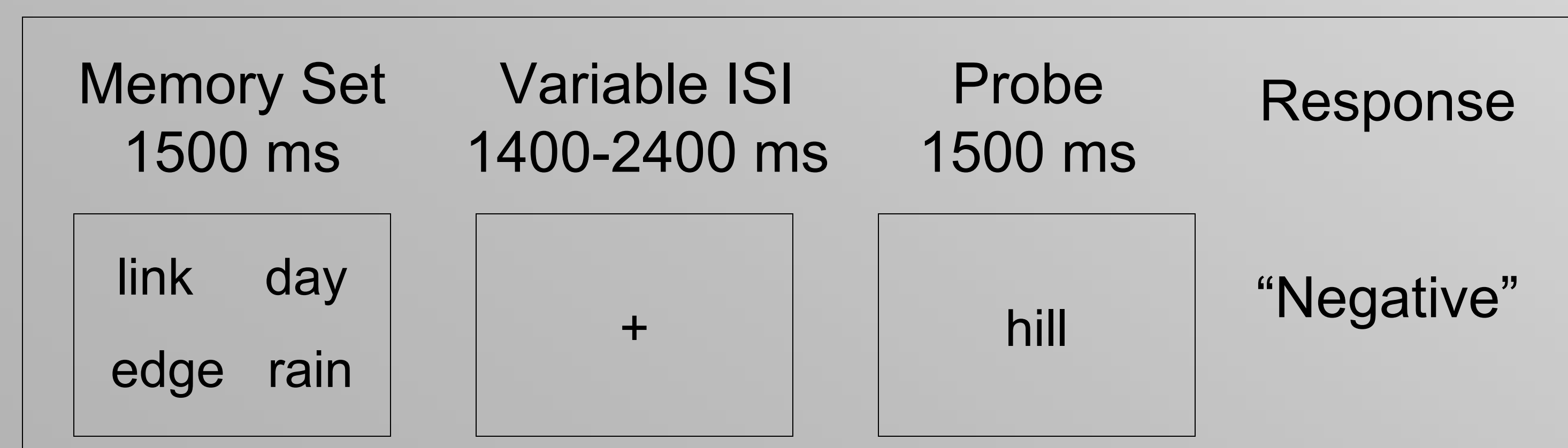
### Sternberg Designs

Small Set Size: 20-item set of short words

able	belt	dash	day	edge
film	hill	item	jail	kid
link	myth	next	oil	pool
ran	smoke	tune	vote	wise

Large Set Size: A set of 600 words of similar word frequency and imagability (e.g. cabin, pace, wide, etc.,)

Duration: Two separate 25 minute runs (counterbalanced)  
240 trials per run with 2000 ITI  
Each run presented in 5 randomized blocks



### Task Manipulations

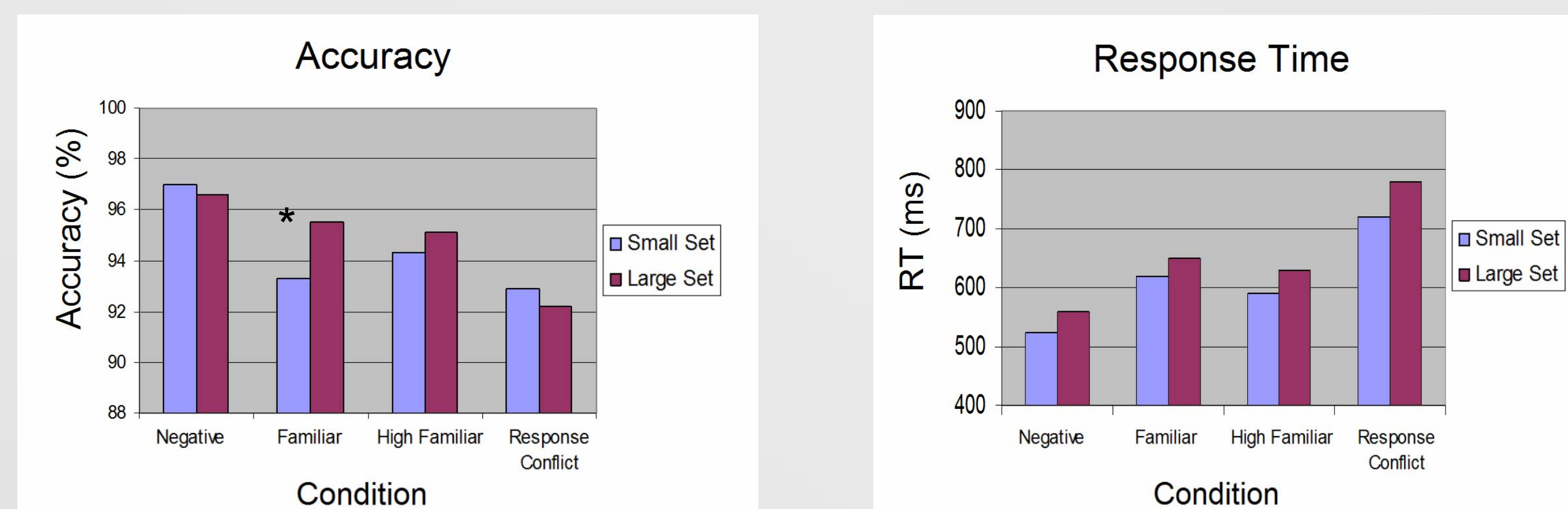
	Target Set	Probe	Condition Type
Trial n-2	tune belt dash link	-	
Trial n-1	dash hill kid vote	VOTE	Negative
Trial n	item rain film day	if EDGE >	Negative
		if FILM >	Positive
		if HILL >	Negative/Familiar
		if DASH >	Negative/Highly Familiar
		if VOTE >	Negative/Response Conflict

### Electrophysiological Recordings

- Recorded using a 128-Channel EGI System at 500 Hz with a vertex reference and impedances < 50 kΩ
- Data were filtered offline at 1 to 30 Hz
- Converted to an average reference
- Blinks corrected with MATLAB regression module

## Results

### Behavioural Results



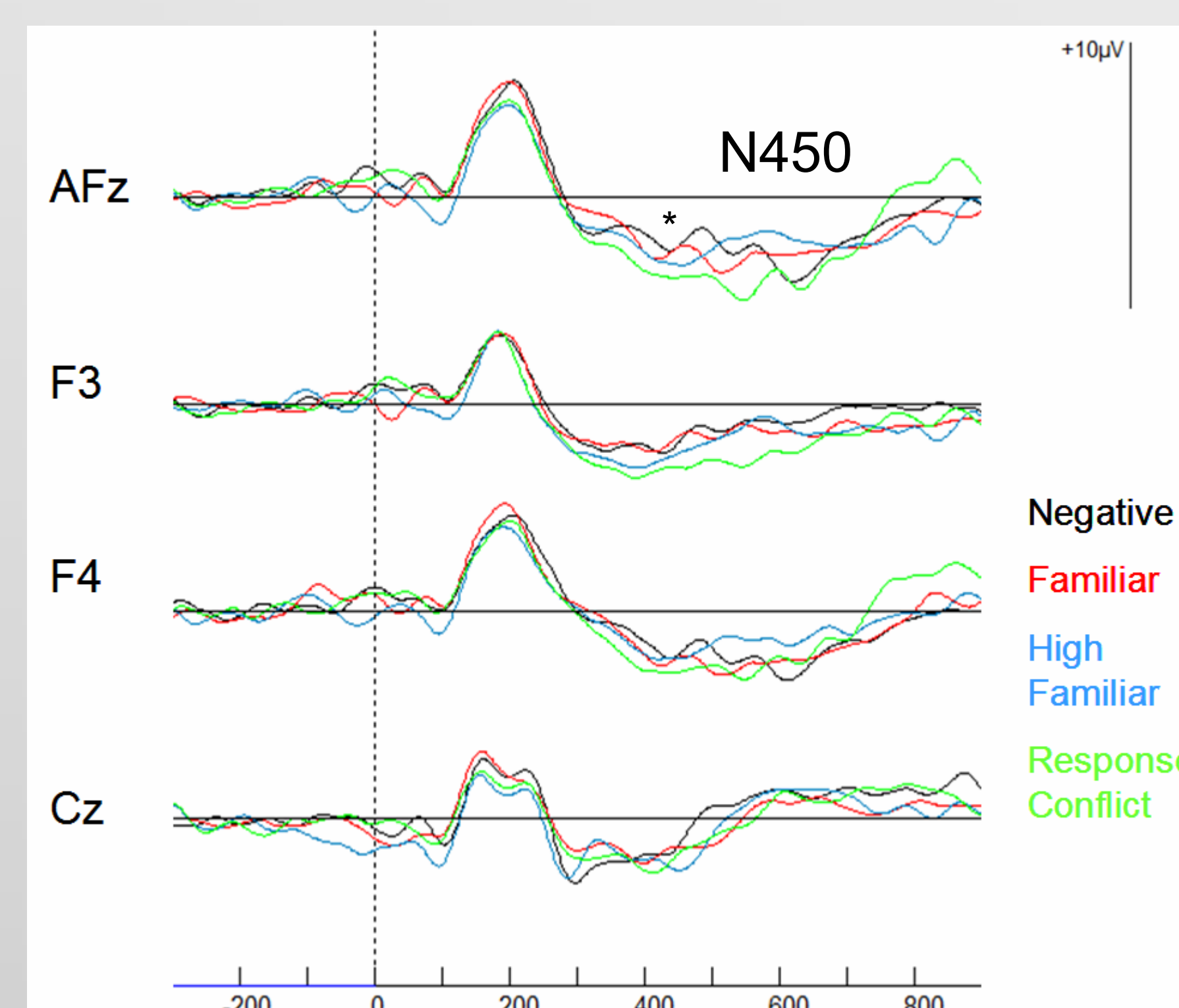
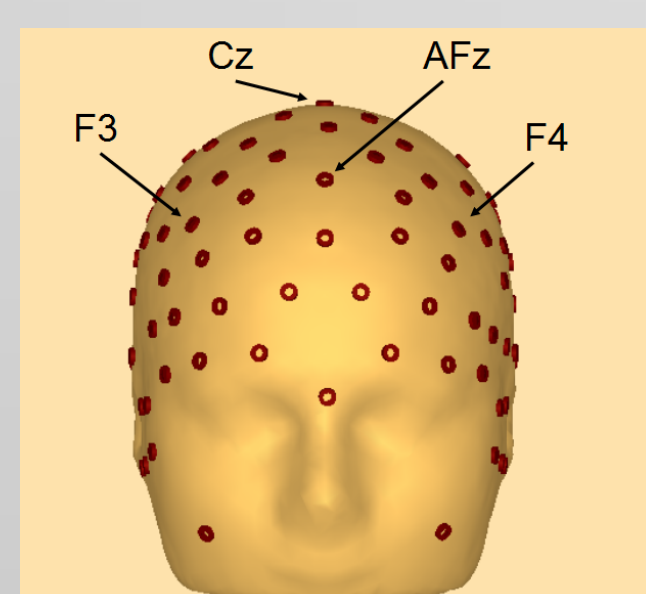
Conflict Effect  $p < .01$   
Task Effect  $p = .74$   
C x T  $p = .09$

Conflict Effect  $p < .001$   
Task Effect  $p = .01$   
C x T  $p = .47$

### ERP Results

#### Small Set Size

Conflict Effect  $p < .05$

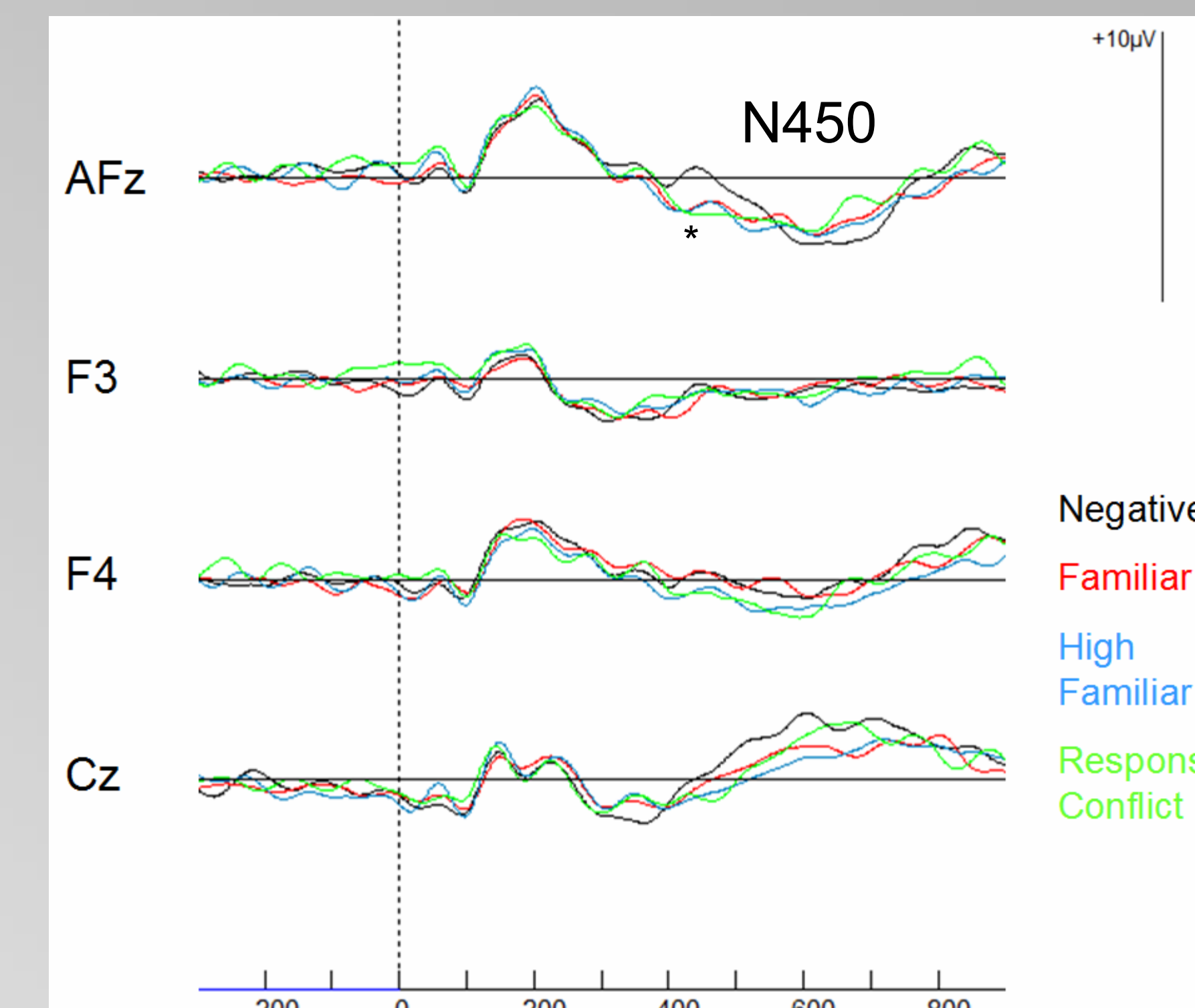


#### Large Set Size

Conflict Effect  $p < .01$

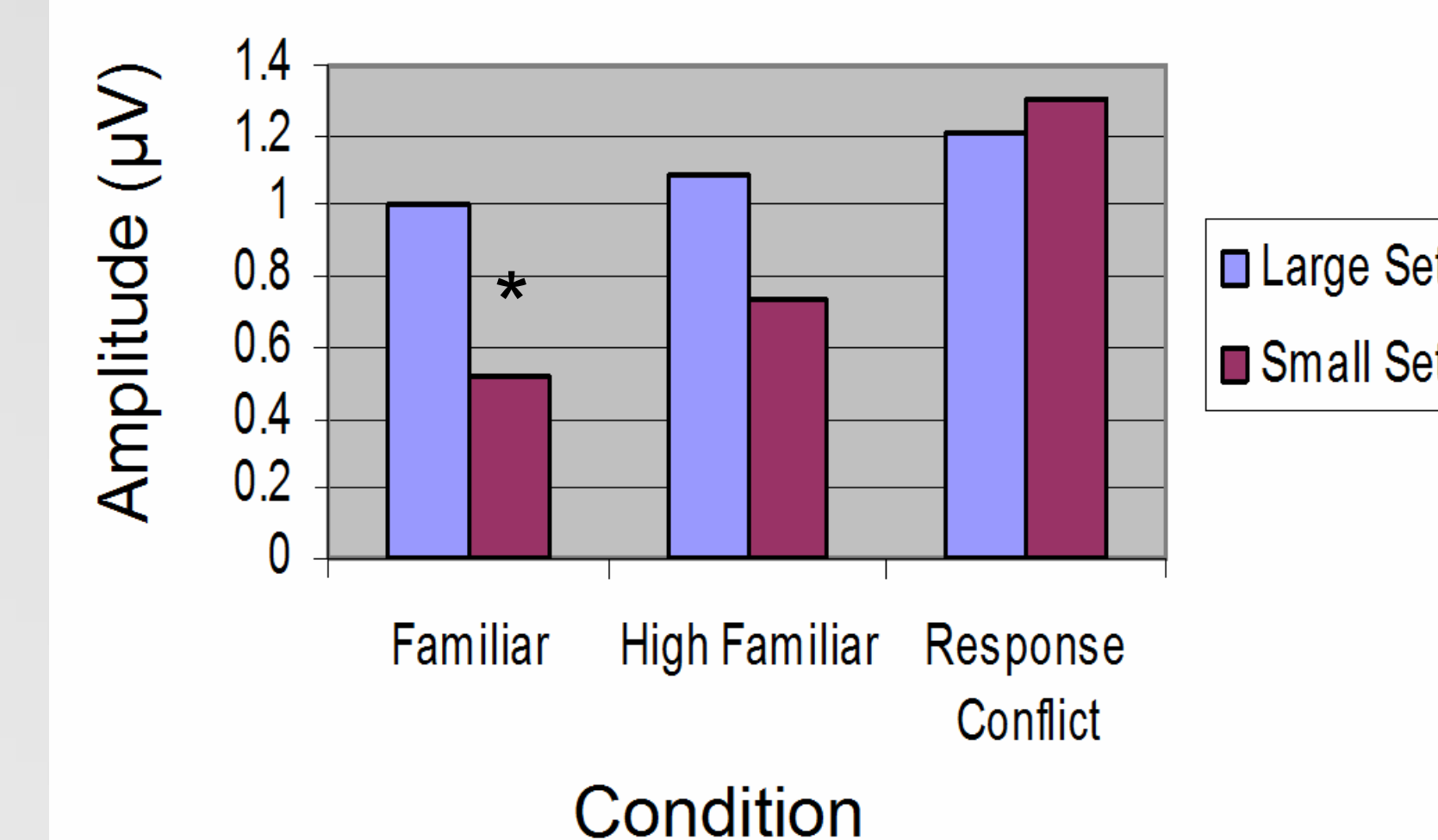
Task Effect  $p < .01$

-small set size produced larger overall amplitudes



Difference scores were created for each of the conflict conditions (**baseline - conflict**) for each task in order to investigate any differences in the pattern of response to conflict.

### Magnitude of Conflict Effects on the N450



Condition x Task Interaction  $p < .05$

## Summary

Large and small test set sizes produced relatively similar behavioral performance, although small set items produced significantly faster responses overall – possibly due to increased processing fluency. Set size did influence N450 responses such that large set sizes allowed for clearer observation of interference effects from manipulations of stimulus familiarity. Response conflict manipulations appeared unaffected by general proactive interference. Minimizing general stimulus repetition is worthwhile when attempting to study brain responses to short-term proactive interference and may improve the reliability of comparisons across different types of conflict (i.e. familiarity-based and response-based conflict).

### References

- Tays, W. J., Dywan, J., Mathewson, K. J. and Segalowitz, S. (2007). Age Differences in Target Detection and Interference Resolution in Working Memory: An ERP Study. Submitted.
- West, R. J. (2004). The Effects of Aging on Controlled Attention and Conflict Processing in the Stroop Task. *Journal of Cognitive Neuroscience*, 16, 103-113.
- Reuter-Lorenz, P. A. et al. (2000). Age Differences in the Frontal Lateralization of Verbal and Spatial Working Memory Revealed by PET. *Journal of Cognitive Neuroscience*, 12, 174-187.
- Nelson, K., Reuter-Lorenz, P. A., Sylvester, C. Y. C., Jonides, J. & Smith, E. (2003). Dissociable Neural Mechanisms Underlying Response-Based and Familiarity-Based Conflict in Working Memory. *PNAS*, 100, 11171-11175.