



## INTRODUCTION

Age-related changes in the functioning of a frontoparietal attentional network have been reported previously, using tasks that combine top-down and bottom-up attentional components. We used functional magnetic resonance imaging (fMRI) to test the hypothesis that normal aging alters this frontoparietal network through changes in the use of top-down attention. To isolate top-down attentional effects, we compared blocks of visual search trials in which the probability of a target-defining feature (color) was either relatively low (neutral condition) or relatively high (guided condition). We hypothesized that the specific form of the difference between the age groups would be an increased magnitude of activation for older adults in the frontoparietal network, especially frontal regions. In addition, we predicted that this activation would be more highly correlated with search performance for older adults than for younger adults.

## METHOD and RESULTS

### ❖ Participants

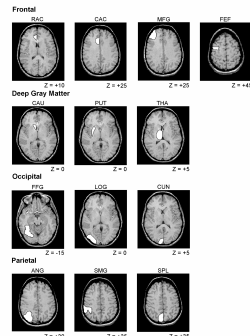
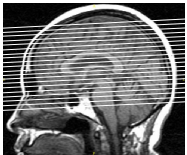
Right-handed, community-dwelling individuals; 16 younger adults (19-28 years; 8 female); 16 older adults (60-82 years; 8 female). Participants were screened for major health problems and use of psychotropic medication.

### ❖ Imaging Parameters

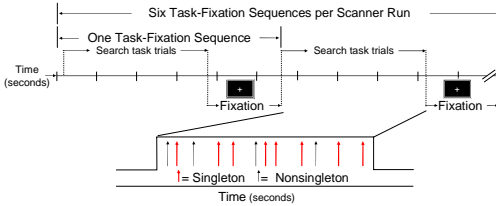
**Structural:** T1-weighted near-axial gradient-echo images, 21 contiguous slices, parallel to AC-PC, 5 mm thick; TR = 450 ms; TE = 3.5 ms.

**Functional:** T2\* Spiral-out gradient echo, co-registered to T1s, TR = 1500 ms, TE = 40 ms, flip angle = 90°; in-plane resolution = 3.75 mm<sup>2</sup>. Six functional runs.

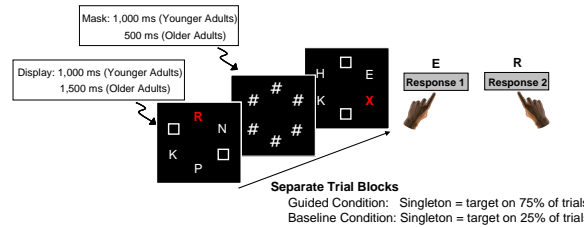
### ❖ Regions of Interest (ROIs):



## Mixed Blocked/Event-Related Design



## Visual Search Task



## Reaction Time Results

### TASK CONDITION MEANS

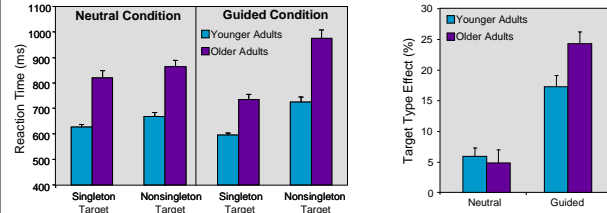
**Error rate**  
< 2.0% for each age group.

**Reaction time:**  
Age x Condition x Target Type significant,  $p < .0001$ .

### TARGET TYPE EFFECT

**Percentage target type effect**  
(nonsingleton RT - singleton RT)/nonsingleton RT

In Guided Condition, older > younger,  $p < .01$ .  
In Neutral Condition, younger = older.



## CONCLUSIONS

❖ Reliance on top-down guidance of attention during search is more pronounced for older adults than for younger adults.

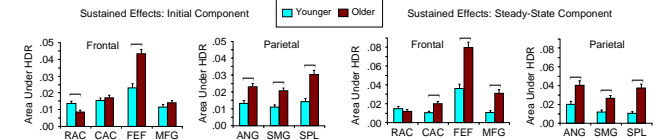
❖ Both sustained and transient activation of frontoparietal network is greater for older adults than for younger adults.

❖ The correlation between activation and performance is a top-down effect limited to the Guided condition. The age-related increase in the activation of the frontoparietal network may be a compensatory mechanism responding to decreased efficiency of visual cortical regions.

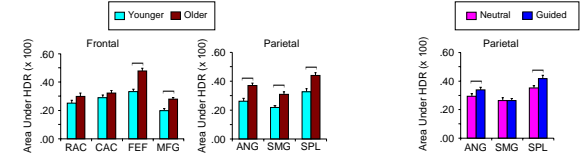
## Activation Magnitude

- ❖ Across task conditions, age-related increases in activation occurred primarily in frontal and parietal regions.
- ❖ Top-down attention led to increased event-related activation in parietal regions.

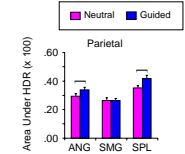
### Sustained Effects: Age Group



### Transient Effects: Age Group



### Transient Effects: Task Condition



## Correlation Between Activation Magnitude and Search Performance (Target Type Effect)

❖ In the Guided condition, on singleton target trials, event-related activation was correlated with search performance (the target type effect), and this correlation varied as a function of age group.

❖ The activation-performance relation involved the frontoparietal network for older adults and the fusiform gyrus for younger adults.

