

Matching Amodal Cues Promotes Differential Expression of Facilitated Operant Learning in 3- and 5-Month-Old Infants

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Abstract/Background

The current study examined human infants' ability to utilize cross-modal information in a learning context (specifically, in Rovee-Collier's conjugate learning procedure; Rovee & Rovee, 1969). Studies have shown that human infants can detect equivalences across modalities and that this detection is facilitated by multimodal presentation (Bahrick & Lickliter, 2004). Bahrick and Lickliter (2000) found that 5-month-old infants were able to discriminate between two rhythms when the rhythms were presented in two modalities but not when they were presented in only one modality, suggesting that amodal cues may facilitate learning. The current study examined the influence of amodal dimensions in a more complex learning paradigm, operant learning. Three- and 5-month-old infants learned to make an operant response (leg kicks) for reinforcement (movement of a toy mobile). The amodal stimulus dimension of shape was manipulated within the context of the learning procedure. That is, infants held an object during acquisition that either matched or mismatched the shape of the mobile's objects. Preliminary results suggest that when shape matched, this amodal congruency facilitated learning of the operant response. Expression of this facilitation varied as a function of age, with the younger infants showing facilitation during the immediate retention test and the older infants showing facilitation during the acquisition of the operant response.

Participants/Apparatus



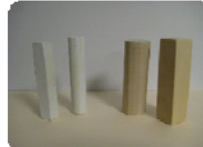
Participants were 3-month-old (M age in days = 97.6) and 5-month-old infants (M age in days = 159.3)



A computerized apparatus, analogous to Rovee-Collier's (1969) mobile procedure, measured kicks and controlled presentation of reinforcement (movement of the mobile).



A padded arm shield prevented visual and oral processing of the held object for 3-month-olds. The shield measures 63 x 19.5 cm. The aperture measures 10 x 8 cm.



The objects measure 8 x 1.5 cm for the 3-month-olds (on the left) and 8 x 2.5 cm for the 5-month-olds (on the right). All groups held the objects for at least 90 s – the minimum time required to process shape haptically (Streri, 1993).

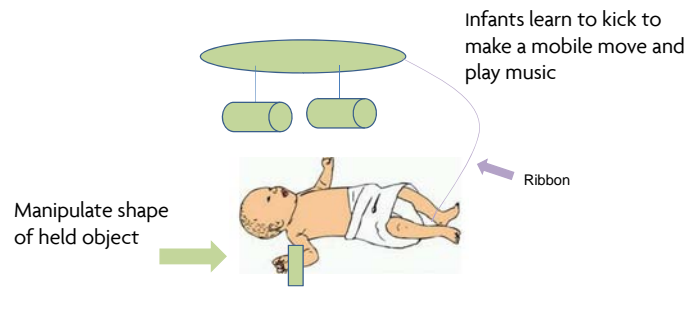


The mobile for 3-month-olds. The cylinders measure 8 x 1.5 cm.



The mobile for 5-month-olds. The cylinders measure 8 x 3.5 cm.

Procedure



Standard Learning Session



Design/Predictions

Group	Visual	Tactile	Prediction
V(cyl) T(0)	Cylinders	None	Average
V(cyl) T(cyl)	Cylinders	Cylinder	Facilitation
V(cyl)T(brk)	Cylinders	Brick	Inhibition

Results/Conclusions

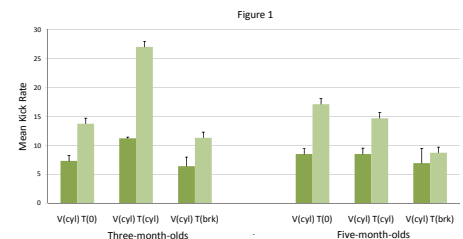


Figure 1: Mixed ANOVAs revealed significant Group x Phase interactions at both ages: $F(2, 21) = 4.0, p = .03$, for the 3-month-olds and $F(2, 21) = 3.5, p = .04$ for the 5-month-olds, but the pattern of the interaction differed as a function of age.

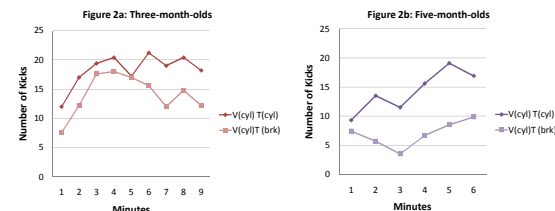


Figure 2: Mixed ANOVAs suggest stronger group differences during acquisition for the 5-month-olds (Fig 2b), $F(1,5) = 3.4, p = .08$, than for the 3-month-olds (Fig 2a), $F(1, 8) = 2.0, p = .19$.

- The results suggest that 3-month-old infants show facilitated learning when the shape of the held object matches the size of the visual objects. This facilitation is expressed during the test phase, but not during acquisition.

- The results suggest that 5-month-old infants show facilitated learning when the shape of the held object matches the shape of the visual objects. In contrast to the younger infants, this facilitation is expressed strongest during the acquisition phase.

- The results suggest that the congruent amodal information need not be directly perceived (the object was not held during test) at either age for the facilitated or inhibited learning to be observed.

- The current results are in agreement with Bahrick and Lickliter's (2002) Intersensory Redundancy hypothesis, suggesting that multimodal contexts direct attention to amodal dimensions; this attention, in turn, appears to facilitate learning in general, that is, the facilitated learning is with respect to the operant response, not discrimination of shape.

