



# Is superior visual search in autism due to memory in search? Todd S. Horowitz and Jeremy M. Wolfe Brandon M. Keehn Christine E. Connolly and Robert M. Joseph

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### background

Autism is a complex neurodevelopmental disorder characterized by difficulties in communication and social interaction, as well as repetitive behaviors and interests. Individuals with autism also exhibit attentional anomalies. Recent studies (O'Riordan & Plaisted, 2001; O'Riordan, Plaisted, Driver, & Baron-Cohen, 2001; Plaisted, O'Riordan, & Baron-Cohen, 1998) have shown that autistic children are actually superior to controls on a range of visual search tasks . Why should this be?

Hypotheses (O'Riordan et al. 2001): Autistic children might have...

iscrimination?

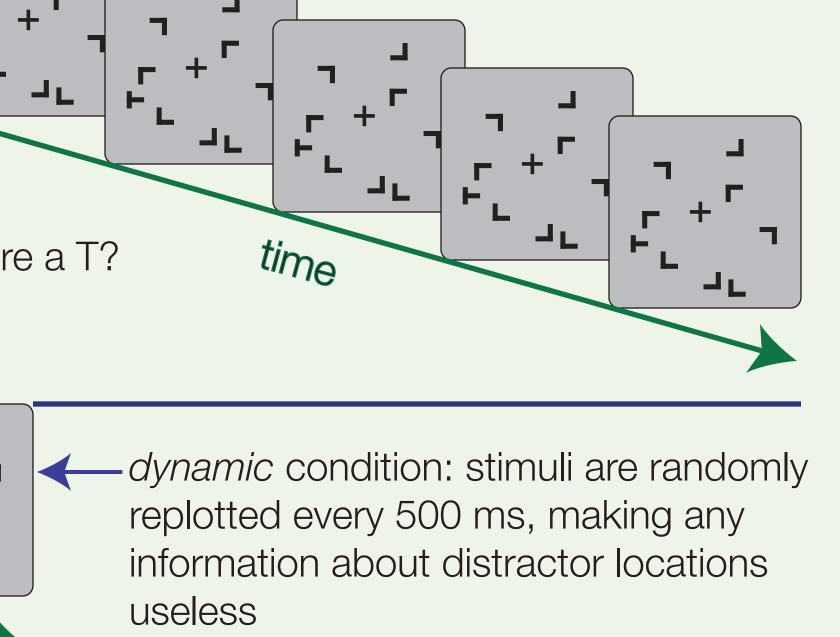
stronger excitation/inhibition? better memory for rejected distractors?

Our goal was to test the last hypothesis, using the randomized search method (Horowitz & Wolfe, 1998) to test for memory for rejected distractors.

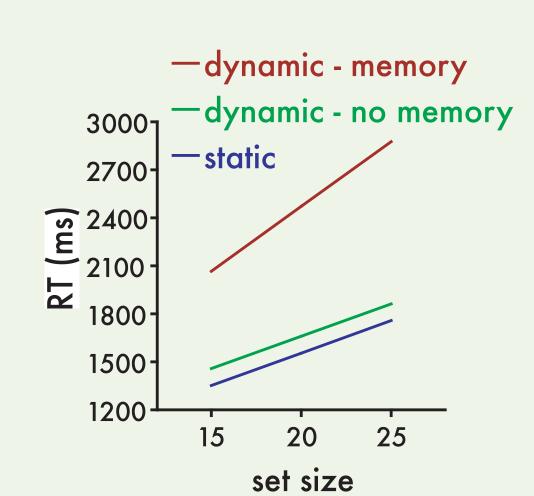
### randomized search task

static condition: stimuli are unchanged throughout the trial, allowing observers  $\longrightarrow$ to use information about distractor locations if they have it.

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Observers completed 90 trials in each condition. Dynamic targets could appear in only 4 possible randomly selected locations to thwart a simple "sit and wait" strategy. Eye position was tracked using an ISCAN Model ETL-500 head-mounted, eye monitoring system



### hypothesis

if observers normally use memory, then target-present slope in the dynamic condition will be twice that of the static condition.

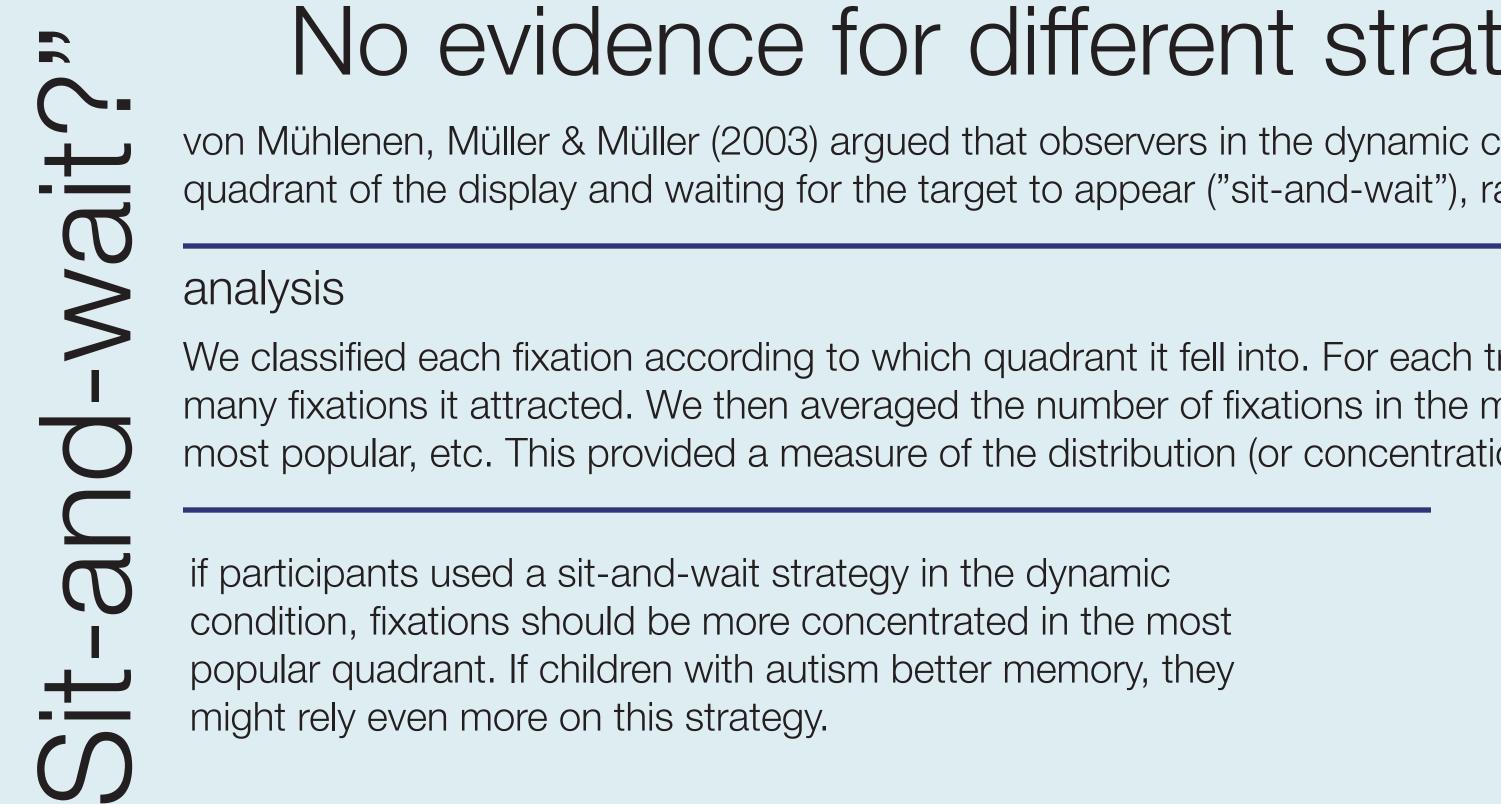
if observers do not normally use memory, then the slopes should be the same

if autistic children have better memory, they will be more impaired in the dynamic condition than typically developing children

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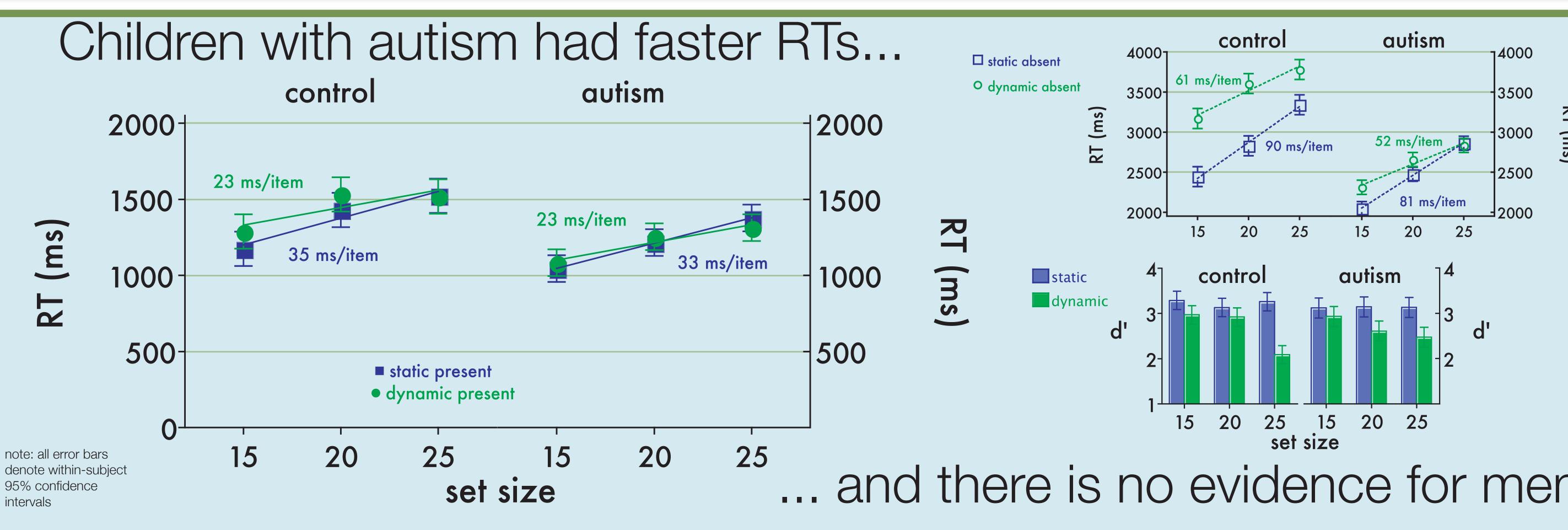
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### San Diego State University & University of California, San Diego

### Participants

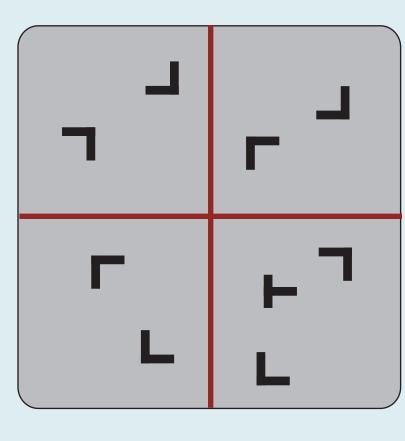
21 children (4 females) with autism diagnoses confirmed by ADI-R (Rutter, Le Couteur, & Lord, 2003), ADOS (Lord, Rutter, DiLavore, & Risi, 1999) and expert clinical judgment, and 21 age and IQ matched typically developing children (4 females) participated. Informed consent was obtained in accordance with the Boston University School of Medicine IRB.

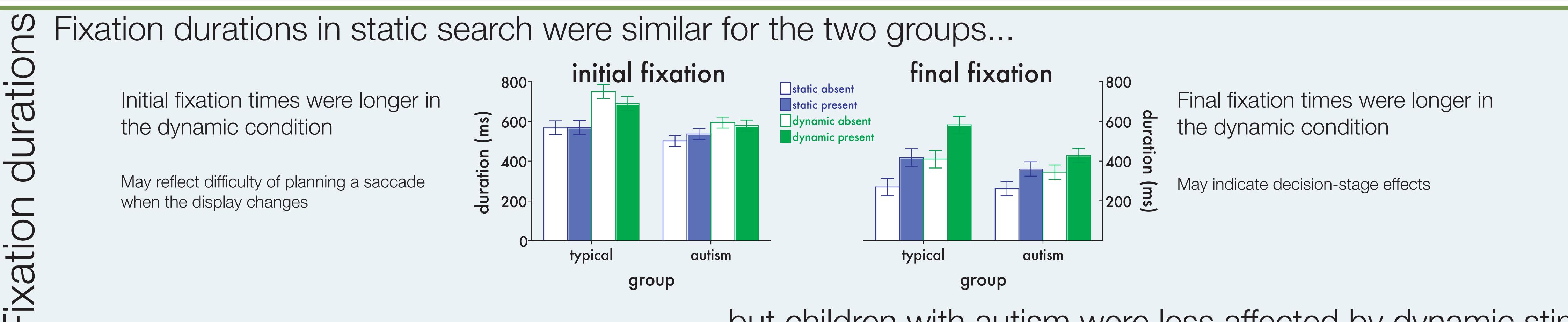


## No evidence for different strategies in dynamic search...

von Mühlenen, Müller & Müller (2003) argued that observers in the dynamic condition might use a strategy of attending to a quadrant of the display and waiting for the target to appear ("sit-and-wait"), rather than searching the whole display.

We classified each fixation according to which quadrant it fell into. For each trial, we ranked each quadrant according to how many fixations it attracted. We then averaged the number of fixations in the most popular quadrant across trials, then the second most popular, etc. This provided a measure of the distribution (or concentration) of fixations.



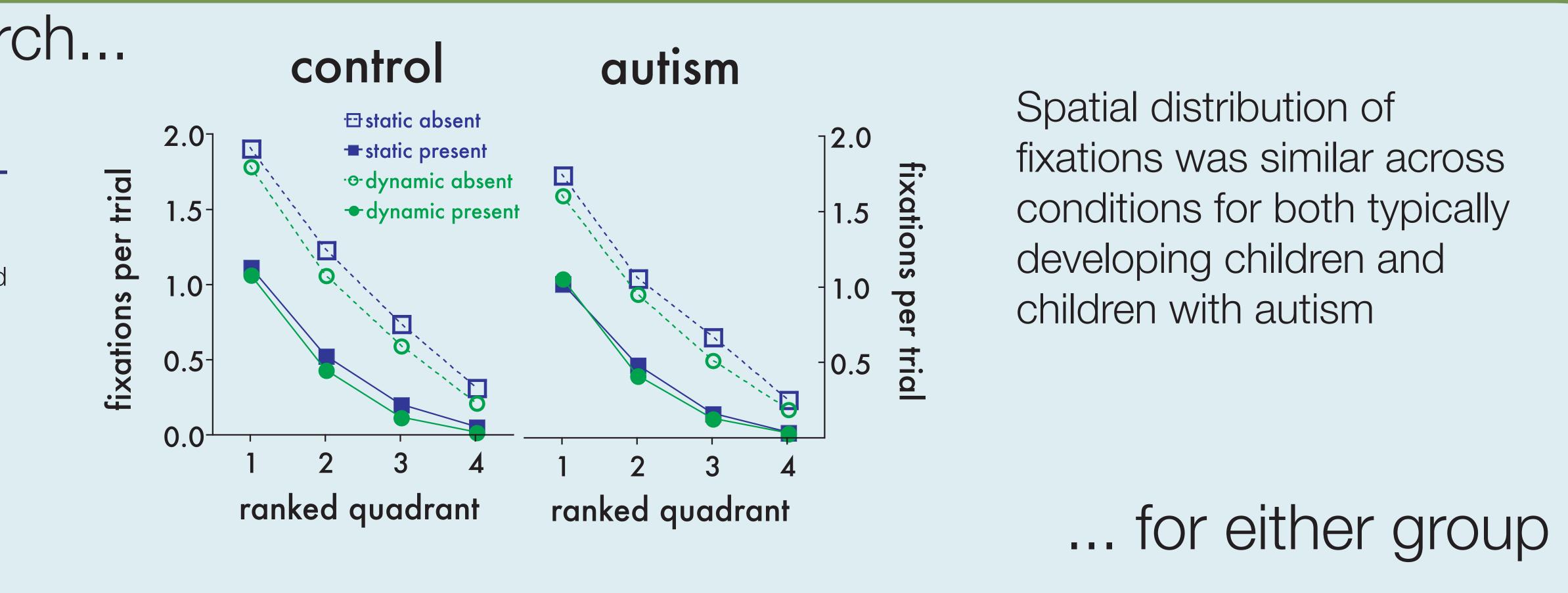




Both groups replicated Horowitz & Wolfe (1998)

Children with autism were faster, but (contrary to previous studies) not more efficient

... and there is no evidence for memory for rejected distractors in either group



... but children with autism were less affected by dynamic stimuli

children



SAN DIEGO STATE UNIVERSITY UCSD



### Boston University School of Medicine

### What have we learned about autism?

Children with autism responded faster, but did not search more efficiently, suggesting that they were able to identify the target more rapidly

Children with autism were less affected by the

dynamic manipulation than typically developing

stronger excitation/inhibition

In previous studies, children with autism also searched more efficiently. Those studies used conjunction searches. Autistic children may be better able to boost target features (or inhibit distractor features), but that would not have helped in our study

Autistic children show no eye movement deficits in search

This is surprising, since other studies have shown autism leads to deficits in voluntary eye movements

### What have we learned about search?

### No evidence of "sit-and-wait" strategies

Spatial distribution of fixations was remarkably constant across conditions and groups

### Visual search (still) has no memory

Or very little memory... in either children or adults

### References

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### Acknowledgements

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