

Visual search performance can be enhanced by instructions that alter eye movements

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Abstract

Subjects perform better on some visual search tasks when they are instructed to search the display passively (i.e. letting the unique item "pop into mind") rather than actively (Smilek et al., 2006; Watson et al., 2010). We have extended this finding by adding a neutral instructions condition to establish a baseline result, and by tracking the subject's left eye during the experiment. The reaction time results of the neutral group suggest that we adopt a more active strategy by default and can be made to improve in this task by following instructions to search more passively. The eye tracking analysis found that the instructions led to systematic differences in the way the subjects searched the display. Whereas the neutral and active instructions led to similar patterns of eye movements, the passive subjects took longer to initiate their first saccade, located the target more quickly, and were faster to make a button press once the target was found. If the passive instructions enhance our search performance by altering eye movements, this has potential implications for real-world search tasks that are primarily carried out by moving the eyes.

Introduction & Method

Smilek et al., (2006) found that subjects performed better on a hard visual search task (Fig. 1) when they were instructed to search the display passively rather than actively (Fig. 2).

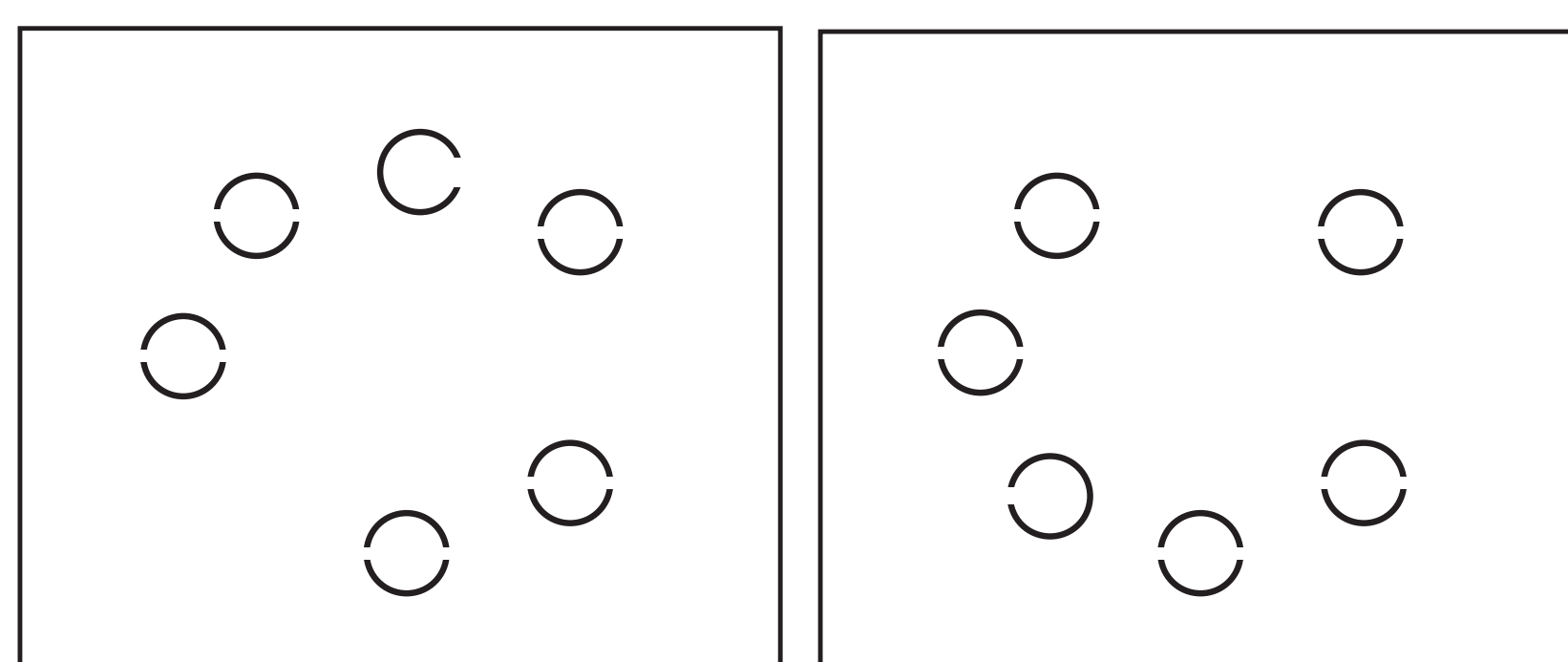


Figure 1: The easy (left) and hard (right) conditions

Passive Instructions: "...be as receptive as possible and let the unique item "pop" into your mind as you look at the screen..."

Active Instructions: "...be as active as possible and "search" for the item as you look at the screen..."

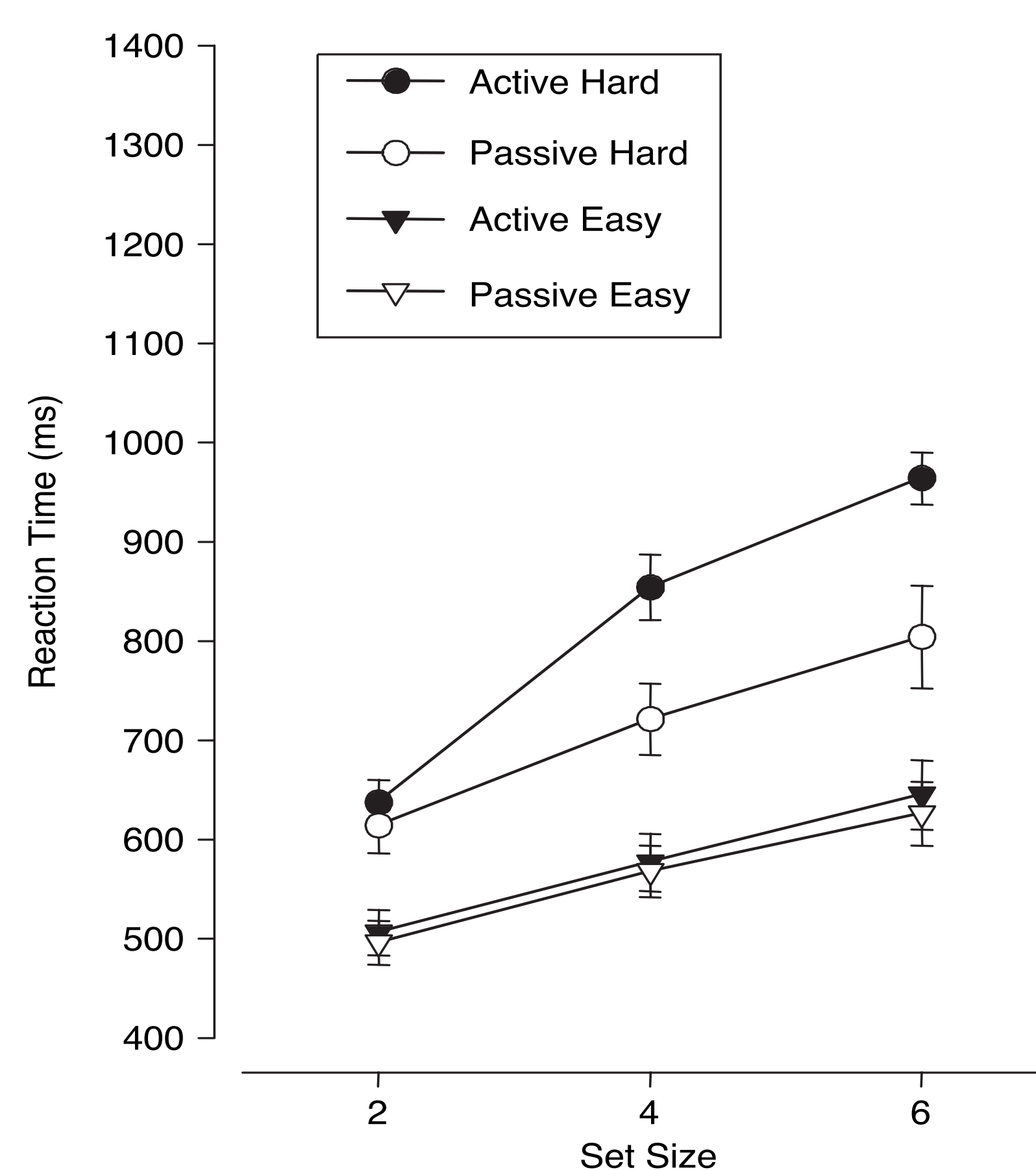


Figure 2: Results of Smilek et al., (2006)

Research Questions

1. Do **passive** instructions make you better at visual search or do **active** instructions make you worse? Or both?
2. Do the instructions lead to systematic differences in the way the subjects move their eyes?

We added a neutral condition and tracked the left eye using a headmounted ISCAN RK-500.

Hypothesis

Passive subjects are faster because they take longer on each fixation, so have longer to analyse the periphery, select better fixation locations and locate the target faster.

Eye Tracking Analysis

Each trial was split into three epochs:

- **Epoch 1:** Display onset → First saccade
- **Epoch 2:** First saccade → Find target
- **Epoch 3:** Find target → Make response

Results

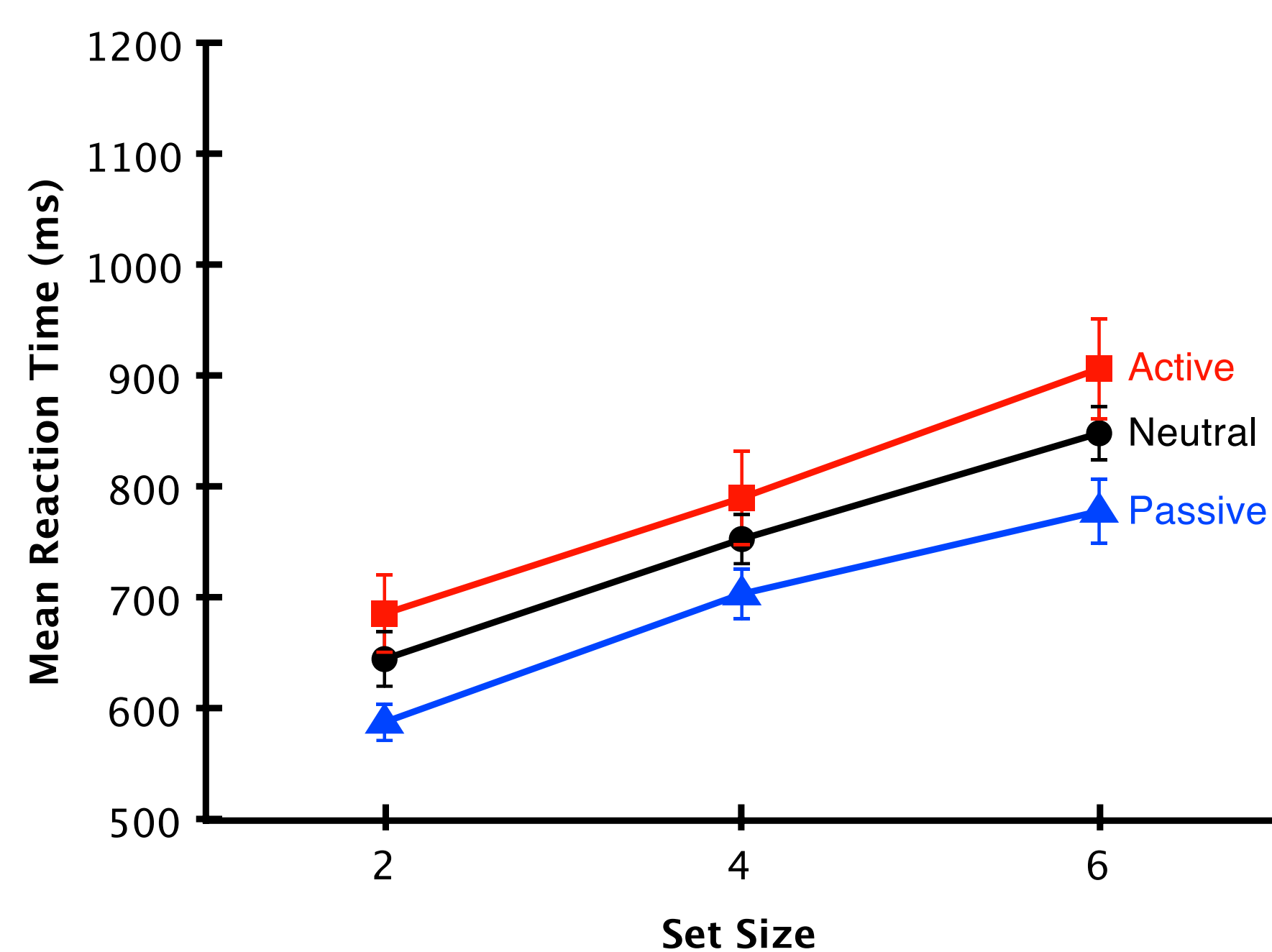


Figure 3: Mean Correct Reaction Time (Easy Condition)

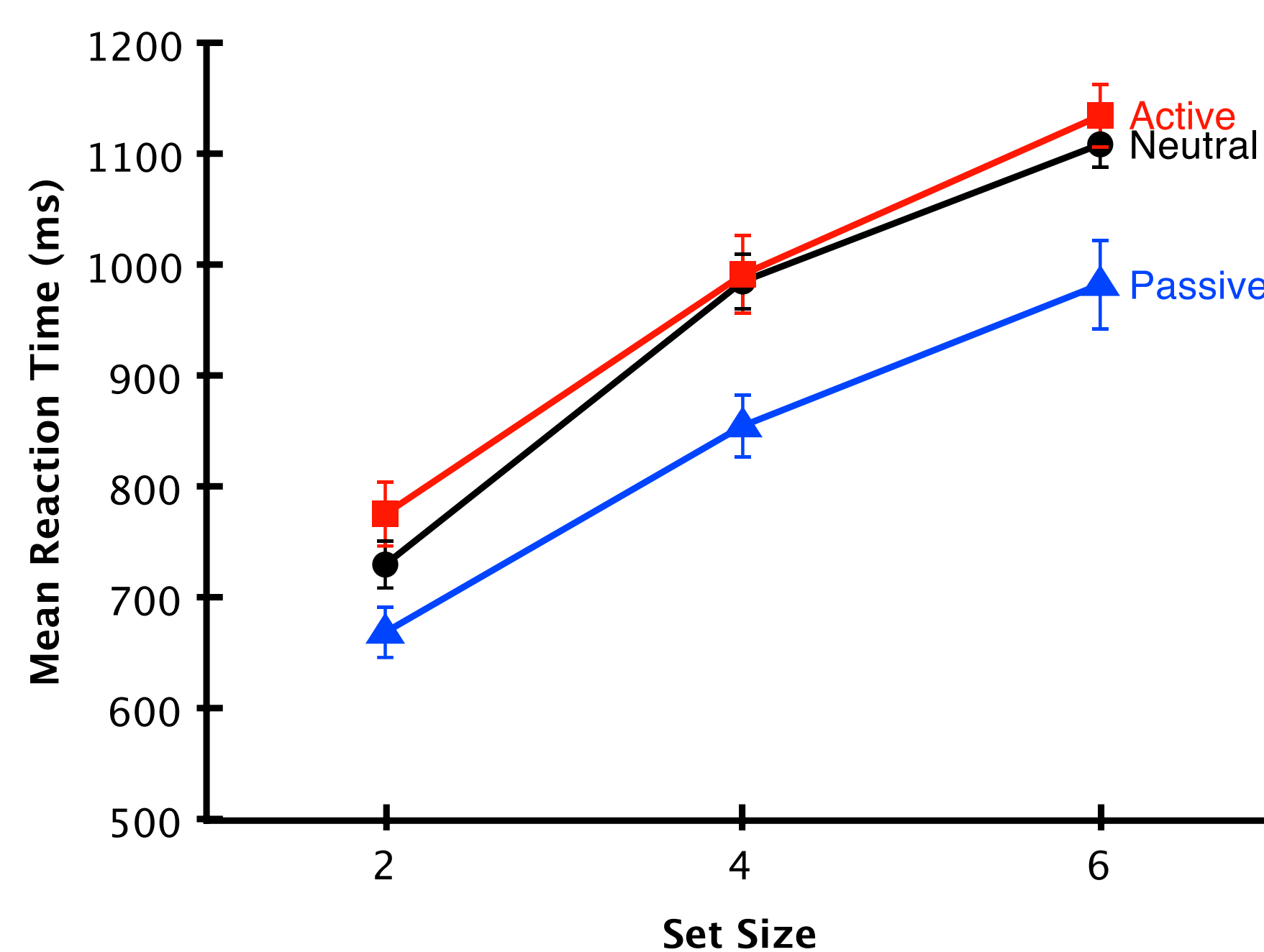


Figure 4: Mean Correct Reaction Time (Hard Condition)

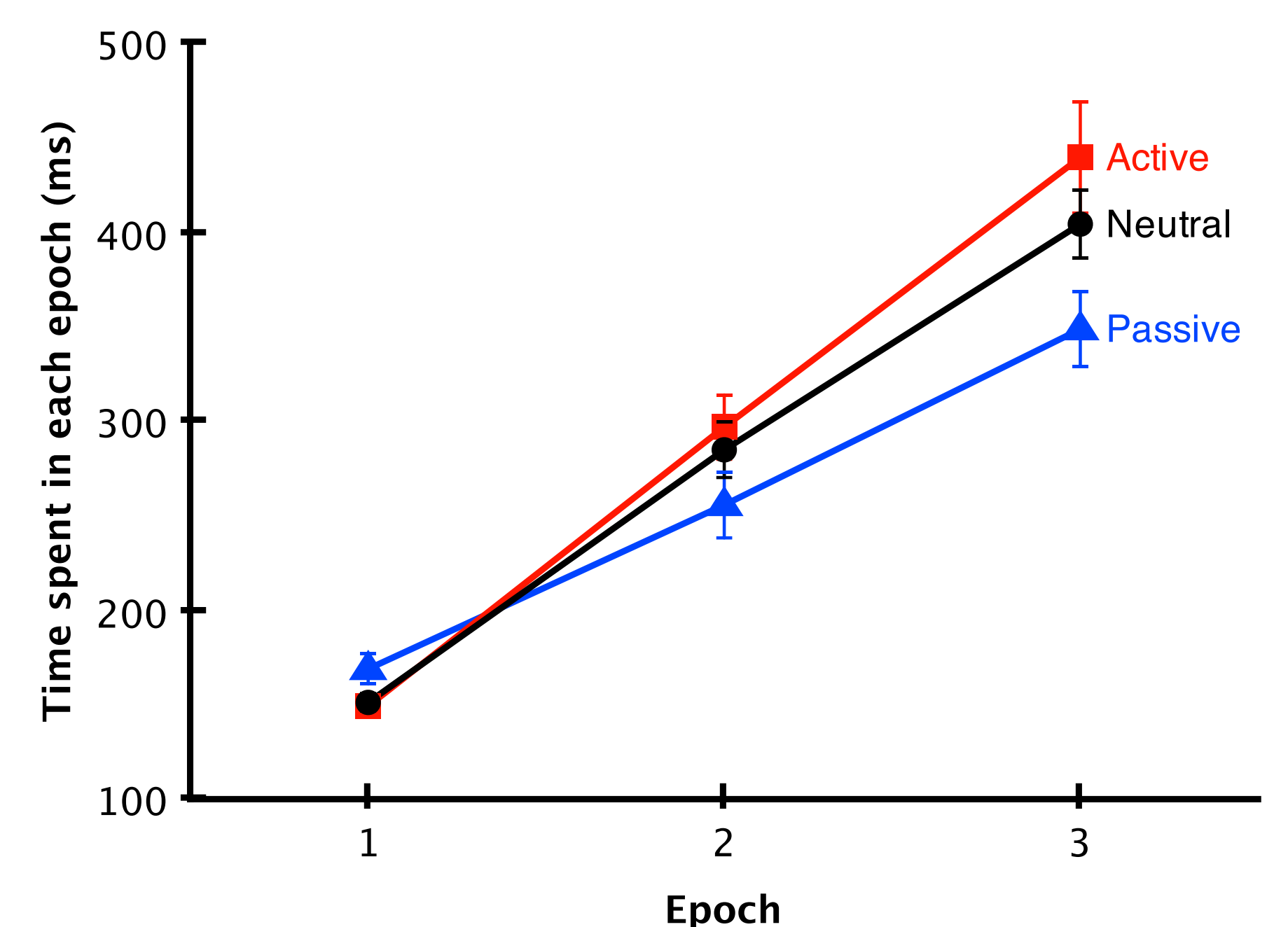


Figure 5: Time Spent in Epoch's 1, 2 and 3 (All Conditions)

Discussion

Research Question 1

Passive subjects were significantly faster than either the **active** or neutral subjects in the hard condition (Fig. 4) but not the easy condition (Fig. 3).

Research Question 2

Passive subjects took significantly longer to start moving their eyes but found the target faster and were quicker to respond compared to **active** subjects (Fig. 5).

Active and neutral subjects were very similar in both visual search performance and in the way they moved their eyes.

Conclusions

1. Subjects can be made to improve on this search task by simply being instructed to search **passively**
2. **Passive** subjects may get faster at searching because they spend longer on individual fixations

We therefore predict that the **passive** versus **active** advantage:

1. Will carry over to search tasks that are primarily carried out using the eyes
2. Won't carry over to search tasks that require more gross movements of the head and / or body

References

Smilek, D., Enns, J. T., Eastwood, J. D., & Merikle, P. M. (2006). Relax! Cognitive strategy influences visual search. *Visual Cognition* 14(4-8), 543-564.

Watson, M. R., Brennan, A. A., Kingstone, A., & Enns, J. T. (2010). Looking versus seeing: Strategies alter eye movements during visual search. *Psychonomic Bulletin & Review*, 17(4), 543-549.

Acknowledgments

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