Can 2-Year-Old Toddlers Switch Targets During Visual Search?

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Distraction in Search

Voluntary attentional control is fundamental for effective visual exploration and learning (for review, see Rothbart & Posner, 2015).

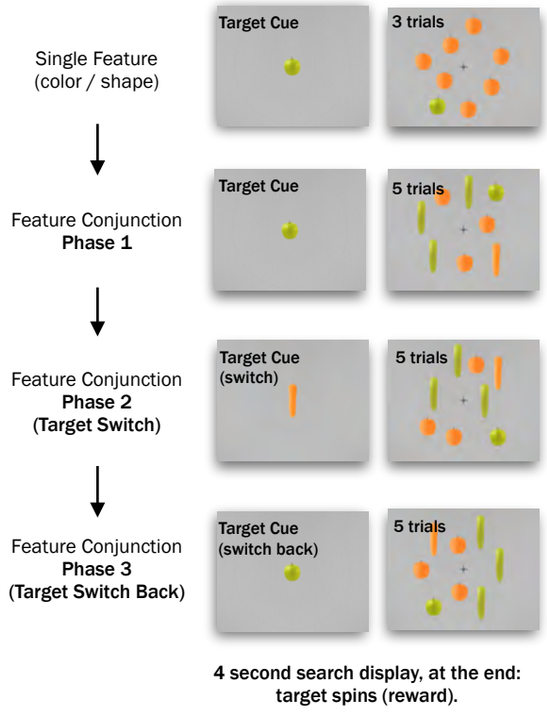
Top-down (or endogenous) control is driven by 'internal' factors, and enables voluntary attentional selection. Bottom-up (or exogenous) control is driven by 'external' factors, and results in involuntary attentional selection.

Previously, we found that 2-year-old toddlers were thrown 'off task' when a novel oddball item appeared during visual search (Smith et al., VSS 2014).

Here, we measured how young children deploy their attention to task goals in the face of competing, previously relevant (and rewarded) distractions (in children, see Chevalier et al., 2010; for review in adults, see Awh et al., 2012; Anderson, 2013).

A unique aspect of our paradigm is that it **does not require verbal instructions, making it ideal for populations with weak language skills, such as toddlers with ASD** (see Kaldy et al., 2011).

Methods



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

Participants

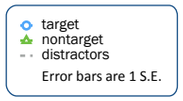
N	Age Months Mean (SD)	Age Months Range	Gender
27	25.8 (5.3)	18.6 - 35.1	8 M 19 F

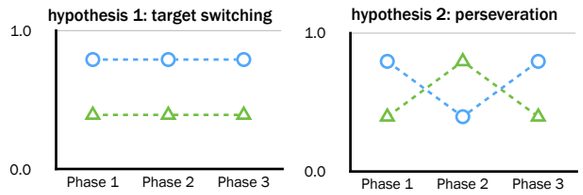
Across phases, the stimuli were identical (spatial layout varied). First target (apple/carrot) was counterbalanced.

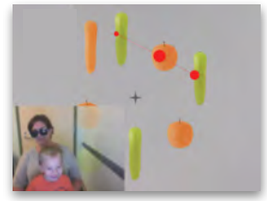
Trials started with the target flying in and jumping up-and-down in the center of the screen (highlighting).

Dependent measures: success rates (proportion of trials Ss looked at the target within the 4 s presentation period) and total looking time.

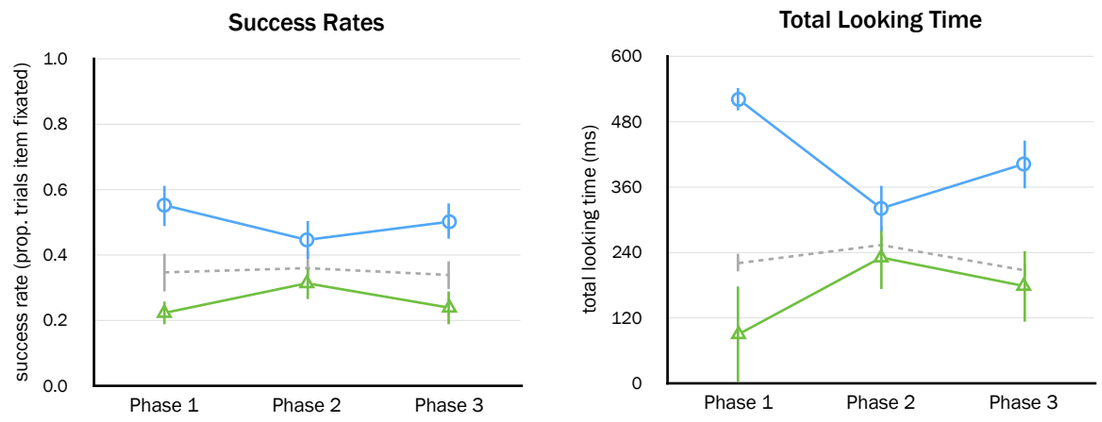
Results







Tobii T120 eye tracker measured eye movements.



Conclusions

Toddlers **found the target more often than the non-target in Phase 1** ($p < 0.001$) **and Phase 3** ($p < 0.05$), but not in Phase 2 ($p = 0.126$). Toddlers also **looked at the current target longer than the non-target in Phase 1** ($p < 0.001$) **and Phase 3** ($p < 0.05$), but not in Phase 2 ($p = 0.273$).

There was a significant increase in looks to the non-target between Phase 1 and Phase 2 ($p < 0.05$). Across Phases, success at finding the target did not differ significantly.

Time to first fixate either the target or non-target did not differ across Phases.

Toddlers seem **capable of guiding top-down attentional control in accordance with task goals.** While they find **a previously selected target distracting, success rates did not drop significantly. Our paradigm allows to quantify target switching ability in a non-verbal task.**

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