

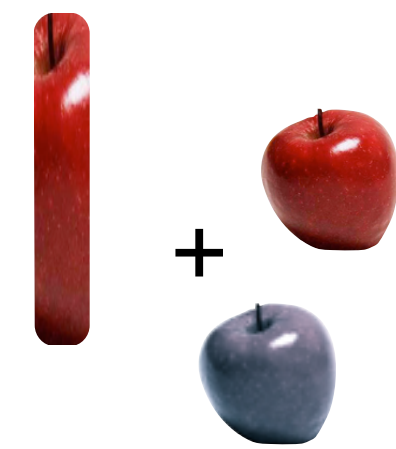
Resistance to distraction in visual search in 2-year-old toddlers with and without Autism Spectrum Disorder (ASD)

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Visual Search

A number of studies show that children with ASD are faster or more successful than typically developing (TD) controls (Plaisted et al., 1998; for a review, see Kaldy et al., 2013). We found this effect as early as 2.5 years of age (Kaldy et al., 2011).



Two competing explanations: Atypical Perception or Atypical Attention?

Enhanced perceptual discrimination:

Both low-level (discrimination) and mid-level (pattern detection) perceptual processes are enhanced in people with ASD (e.g. Mottron et al., 2006).

Greater attentional engagement:

ASD children persevere longer on a task displaying more task-focused attention than TD children. Our recent pupil analyses support this explanation (Blaser et al., 2014).

Predictions

We expect that the introduction of a novel 'oddball' item – a lure to throw participants off-task– will be more distracting to TD toddlers.

Participants

Tobii T120 eye tracker measured eye movements.



| | N | Mean Age (months) | Age Range (months) | IQ Mullen Composite |
|-------------------|-----------|-------------------|--------------------|---------------------|
| Study 0 TD | 16 (6 F) | 24 ± 3.7 | 18.2 - 29.7 | 103.5 |
| Study 1 TD | 20 (12 F) | 26.5 ± 3.7 | 18.6 - 33 | 106.2 |
| ASD | 22 (3 F) | 27.2 ± 5.4 | 16 - 34.8 | 63.4 |

* Study 0: 4 toddlers were excluded due to fussiness.
* Study 1: 2 TD and 1 ASD toddlers were excluded due to fussiness.

Task: Feature Conjunction v. Oddball Search

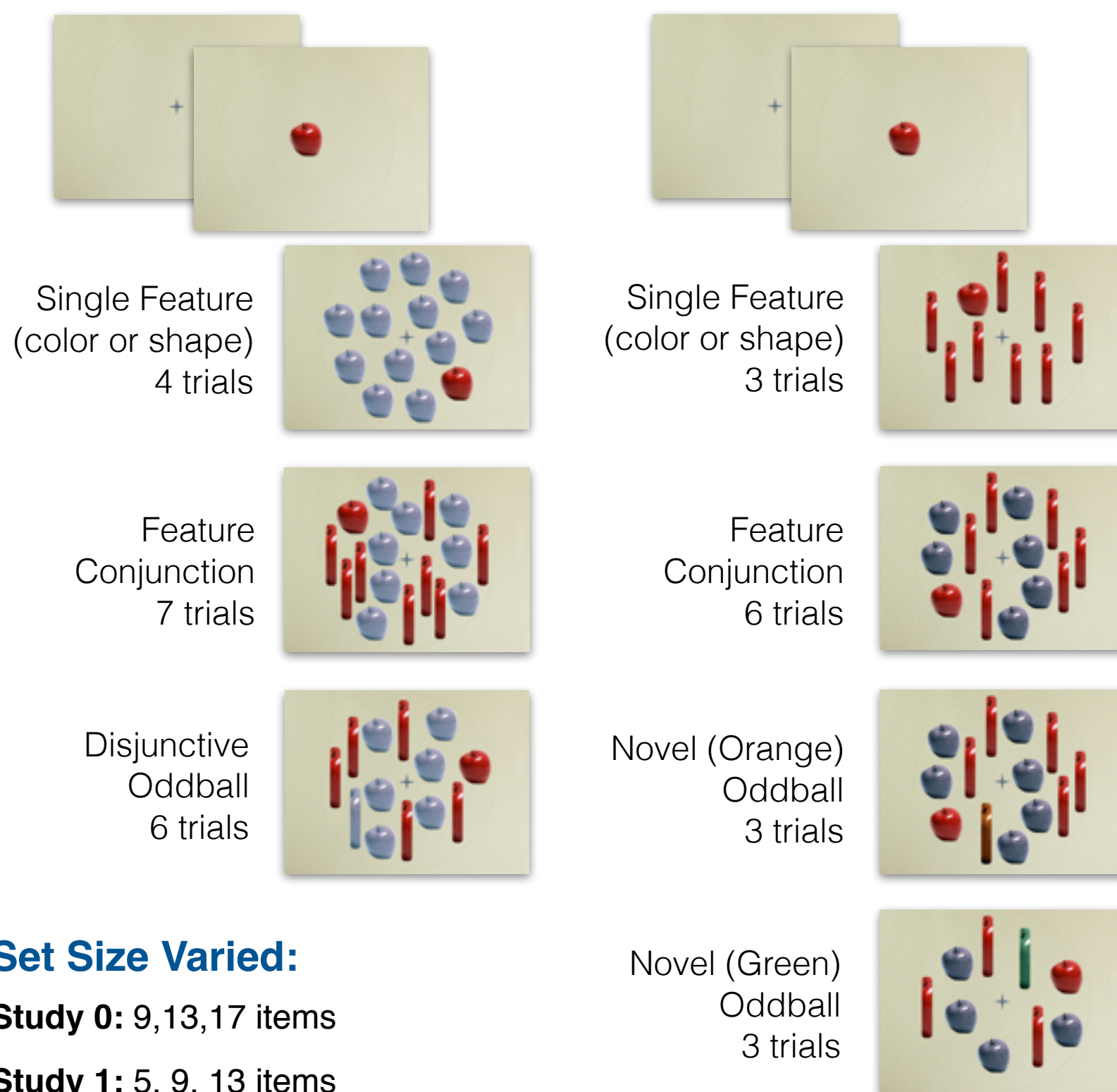
We developed a no-instruction version of the classic visual search paradigm specifically designed for toddlers with weak language skills.

Study 0

4 second search display, at the end: target spins (reward).

Dependent measure: success at finding the target (% of trials participant looked at the target within the 4 s presentation period).

Study 1



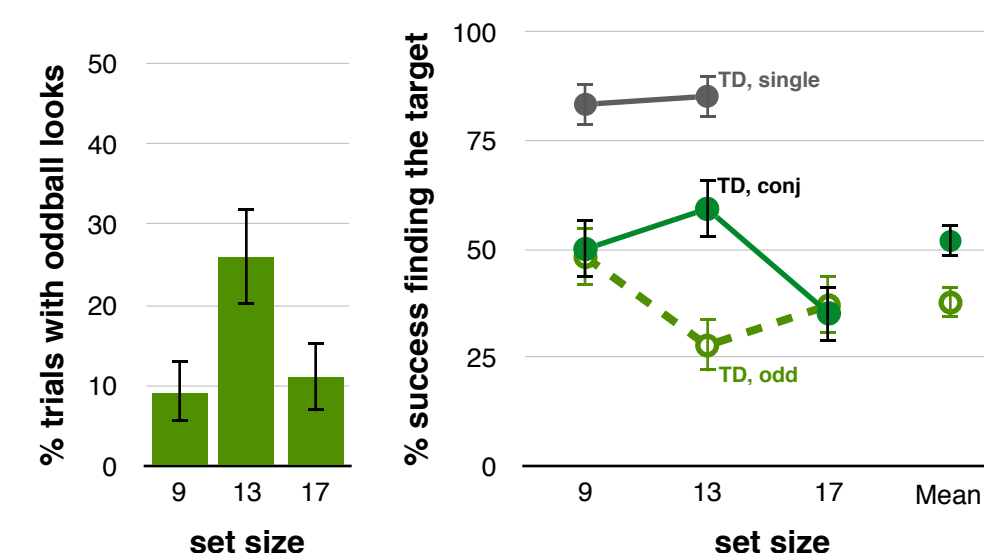
Set Size Varied:

Study 0: 9, 13, 17 items

Study 1: 5, 9, 13 items

Results: Study 0

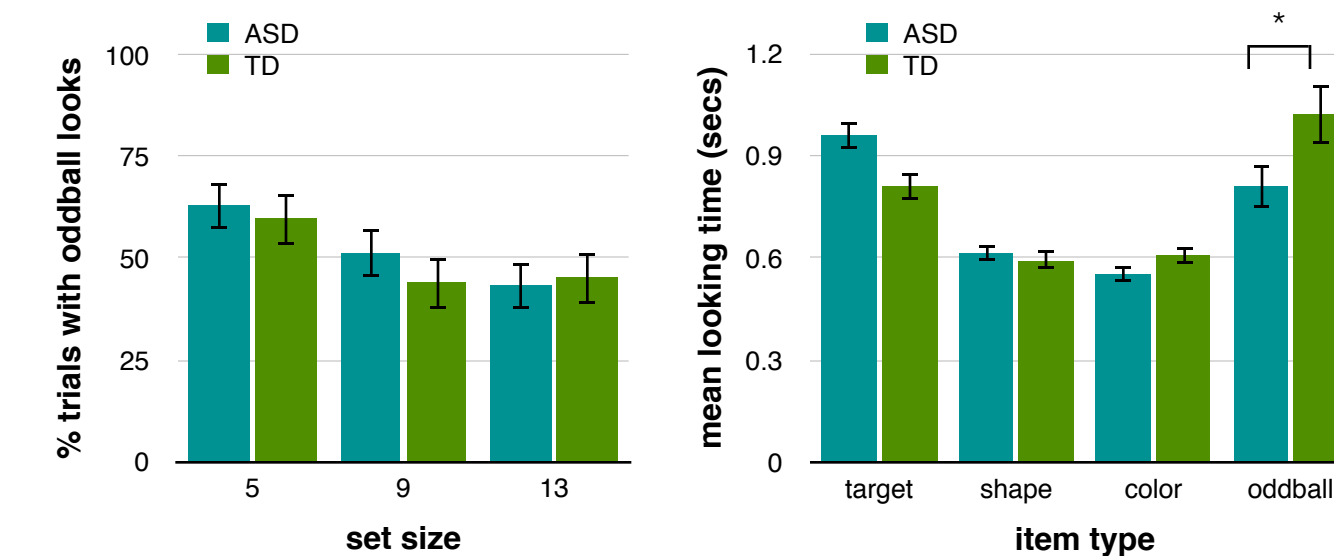
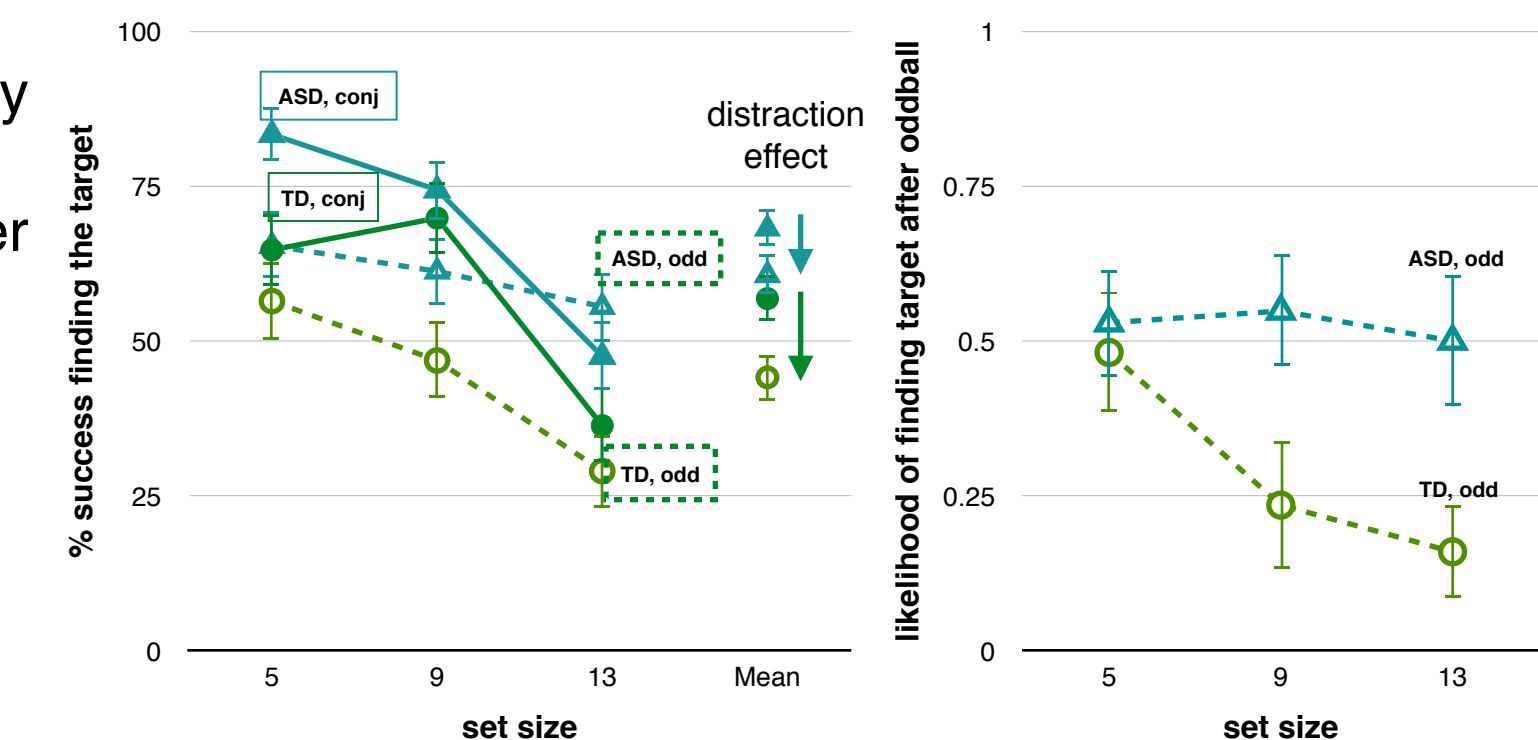
The disjunctive oddball was not salient enough to draw toddlers' eyes often (only in 15.4% of trials). This is possibly caused by the double inhibition of distractor features (Kim & Cave, 1995).



^ Error bars are ±1 SEM.

Results: Study 1, Resisting distraction

- Both groups' search performance was affected by the oddball, but the distraction effect was weaker in ASD (7.5% vs 12.7%).
- The likelihood of finding the target after looking at the oddball was significantly lower in TD toddlers (30.4% vs. 52.9%, $p = 0.004$)



* $p = 0.0438$. ^ Error bars are ±1 SEM.

- Both groups noticed the oddball, and spent more time looking at it than a regular distractor.
- Overall, the groups did not differ in gaze behavior (# of items visited, time-to-target, amount of time spent on screen).

Conclusions

- We replicated our main group effect found in Kaldy et al. (2011): ASD toddlers were more successful than TD toddlers at finding the target.
- We hypothesized that if toddlers with ASD look for the target with an increased attentional focus, they will be less distractible. We found that this was in fact the case: the search performance of ASD toddlers was less affected by the introduction of a distracting oddball item compared to our age-matched controls.
- Not surprisingly, the salience of the oddball is important: TD toddlers' search performance was more affected by a novel color oddball than a disjunctive oddball.

References

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