Intermodal Perception of Self: Infants’ Sensitivity to Temporal and Spatial Contingencies
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Introduction
Infant perception of the contingencies between proprioceptive feedback from their own motions and consequent visual or vocal stimulation is a fundamental basis for distinguishing self from other social stimulation (Bahrick & Watson 1985; Schmuckler 1996). Stimulation from the self is perfectly contingent with proprioceptive information whereas stimulation from social partners is imperfect. Bahrick & Watson (1985) demonstrated that 5-month-old infants could discriminate between a live, perfectly contingent video display of their own legs moving and a non-contingent display of their own legs or of another infant’s legs, and preferred to view the noncontingent stimulation. Subsequent studies demonstrated that detecting this contingency required proper spatial alignment (Rochat & Morgan 1996; Schmuckler 1996; Schmuckler & Fairhall, 2001). A more recent study found that infants could detect this intermodal proprioceptive-visual contingency on the basis of motion information alone, when featural information specifying the appearance of the legs was eliminated (Schmuckler & Fairhall, 2001). Specifically, infants of 5- and 7-months discriminated contingent from noncontingent point light displays of moving legs.

The present studies: 1) replicated and extended this finding to infants as young as 2-months of age, and
2) assessed whether infants of 5- and 9-months could discriminate point light displays of their legs even when the temporal and spatial contingencies were degraded.

Experiment 1: Method
Research Question: Can infants detect the perfect temporal contingency between proprioceptive and visual information from self movement in the absence of featural information?

16 2-month-olds & 16 5-month-olds wore socks with three luminescent dots (i.e., point lights) that eliminated featural information but preserved the perfect contingency between visual-proprioceptive stimulation.

Infants viewed a live contingent point-light display of their own self-produced leg motion and a pre-recorded non-contingent point light display of another infant’s motion across 4-40s trials (Block 1: 1 trials & 2: Block 2 = trials 3 & 4). The dependent variable was the proportion of time infants spent looking toward contingent display or the non-contingent display.

Results: Experiment 1
Five-month-olds looked longer to the non-contingent display on Blocks 1 and 2 combined ($M = 60; SD = 15$) $t(15) = 2.6, p = .022$, as well as during Block 1 ($M = 62; SD = 17$), $t(15) = 2.7, p = .016$, but not during Block 2, $p = .31$, replicating the results of Schmuckler & Fairhall (2001).

Moreover 2-month-olds looked longer toward the non-contingent display during Block 1 ($M = 63; SD = 24$), $t(15) = 2.2, p = .042$, thus extending these findings to younger infants.

Results: Experiment 2
5-month-olds looked longer toward the non-contingent display during Block 2 ($M = 59; SD = 17$), $t(15) = 2.3, p = .039$ and across Blocks 1 & 2 combined ($M = 59; SD = 14$), $t(15) = 2.4, p = .028$.

Nine-month-olds looked longer to the non-contingent display ($M = 61; SD = 18$) during Block 1, $t (15) = 2.2, p = .041$, and across Blocks 1 & 2 combined ($M = 61; SD = 15$) $t (15) = 2.9, p = .011$.

Conclusions
Two-months is the youngest age, to date, infants have been shown to detect the perfect proprioceptive-visual contingency specifying self.

Further, 5- and 9-month-old infants are able to detect this proprioceptive-visual contingency even when temporal and spatial information is degraded. This imperfect contingency is similar to the contingency provided by a social partner.

Together these findings suggest that infants have fundamental capabilities that distinguish self from social stimulation, even as young as 2-months of age.

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