

## Introduction

The present study examined the role of inhibition in adult age differences in visual search. Older adults have visual search deficits, but there is not much evidence yet determining the role of inhibition. Hasher and Zacks (1988) proposed inhibitory deficit theory which states age-related deficits in inhibition can account for a variety of age changes in cognition. There is evidence of inhibitory deficits with aging, and there is evidence that inhibition contributes to search performance, but it is unknown whether the type of inhibition involved in search is susceptible to age effects.

To assess age differences in visual search, younger and older participants completed two search tasks: efficient search (Q among O's) and inefficient search (O among Q's). The visual search task was followed by a Klein (1988) probe paradigm to assess the magnitude of inhibition in the two search tasks. Klein (1988) demonstrated that the difference in reaction times to on probes (inside a distractor) and off probes (at an empty location) was greater in the inefficient task than the efficient task. His explanation for this pattern was because serial search is employed in the inefficient task and object based inhibition tags the searched locations to reduce return of attention to those locations (Klein, 1988). With efficient search, the tags are less utilized because less time is spent searching the display due to the fact that targets pop out of the display.

We predicted that older adults would have poorer search performance, particularly in the inefficient task. We also predicted that older adults would be less able to utilize inhibitory tags during inefficient search than younger adults.

## Method

### Participants

- 42 younger adults (18-35 yrs;  $M = 21.7$  yrs) and 42 older adults (60-80 yrs;  $M = 69.5$  yrs)

### Search Task:

- Figure 1 illustrates the sequence of events in a sample trial.
- Participants completed two different visual search tasks in separate blocks: an **efficient task** (Q among O's) and an **inefficient task** (O among Q's).
- The items were randomly placed at 20 locations in the array with either **6 or 10 items** presented in each array. Display size was manipulated to assess search efficiency. The target was displayed on half the trials.
- Participants responded with a 'Yes' or 'No' if the target was in the display. Speed was emphasized but not over accuracy.

### Probe Detection Task:

- Participants then completed a probe detection task (Klein, 1988). Following the search response, a dot was sometimes presented in the search display. The probe was either an 'on-probe' (inside a distractor item) or an 'off-probe' (at an empty location).
- The target probe was present in half the displays. If present, participants pressed a button as soon as they saw the probe.

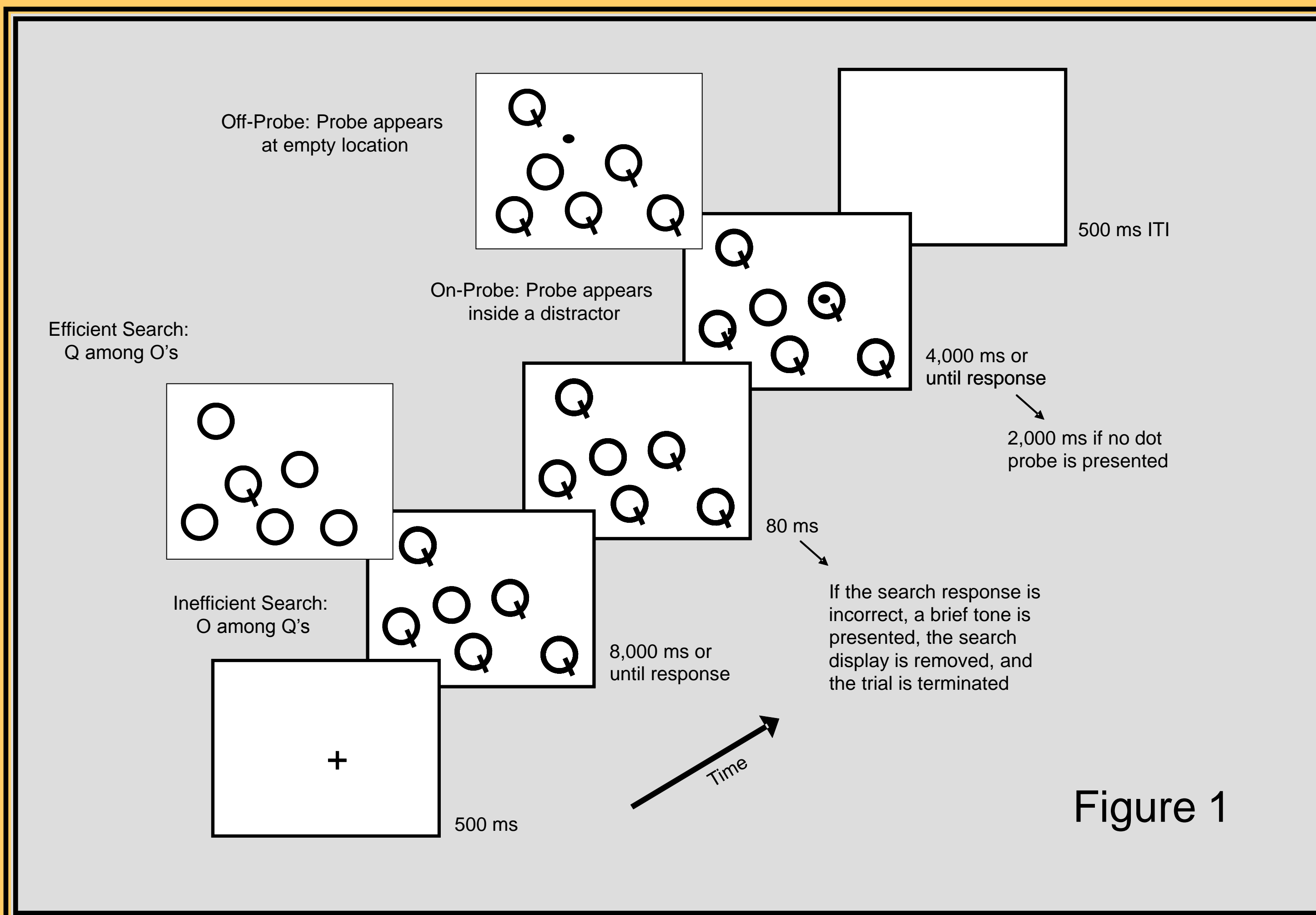


Figure 1

## Result

### Age Differences in Visual Search

- There was a significant four-way interaction with Group  $\times$  Task  $\times$  Target Condition  $\times$  Display Size,  $F(1, 82) = 14.16, p < .001$ .
- Group differences were seen in search slope for both efficient and inefficient tasks with greater differences in the inefficient search task (Figure 2).
- This task demonstrated an age difference in visual search performance, with older adults being particularly impaired on the inefficient search task with the target absent.

### Age Differences in Probe Detection

- There was a Task  $\times$  Probe Condition interaction,  $F(1, 82) = 4.97, p < .05$ , indicating bigger RT differences between on and off probes in the inefficient search task than in the efficient search task (Figure 3a).
- When collapsed across target present and absent trials, on-off differences (On RT - Off RT) were significantly greater than zero on both search tasks for younger adults and for the inefficient task for older adults (Figure 3b).
- As predicted, the magnitude of inhibition, as measured by on probe costs, was greater for the inefficient task than the efficient task. However, group differences in on-probe costs were not significant (Figure 3b).

## Conclusions

- Visual search was more effortful for older adults, particularly during the inefficient search task.
- On-probe costs (reflecting inhibitory processing), although present on both tasks, were greater during inefficient search than efficient search, suggesting that inhibition was more evident during sequential search.
- There were no significant age differences for the on-probe costs, indicating young and older adults both used inhibition during search.

## Visual Search Task

Figure 2a: Search RTs for Efficient Task

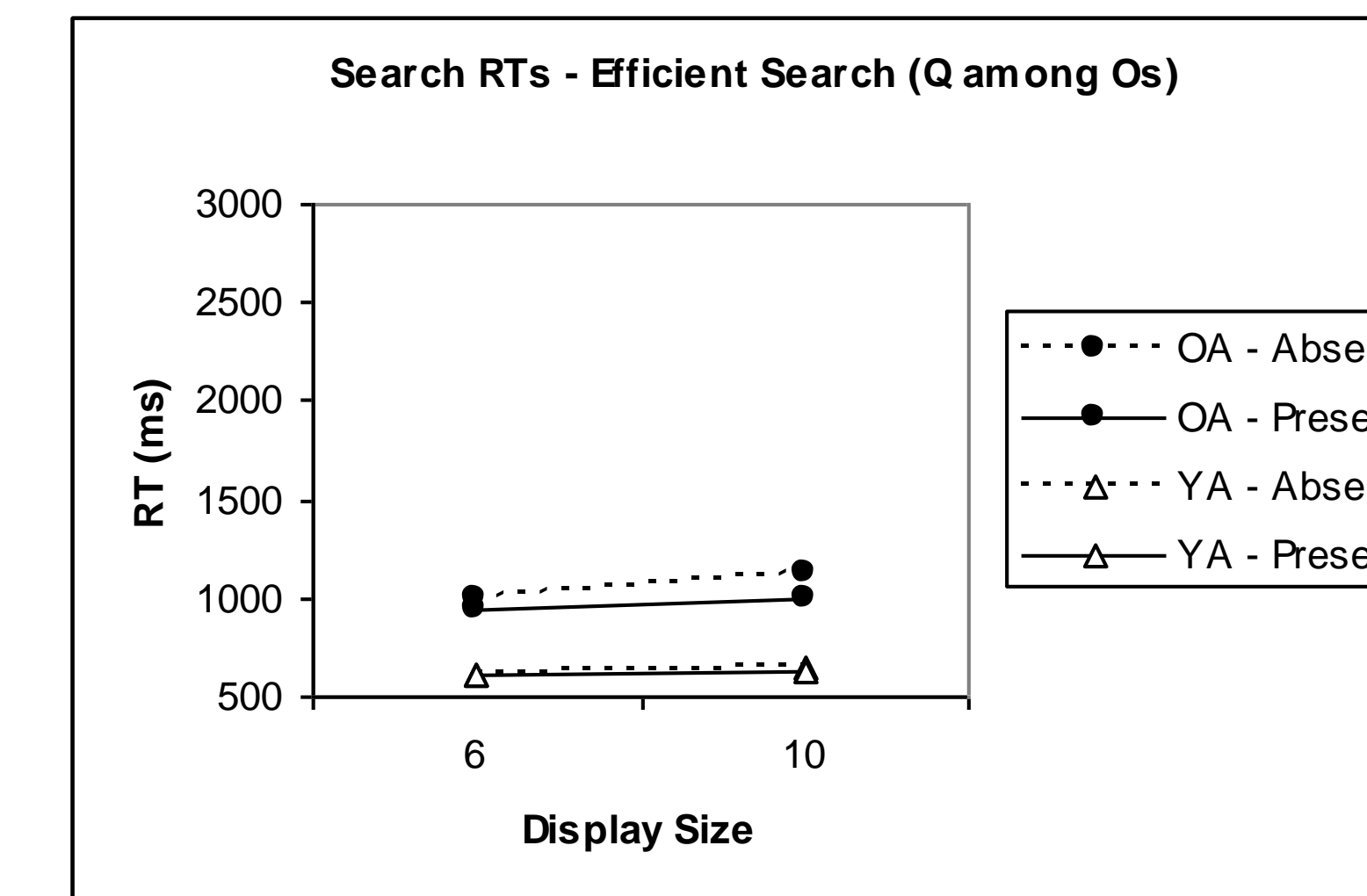
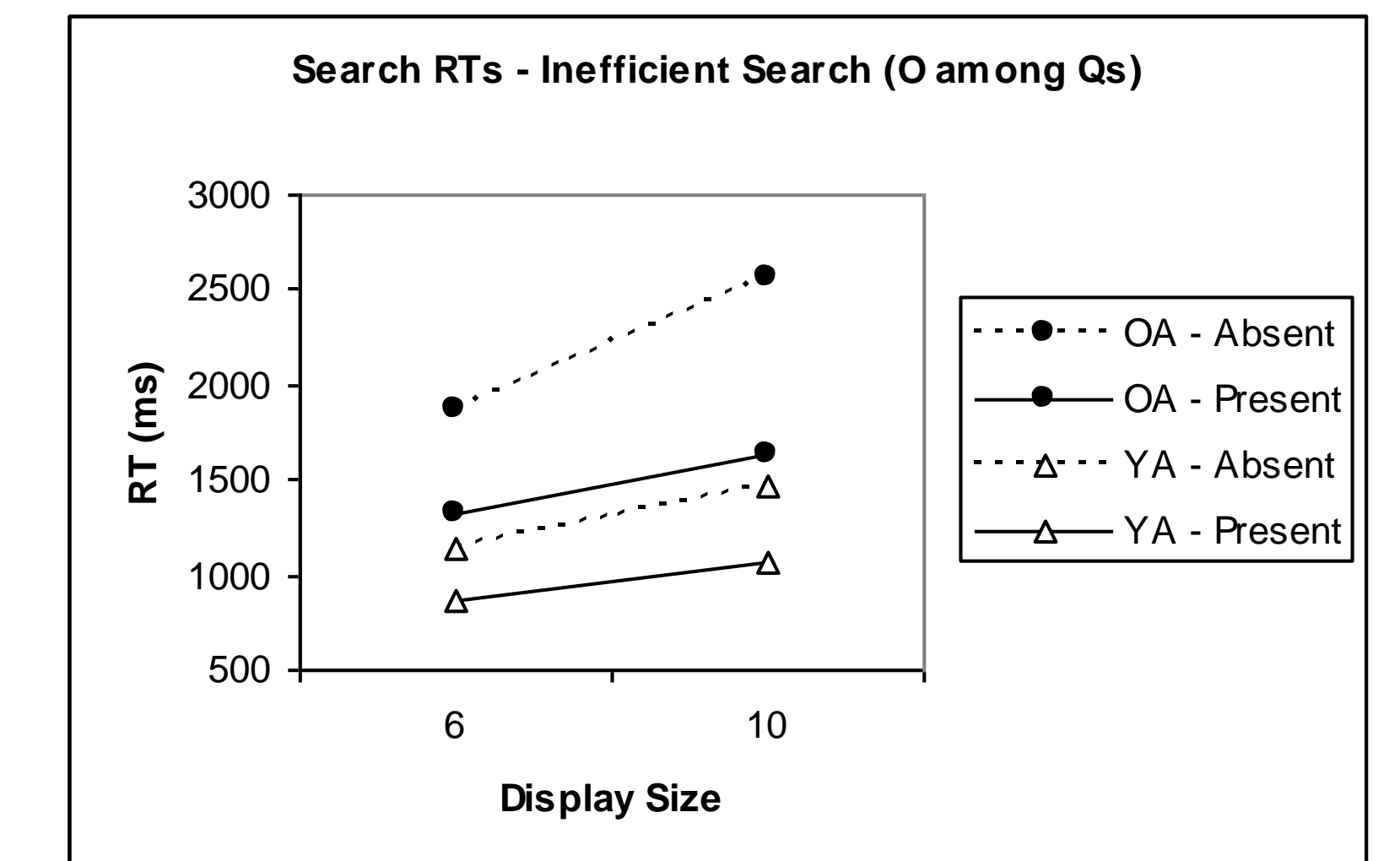


Figure 2b: Search RTs for Inefficient Task



## Probe Detection Task

Figure 3a: Probe RTs with On Probes and Off Probes

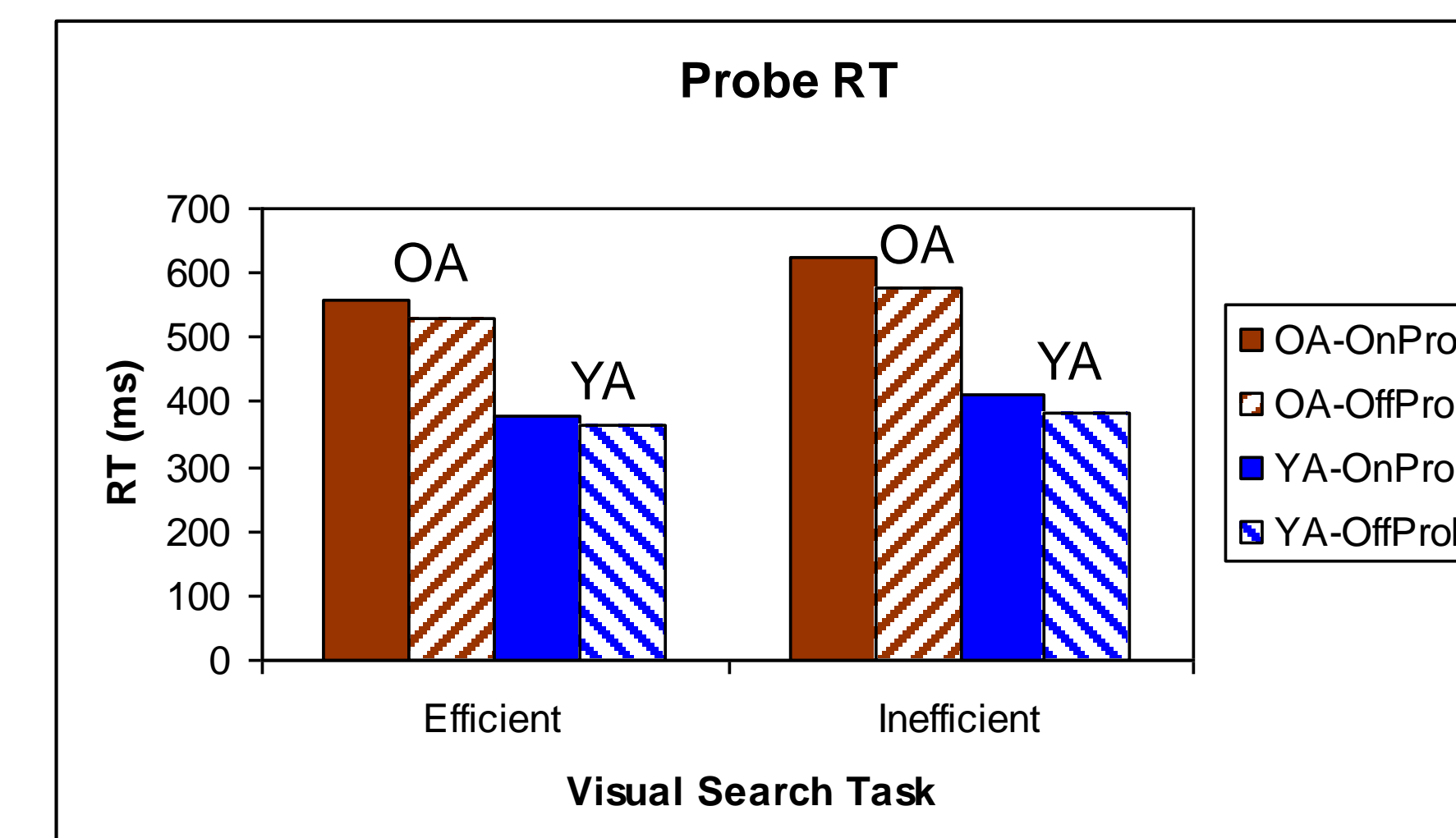
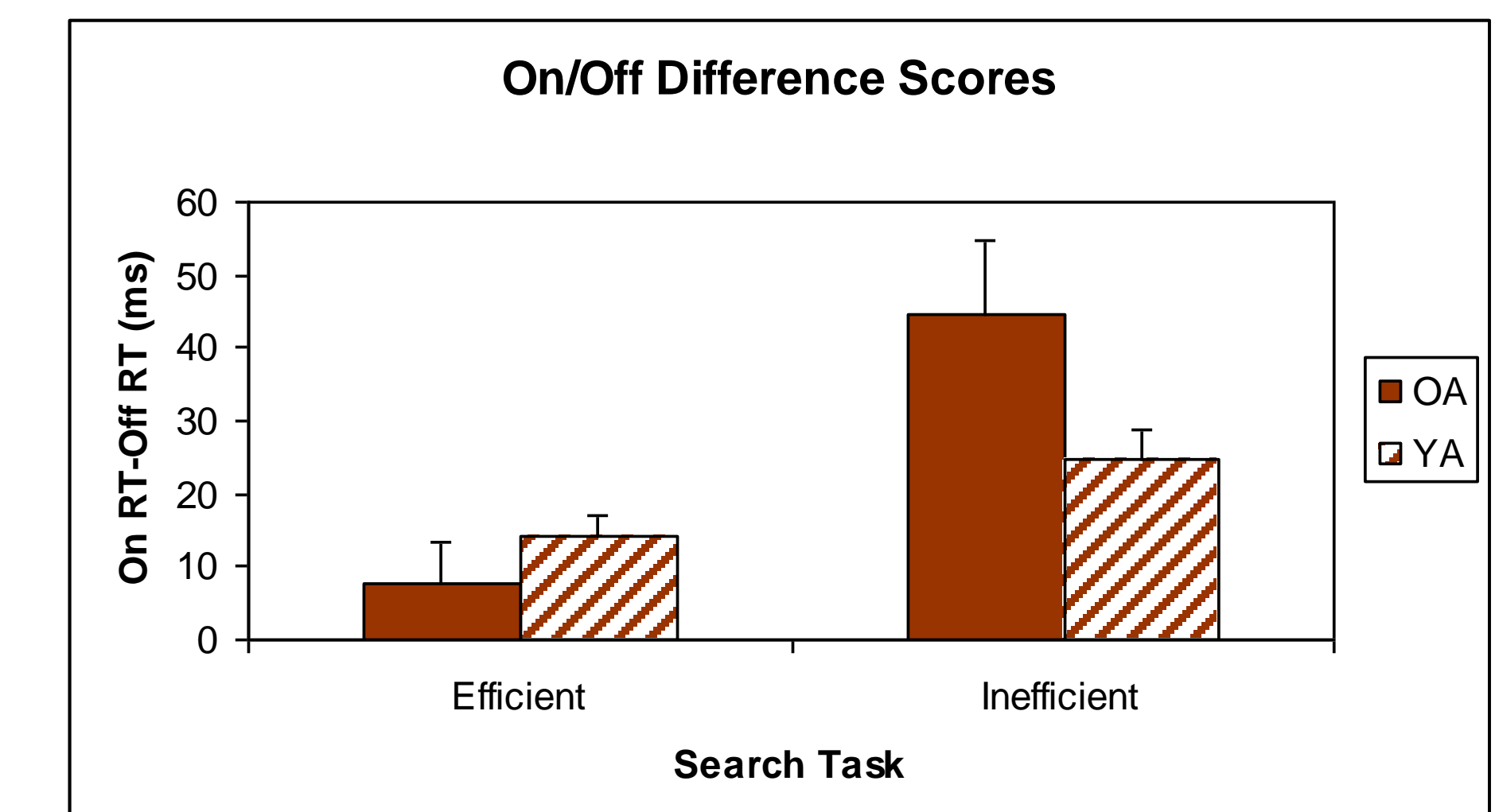


Figure 3b: On/Off Difference Scores



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