A salient auditory stimulus improves visual contrast sensitivity but not detection speed in 3- and 6-month olds

Hiu Mei Chow[1], Vivian M. Ciaramitaro[1] & Karen Dobkins[2]

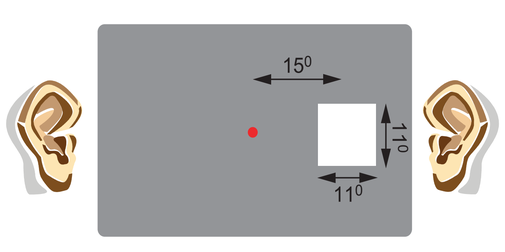
1 University of Massachusetts Boston, MA 2 University of California San Diego, CA

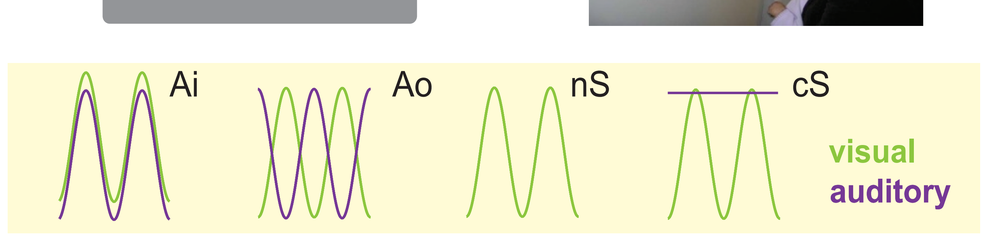
Background

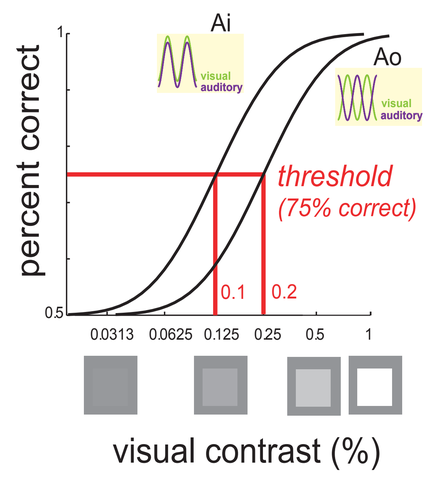
Previous research has found that both spatial and non-spatial auditory stimulus can influence visual detectability in adults (e.g. Arieh & Marks, 2008; McDonald et al., 2000; Nickerson, 1973; Odgaard, et al., 2003; Stein et al., 1997; Störmer et al., 2009).

Here we examine whether similar influences occur early in development: does a task-irrelevant (non-spatial) auditory stimulus improve visual contrast detection threshold and detection speed in 3- and 6-month old infants?

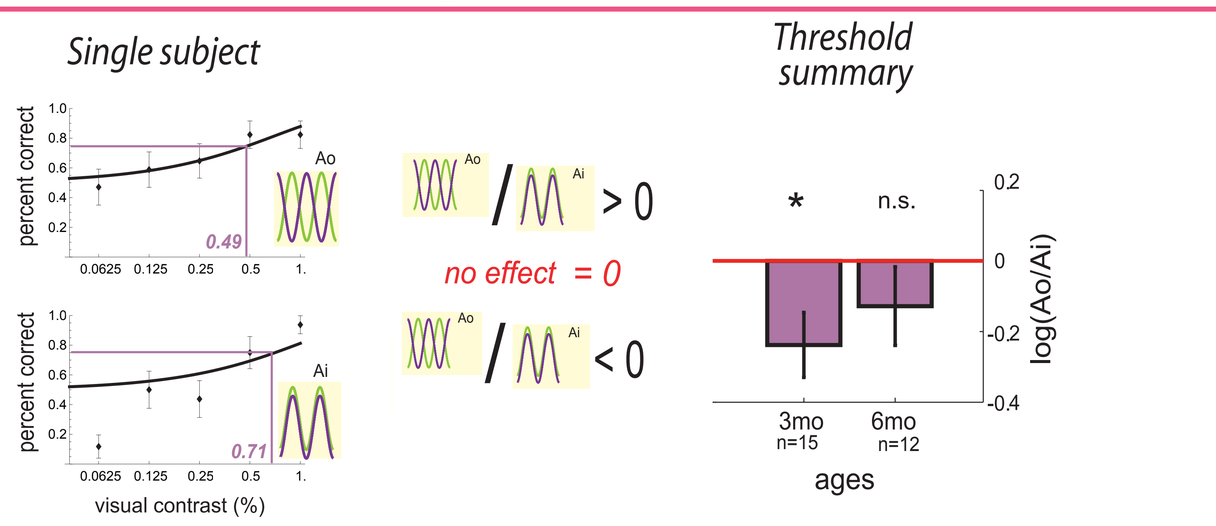
Method



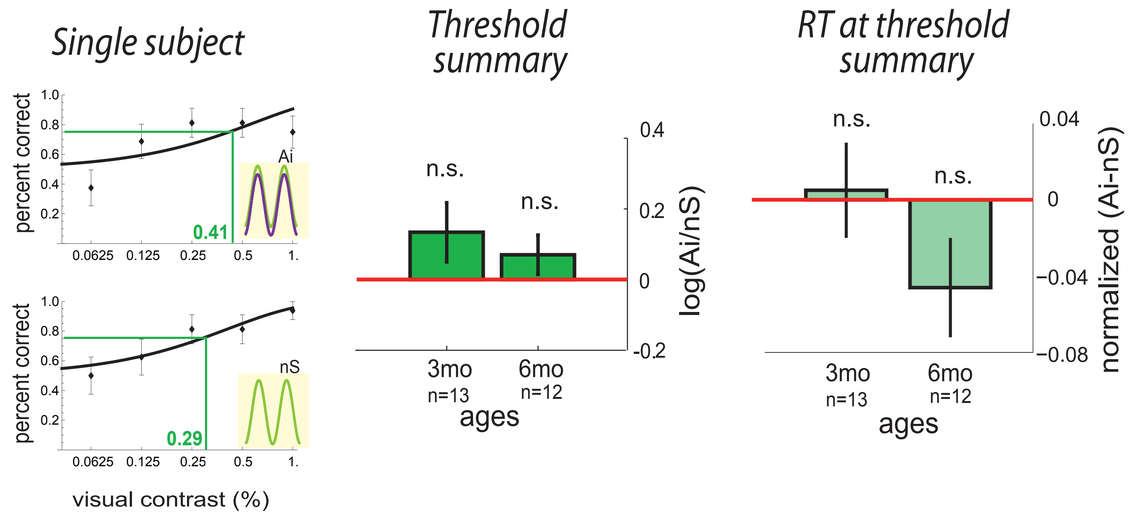


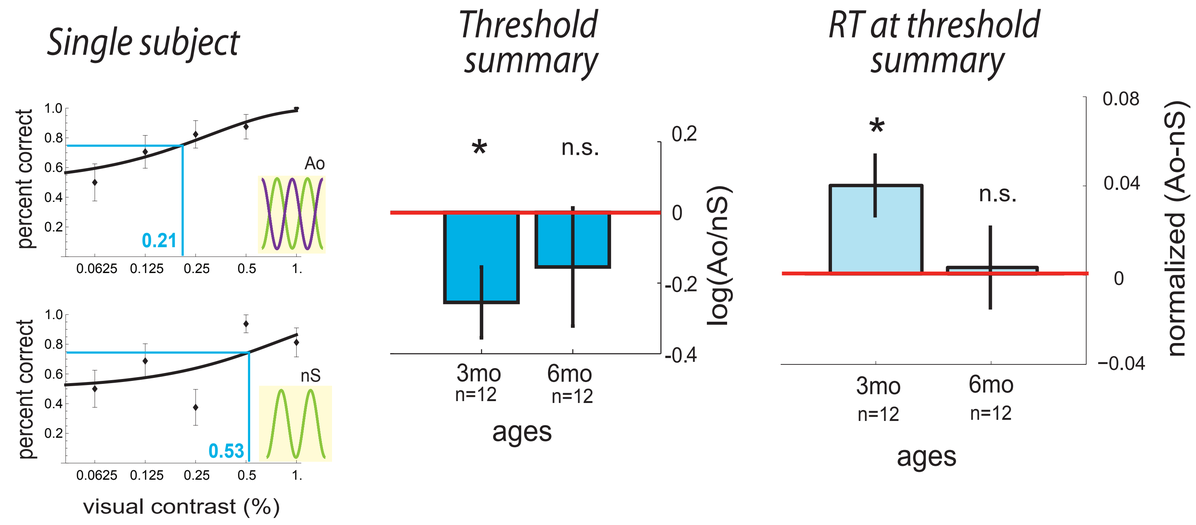


Can a sound improve visual contrast detection? *Yes, when out-of-phase!*

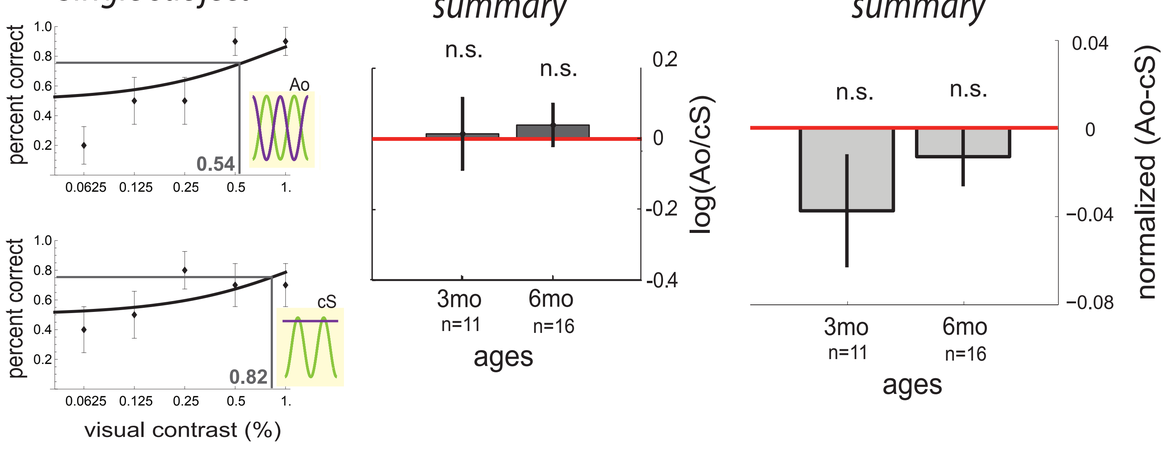


Does *in-phase* sound impair or *out-of-phase* sound facilitate? *Out-of-phase facilitates!*





Is this an auditory alerting effect? *Yes!*



Outstanding questions

1. What makes our sound alerting to infants? Is it the abrupt onset or it being difficult to integrate with the visual stimulus?

2. Speed-accuracy trade-off in infants? We are using eye tracking to get more accurate detection time measures.

3. Is the influence of visual stimuli on auditory contrast detection similar to the current findings? Our pilot results say yes!

CONCLUSION: Crossmodal alerting can be seen as early as 3 months.

References:

Sample studies on non-spatial auditory cue: (1) Arieh & Marks (2008). Cross-modal interaction between vision and hearing: A speed-accuracy analysis. Per. Psych. 70(3), 412-421. (2) Nickerson (1973). Intersensory facilitation of reaction time: Energy summation or preparation enhancement? Psychological Review, 80, 489-509. (3) Odgaard, Arieh & Marks (2003). Cross-modal enhancement of perceived brightness: sensory interaction versus response bias. Per. Psych. 65(1), 123-132. (4) Stein London, Wilkinson & Price (1996). Enhancement of perceived visual intensitiy of auditory stimuli: a psychophysical analysis. J. Cog. Neuro. 8(6), 497-506.

Sample studies on spatial auditory cue: (5) McDonald, Teder-Salejarvi & Hillyard (2000). Involuntary orienting to sound improves visual perception. Nature, 906-908. (6) Störmer, McDonald & Hillyard (2009). Cross-modal cueing of attention alters appearance and early cortical processing of visual stimuli. PNAS, 106(52), 22456-22461.