

Steady Visual Search Performance in 16-month-olds across Synchronous and Asynchronous Acoustic Stimulation



Uppsala **B**arn-
& **B**aby **L**ab

Hsing-Fen Tu^{1,2*} & Gustaf Gredebäck¹

¹Department of Psychology, Uppsala University, Uppsala, Sweden

²Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

*hsingfen.tu@psyk.uu.se; hsingfen@cbs.mpg.de



1. Visual Search and Multisensory Input

- ❖ **Visual search skills** require infants to look for targets among distractors and play a fundamental role in daily life and early cognitive learning.
- ❖ Infants capture temporal synchrony between **acoustic and/or visual stimulations** to explore their world from the beginning of their life.
- ❖ The **Intersensory Redundancy Framework** suggests that infants gain benefits by using amodal properties in a cross-modal sensory event to guide learning.
- ❖ In adults, rhythmic auditory stimulations, even non-meaningful ones, are seen to facilitate visual search performance (**pip – and - pop effect**).

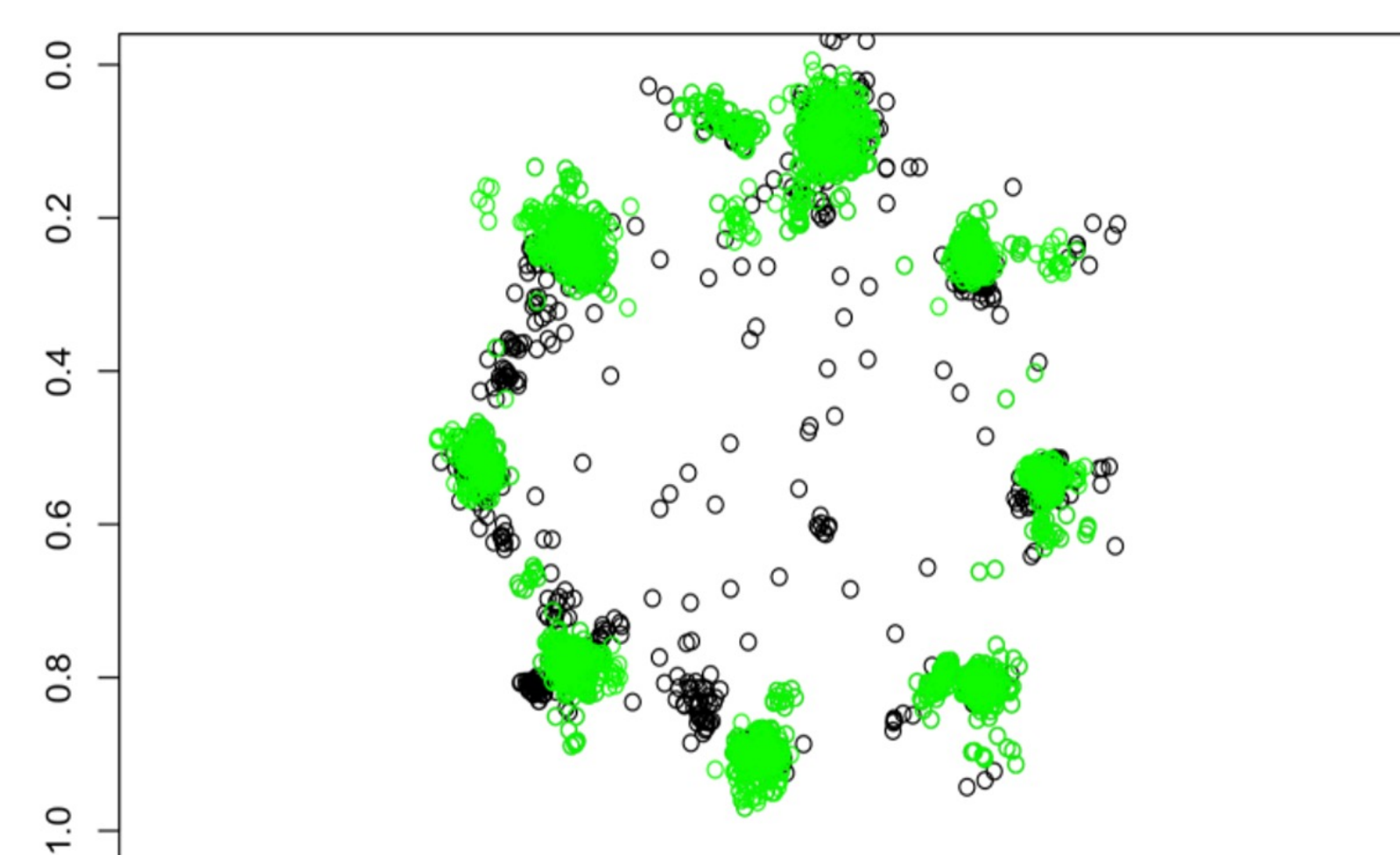
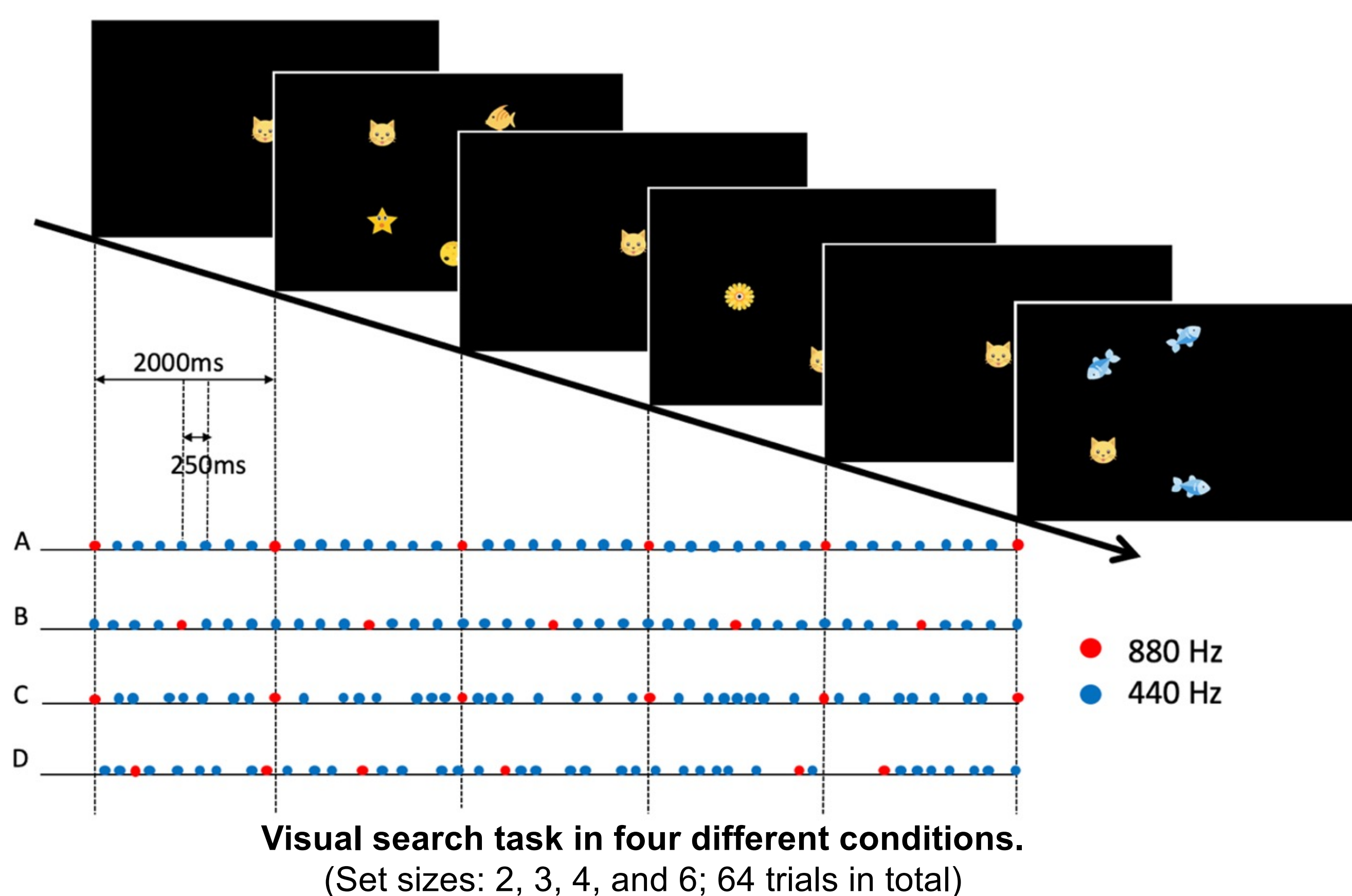
Question 1:

Does a periodic beat sequence synchronizing with visual stimuli increase visual process efficiency (↓ Reaction Time)?

Question 2:

Does a periodic beat sequence synchronizing with visual stimuli increase search accuracy?

2. Visual Search Paradigm



Robustness test.

(Matlab, Psychtoolbox, Tobii SDK, and Tobii Pro EyeTrackerManager)

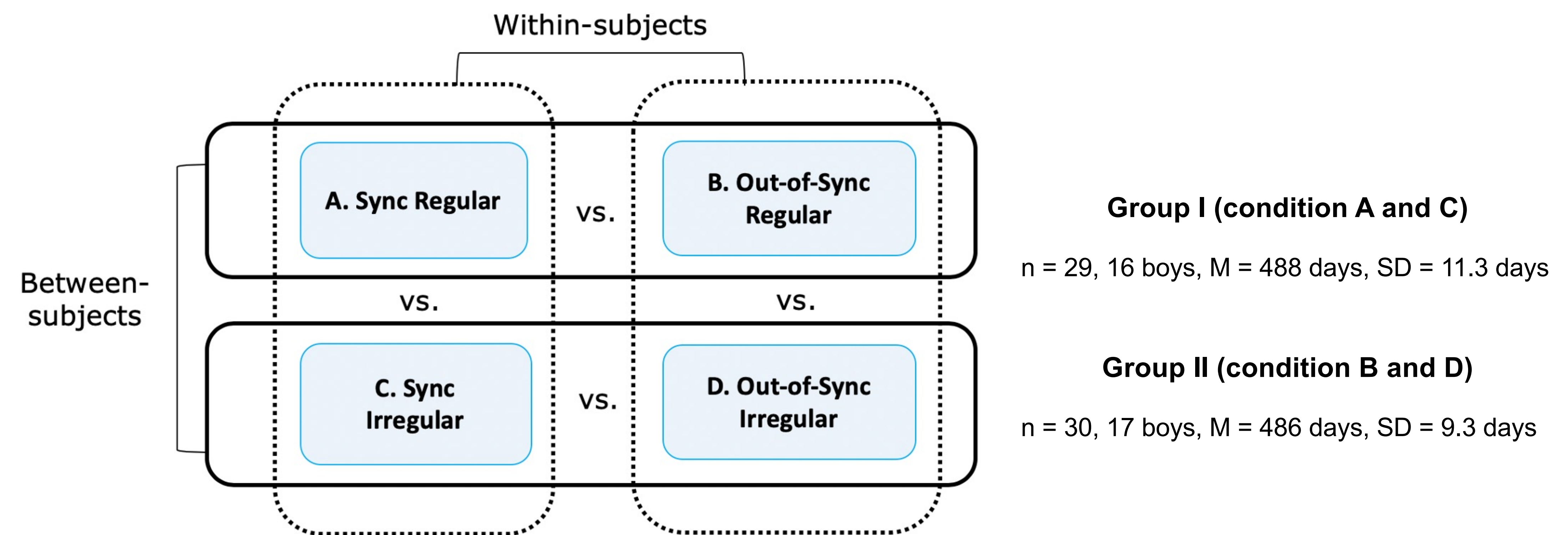
7. Fine print

References:

Bährick, L. E., & Lickliter, R. (2012). The role of intersensory redundancy in early perceptual, cognitive, and social development. *Multisensory Development*, 183-206.
Boiger, D., Cusul, J., & Schön, D. (2014). Metrical rhythm implicitly orients attention in time as indexed by improved target detection and left inferior parietal activation. *Journal of Cognitive Neuroscience*, 26(3), 593-605.
Ngo, M. K., & Spence, C. (2010). Auditory, tactile, and multisensory cues facilitate search for dynamic visual stimuli. *Attention, Perception, & Psychophysics*, 72(6), 1654-1665.
Van der Burg, E., Olivers, C. N. L., Bronkhorst, A. W., & Theeuwes, J. (2008). Pip and pop: Nonspatial auditory signals improve spatial visual search. *Journal of Experimental Psychology: Human Perception and Performance*, 34(5), 1053-1065. doi:10.1037/0096-1523.34.5.1053

Funding: Art Mentor Foundation Lucerne, 2018

3. Participants and a Mixed Study Design

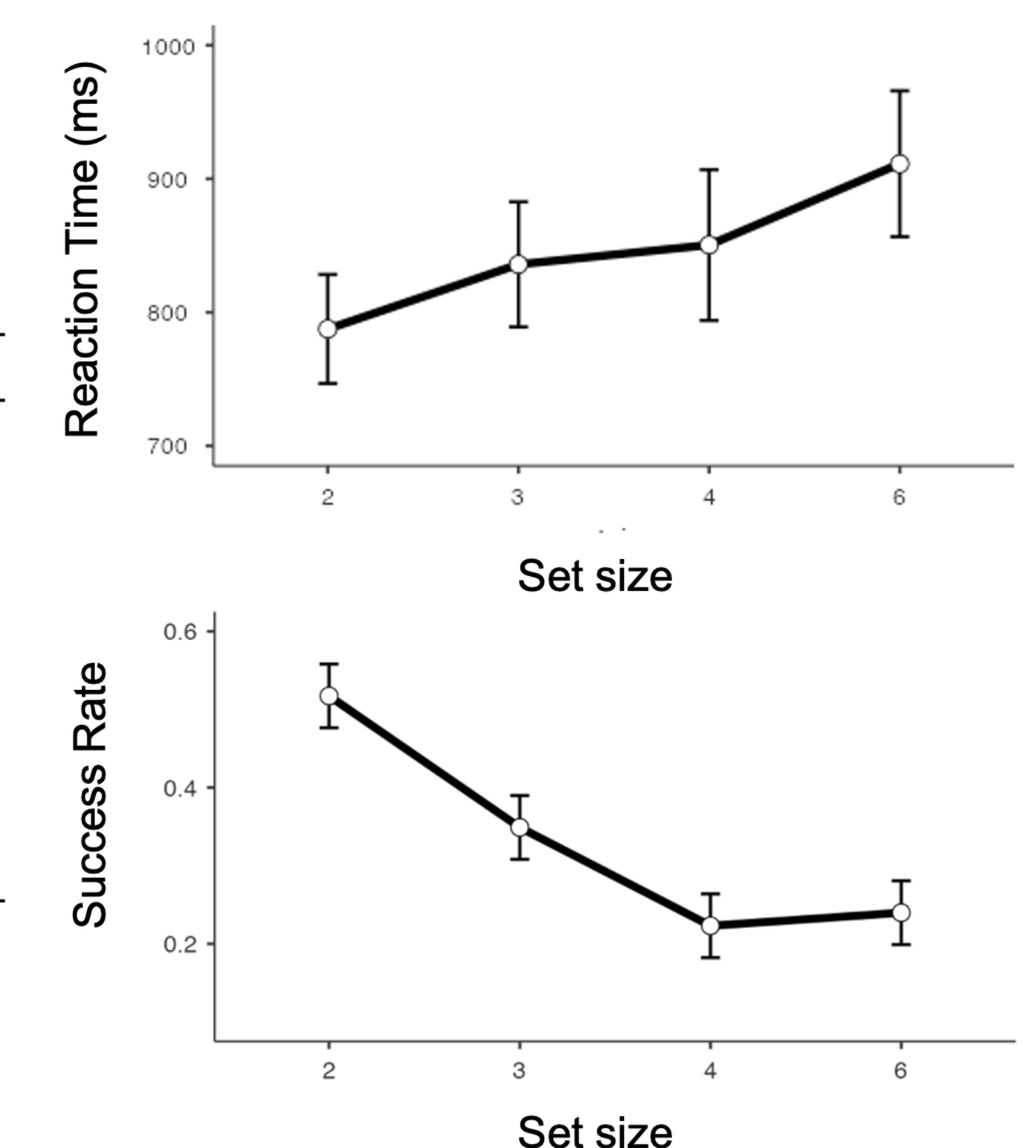


- Illustration of the 2X2 experimental design for investigating the effect of regularity and synchrony of visual processing in children at age of 16 months.
- One control group which receives silent condition is not illustrated in this figure.
- All conditions here are counterbalanced.

4. Results

Mixed-effects models: significant main effects for set size ($F = 5.76$, $p < .001$)

	F	Num df	Den df	p
Reaction Times				
Set size	5.760	3	1733.0	<.001
Synchronous vs. Asynchronous	0.003	1	69.6	0.960
Regular vs. Irregular	0.731	1	1745.8	0.393
Success Rate				
Set size	124.997	3	5213.5	<.001
Synchronous vs. Asynchronous	1.689	1	55.5	0.199
Regular vs. Irregular	0.008	1	5272.7	0.928



5. Conclusion

- ❖ Similar to previous literature, infants' visual search skills were adult-like. Reaction time increases and accuracy decreases when the set size increased.
- ❖ Our results did not support the assumption that periodic or synchronous auditory stimulations modulate visual search performance in 16-month-olds.

6. Discussion

- ❖ Visual search skills of the 16-month-olds might not be fully matured, and in turn, limited the effect of modulation.
- ❖ The auditory entraining beat sequence with the frequency of 4 Hz might be effective for adults based on previous literature but not for infants at the age of 16 months.
- ❖ Limited sample size and dependency of the sample might contribute to the null findings.
- ❖ Repeated visual stimuli might have limited effect to motivate infant's participation.