

Covert “gaze”-cueing to a novel agent in adulthood and childhood... but not in infancy

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Background

Infants distinguish between inanimate physical objects and mental agents – entities that possess mental states directed at the world – even when an agent is completely novel.

Given appropriate evidence that a novel entity is an agent, infants will follow the agent’s implied direction of gaze, turning their eyes or head to see what it appears to see (Johnson et al., 1998; Beier & Carey, 2013). This deliberate and overt social behavior is known as “*gaze-following*.”

When they see a real person looking toward the periphery of a display, infants also display rapid, *covert* shifts of attention in the same direction that another person looks.

This second orienting behavior is called “*gaze-cueing*.” It is an automatic, fast, and subtle behavior: the infant sees another’s shifting gaze and reflexively attends to the same location without moving her eyes or head (Hood et al., 1998).

At present, it is unknown whether adults, children, or infants show a gaze-cued response to a novel agent’s “gaze” in the absence of familiar morphological features (e.g., eyes) that could indicate the direction of its shifting attention.

Aims & Design

The current study seeks to assess whether a novel agent, identified via a contingent social/communicative interaction with a human adult actor, will recruit a covert “gaze”-cued orienting response in **adults, 4 – 6-year-old children, and 19-month-old infants**.

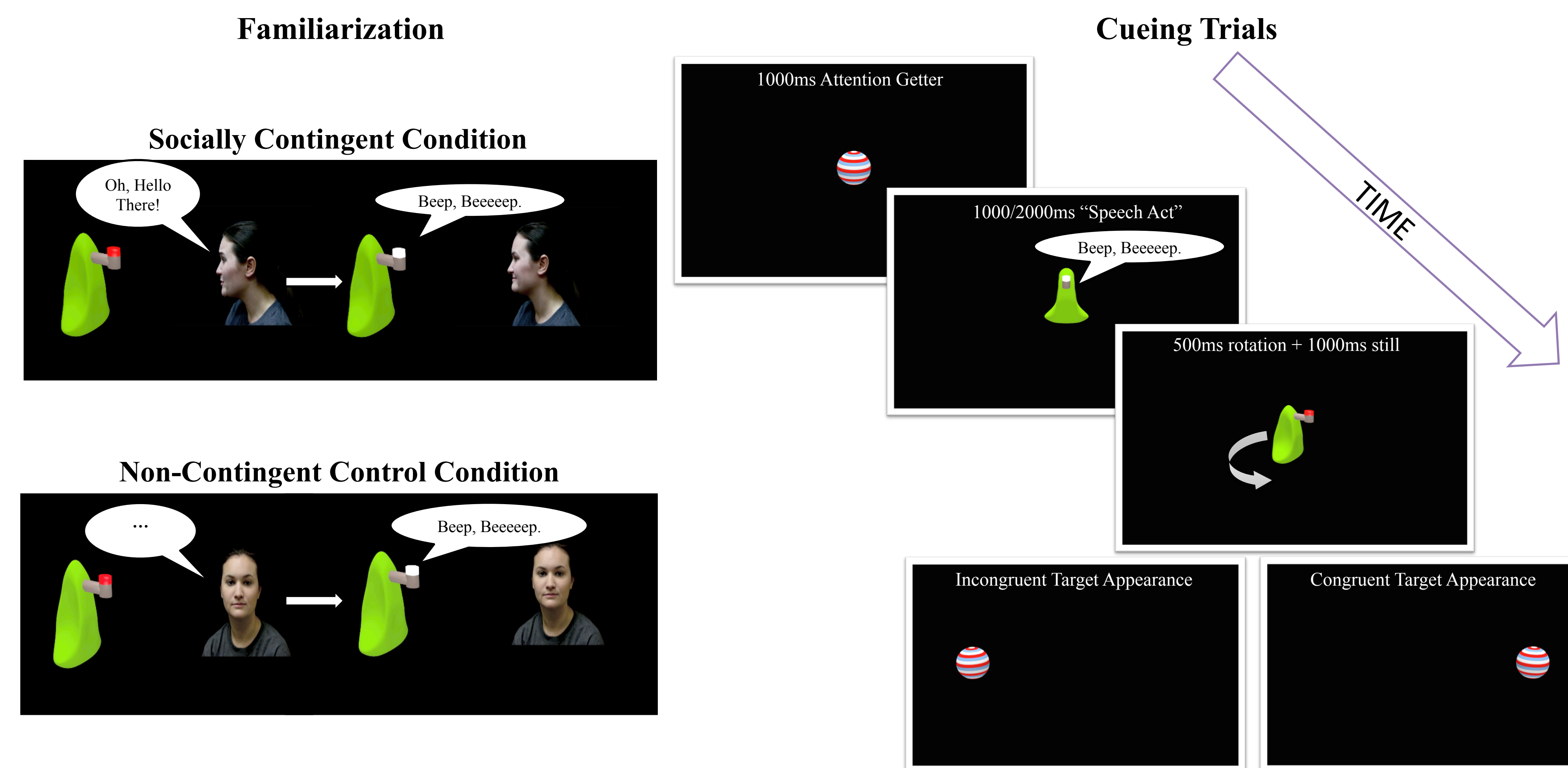
Familiarization:

- Socially Contingent or Non-Contingent Control movies (between-subjects)
- 60s introduction movie at start; 20s re-familiarization every 8 trials
- Control movies confirmed that any cueing response obtained in the primary condition could not be explained by low-level cues such as the movement in the entity’s rotation.

Gaze-cueing test trials:

- A Tobii TX-300 eye-tracker measured participants’ *saccadic reaction times* (SRTs) to fixate peripherally appearing target objects.
- On each test trial, target object appearance was either Congruent or Incongruent with the direction of the entity’s rotation.
- Shorter SRTs on Congruent trials indicate that the entity’s turn cued participants’ covert attention.

Methods



Trial Coding Check

To ensure that participants’ orienting responses were covert, research assistants coded videos of each trial with overlaid gaze plots. For included trials:

1. The participant’s gaze did not leave the centrally positioned entity until the target appeared.
2. The participant’s saccade from central entity to peripheral target was direct and uninterrupted.

Discussion

Because data collection is ongoing, no firm conclusions can be drawn from our current sample. However, the present data indicate that:

- Adults and 4 – 6-year-olds show “gaze”-cued responses in the direction of a novel, faceless agent’s turn.
- In contrast, 19-month-olds do not show the same attentional response.

Because participants did not show cueing responses to identical test trials in the Non-Contingent condition, responses obtained in the Socially Contingent condition were not due to the low-level motion of the entity’s turns.

Further, participants’ cued responses could not have relied upon representations of visual stimuli whose meaningful directionality had been learned through extensive prior experience (c.f., cueing to grasping hands: Daum & Gredebäck, 2011; arrows: Jakobsen et al., 2013).

Rather, by 4 to 6 years of age and continuing through adulthood, **the cognitive mechanisms that support reflexive, covert social orienting receive input from abstract, conceptual representations of an entity’s agency.**

Prior studies have demonstrated that 12-month-old infants will overtly *follow* the implied gaze of a novel agent (Johnson et al., 1998; Beier & Carey, 2013), so it is notable that 19-month-olds are apparently not covertly *cued* by a similar presentation.

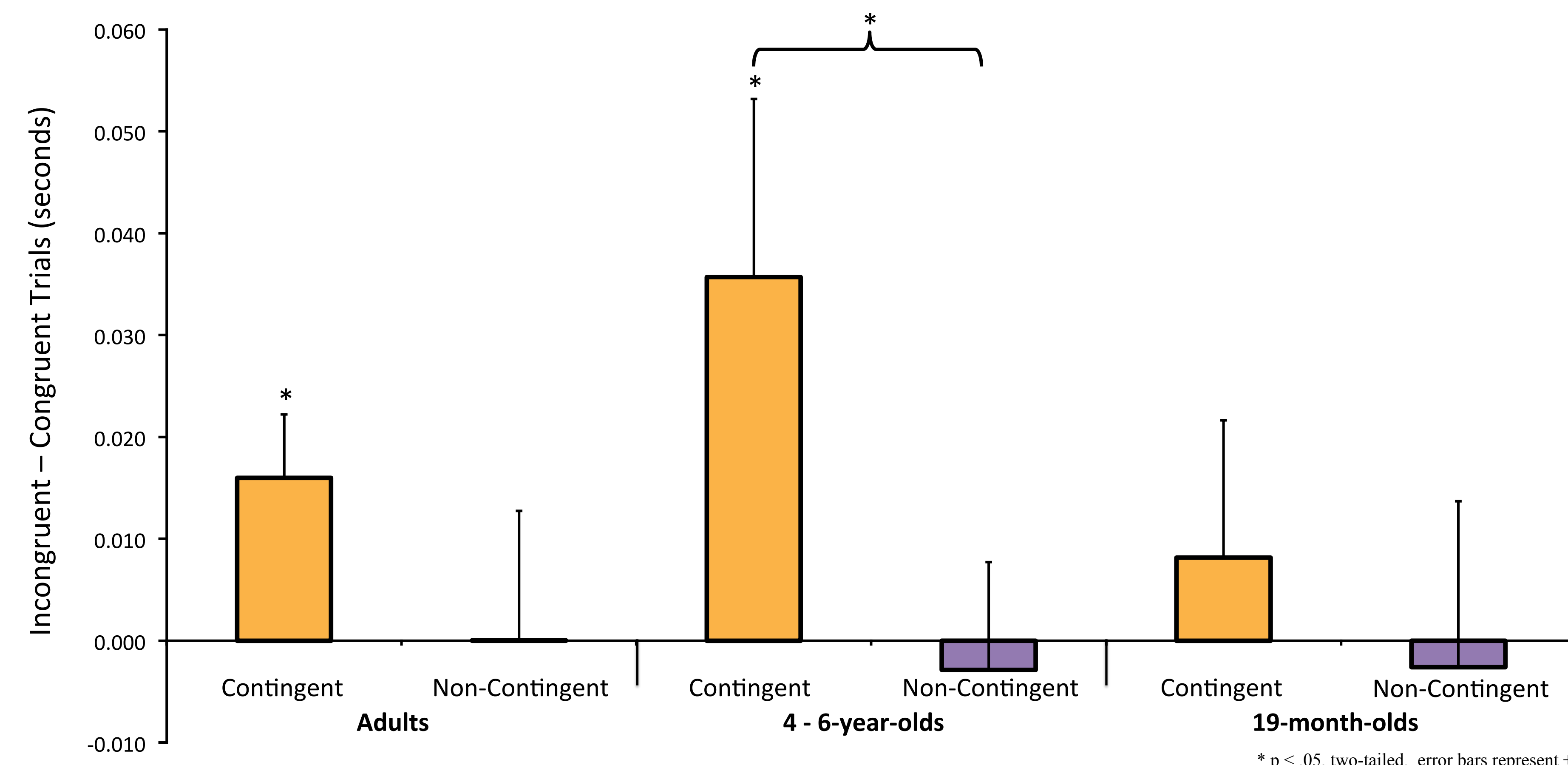
Further work should verify this dissociation by confirming that 19-month old infants do follow the agent’s “gaze” using the current presentations.

Preliminary Results

Age Group	Condition	Mean Ages	n (# female)	Congruent Mean SRT (SD)	Incongruent Mean SRT (SD)	t	df	p	Mean # Con Trials	Mean # Incon Trials
Adults	Congruent	21y; 13d	28 (21)	.289 (.047)	.305 (.051)	*2.55	27	< .05	22.82 (4.4)	22.50 (5.3)
	Non-Contingent	20y; 16d	31 (23)	.321 (.071)	.321 (.058)	0.07	30	0.94	22.19 (4.3)	21.71 (4.1)
Children	Congruent	5y; 17d	17 (5)	.420 (.123)	.456 (.153)	*2.72	16	< .05	12.82 (5.6)	12.24 (4.6)
	Non-Contingent	5y; 12d	18 (9)	.373 (.090)	.370 (.084)	0.28	17	0.79	12.56 (6.9)	13.22 (6.7)
Infants	Congruent	19m; 16d	14 (5)	.488 (.121)	.496 (.111)	0.62	13	0.55	9.71 (3.4)	10.21 (4.0)
	Non-Contingent	19m; 12d	13 (5)	.470 (.072)	.468 (.088)	0.15	12	0.89	9.83 (3.2)	10.50 (3.6)

*Total n will be 24 participants per condition for infants and children. For adults, sample sizes exceed 24, as participants were recruited in anticipation of possible drop-outs.

Difference Scores: Saccadic Reaction Times



References

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