



BACKGROUND

Biological Motion (BM)

- Perceptual sensitivity to BM is evident in infants as young as 2 days old, suggesting the presence of an innate neurological perceptual mechanism for processing biological motion (Simion et al., 2008).
- Typically-developing 8-month-old infants demonstrate greater right hemisphere activation compared to left hemisphere activation during perception of BM, similar to that of adults, suggesting that the processing of BM begins by eight months of age (Harai & Hiraki, 2005).
- The perception of BM may be atypical in children with autism (Klin et al., 2009).

Audio-visual Synchrony (AVS)

- Detection of temporal contingency between auditory and visual events is another foundational skill for interpreting socially-relevant information.
- Electrophysiological studies in typically-developing adults and children reveal neural facilitation to multisensory events, marked by a significantly more negative response to multisensory stimuli relative to the sum response of two unimodal stimuli (Hyde et al., 2010; Brandwein et al., 2011).

Current Study

- Two experiments assessed electrophysiological brain responses to BM, scrambled motion (SM), and AVS in infants at elevated risk for ASD in the first year of life.
- We evaluated the hypotheses that that, relative to normal risk (NR) infants, high risk (HR) infants would display:
 - Atypical social perception, i.e., decreased differentiation between BM and SM
 - Atypical sensory perception, i.e., weakened neural facilitation to AVS

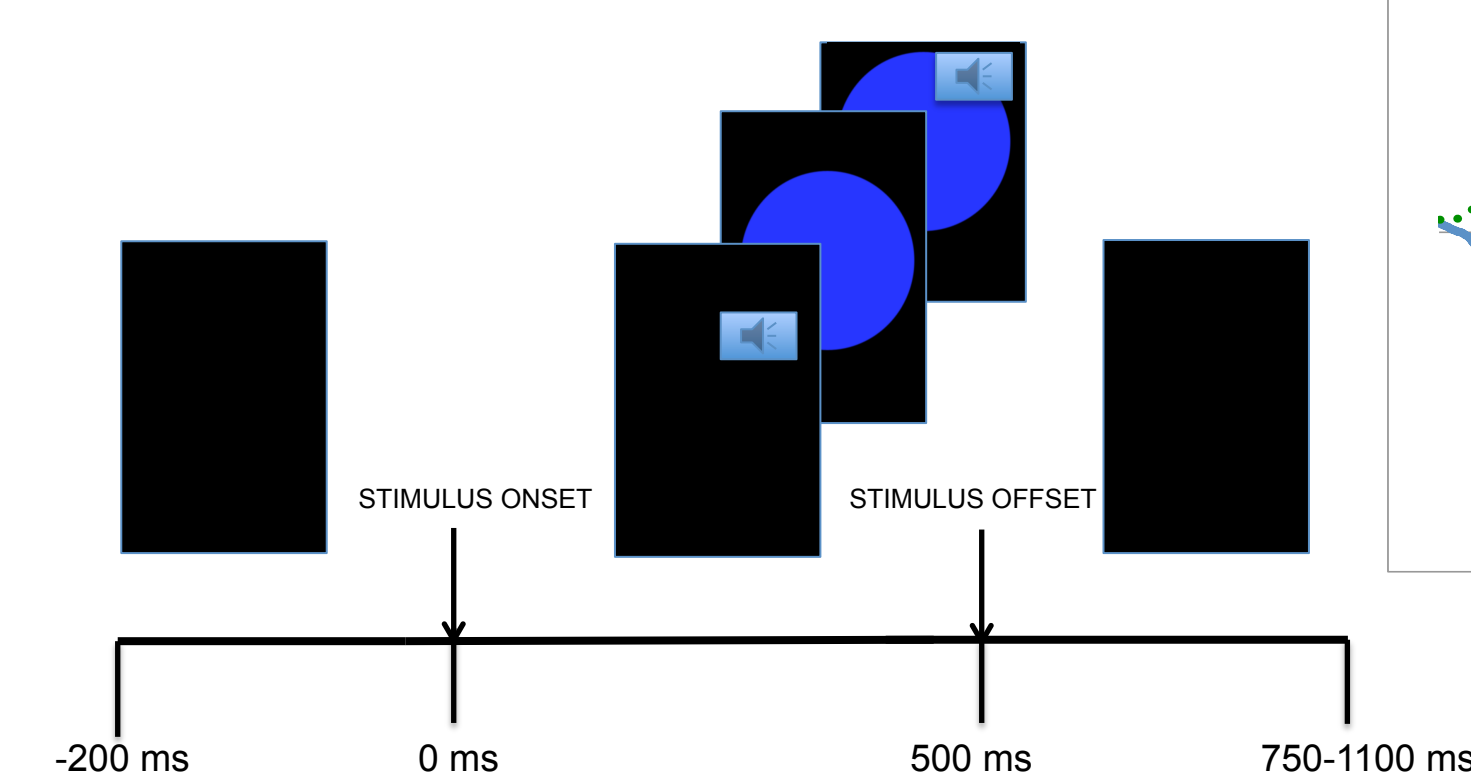
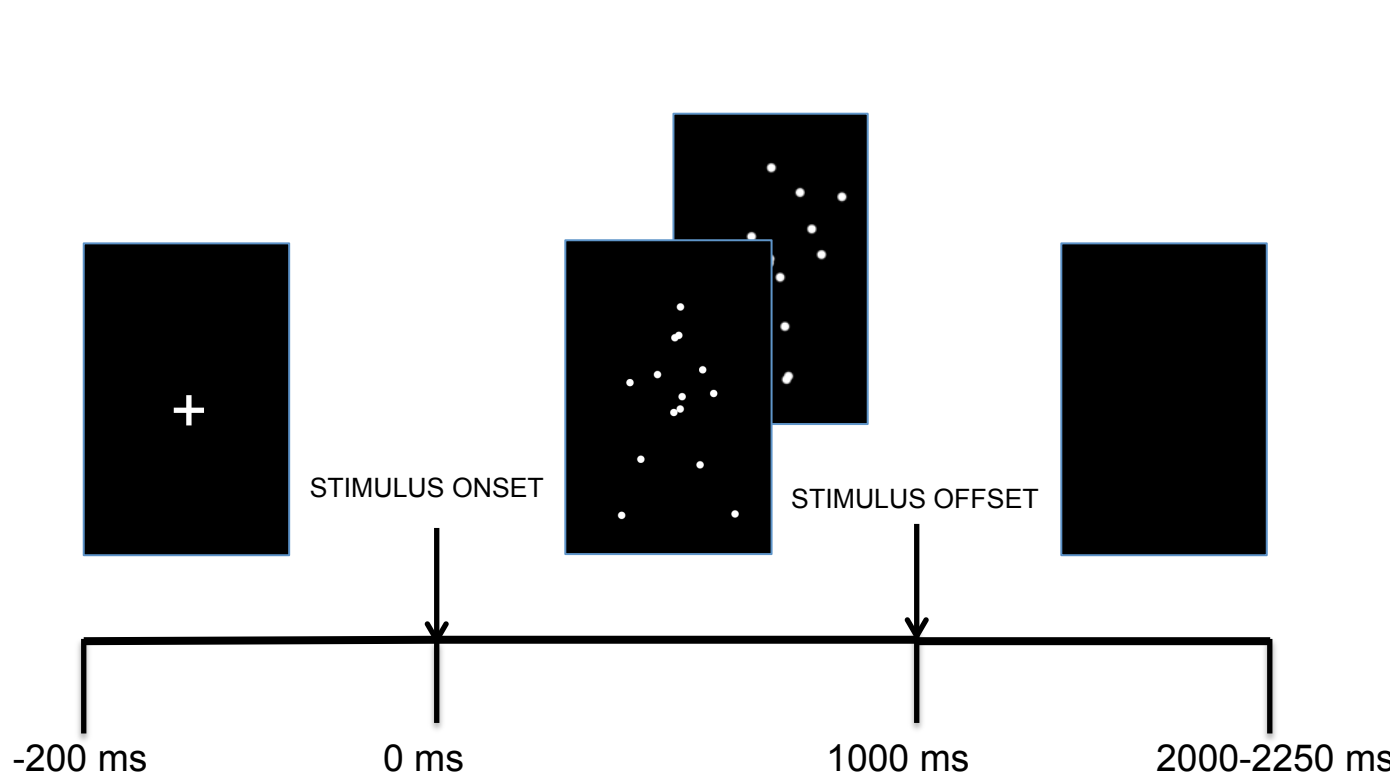
PARTICIPANTS & METHODS

Biological Motion Paradigm

	Normal Risk Infants (N)	High Risk Infants (N)
6 months	13	7
9 months	11	5

Audio-visual Synchrony Paradigm

	Normal Risk Infant (N)	High Risk Infants (N)
9 months	5	3
12 months	3	3



100 trials total:

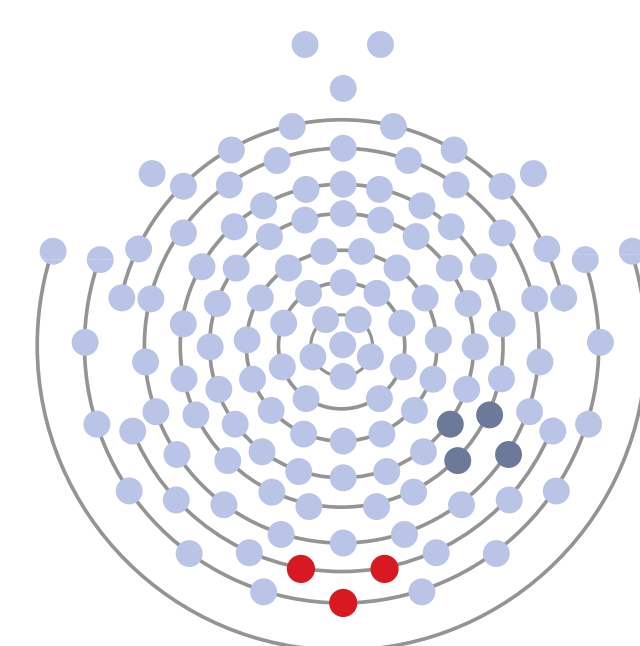
- 25 point-light display walkers moving right
- 25 walkers moving left
- 25 scrambled patterns moving right
- 25 scrambled patterns moving left

90 trials total:

- 30 audio only
- 30 visual only
- 30 audiovisual

- EEG recorded continuously at 500 Hz using 128-channel Hydrocel Geodesic Sensor Nets.
- ERPs segmented to stimulus onset, hand-edited for artifact, and averaged referenced.
- Peak amplitude for the N200 was extracted in the Biological Motion Paradigm and the Audio-visual Synchrony paradigm.
- Minimum amplitude was analyzed using Repeated Measures ANOVA (between-subjects: risk (HR/NR); within-subjects: condition (BM/SM)).

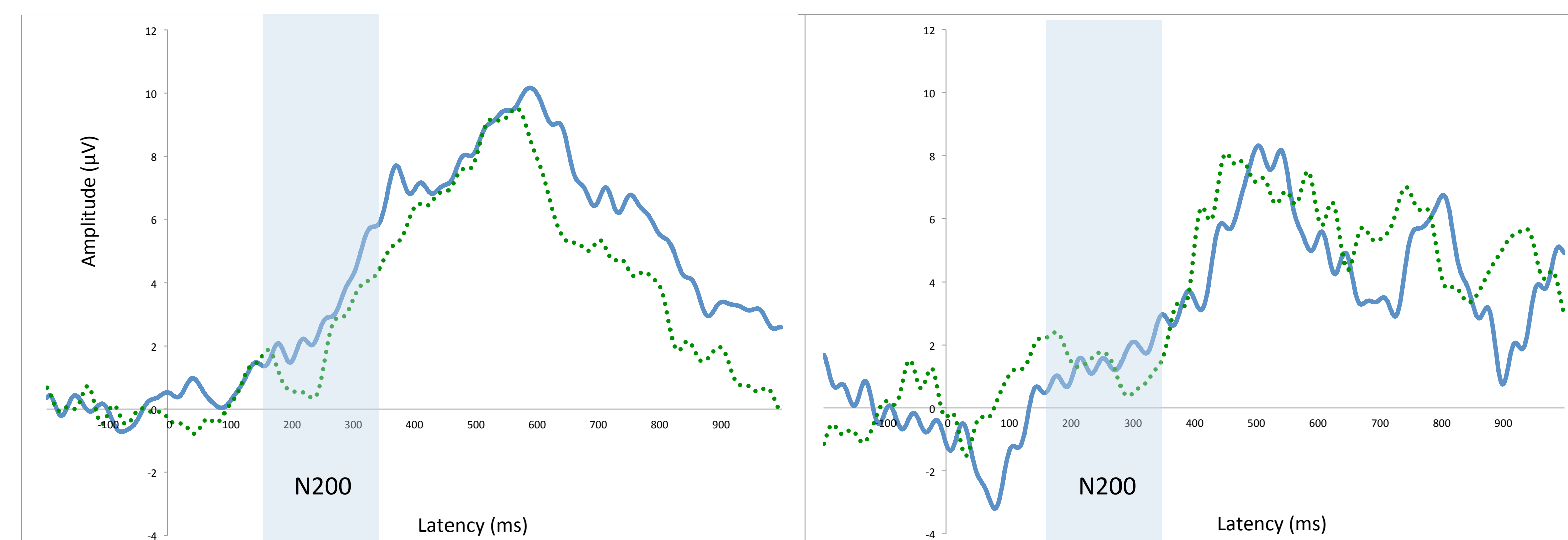
Figure 1: BM and AVS N200. Data were averaged across 4 electrodes for the BM N200 recording site (91, 92, 96, 97) and 3 electrodes for the AVS N200 recording site (74, 81, 82).



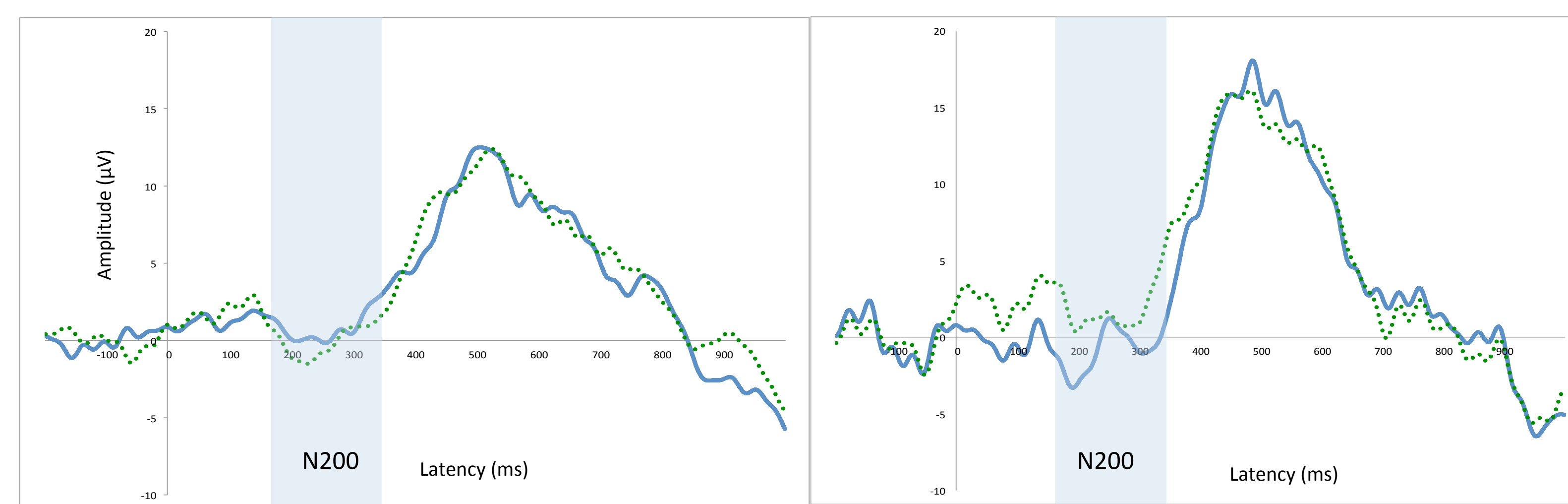
Normal Risk Infants (NR)

High Risk Infants (HR)

6 months



— Biological Motion
- - - Scrambled Motion



9 months

Figure 2: Grand averaged waveforms for BM and SM for HR and NR infants at 6 month and 9 month time points.

PRELIMINARY RESULTS

Biological Motion:

- At 6 months of age, both HR and NR infants exhibited a more positive amplitude to BM relative to SM. Neither HR nor NR infants exhibited significant differentiation between the two conditions ($p > .05$).
- At 9 months of age, NR but not HR infants continued to demonstrate a more positive amplitude to BM. Neither HR nor NR infants demonstrated significant differentiation between the two conditions ($p > .05$).

NR

HR

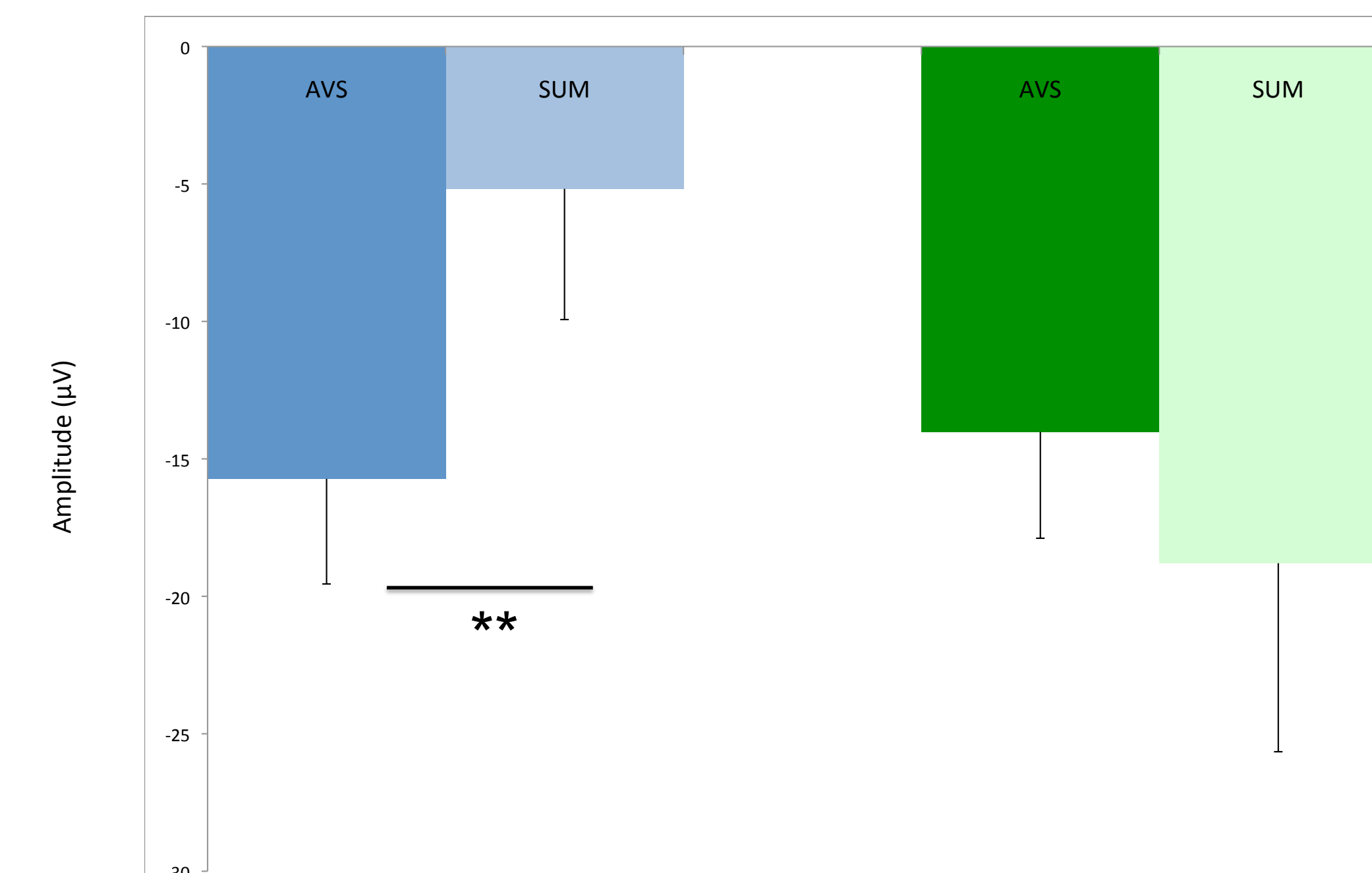


Figure 3: Amplitude of grand averaged waveforms elicited by audio-visual stimuli and summed response to audio only and visual only stimuli in 9 to 12 month infants.

Audio-visual Synchrony:

- NR infants exhibited a significantly more negative AVS amplitude compared to the summed auditory and visual amplitude ($t(7) = -3.295, p = .01$).
- HR infants did not demonstrate a significant difference between AVS amplitude and summed auditory and visual amplitude ($p > .05$).

CONCLUSIONS

- HR infants between 6 and 9 months display comparable neural response to BM.
 - Atypicalities in social perception may emerge after the first year of life.
 - HR infants may have normative response to BM, with social dysfunction emerging during processing of more complex biological stimuli.
- HR infants between 9 and 12 months display atypical multisensory integration.
 - Deficits in social perception may occur secondary to more basic perceptual anomalies.

FUTURE DIRECTIONS

- Ongoing data collection will follow infants through diagnostic outcomes at 36 months.
 - Compare results in infants who develop ASD versus high-risk infants who develop typically.
- Future work will investigate the developmental unfolding of social and sensory perception and the influence of early developmental abnormalities on subsequent development.

REFERENCES

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