Assessing the Influence of Amodal Cues (i.e. Shape) in a Tactile Habituation Task in 3-Month-Old Human Infants

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Background

•This study investigated the role of amodal information in a simple learning task in 3-month-old human infants. Amodal information refers to information that is redundant across separate sensory modalities. For example, shape is an amodal dimension because it can be processed both haptically (i.e. through the sense of touch) and visually (i.e. through the sense of sight). The current study asked whether the presence of amodal shape information would influence simple habituation processes and/or discrimination processes in human infants. Using an infant-controlled tactile habituation task, half the infants held, in one hand, a simple object (a cylinder) while the other half held the cylinder while visually processing cylinders hanging from a toy mobile. After haptically habituating to the cylinder, both groups were then tested for haptic discrimination of a new object, a brick. Preliminary results show that infants who received congruent (visual-tactile) amodal shape information habituated faster in comparison to infants who received only tactile shape information. Significant differences were not observed in discrimination, although the pattern of discrimination appeared to differ as a function of the presence of congruent amodal information.

Purpose of Study

•Broad: To study the role intersensory integration plays in learning processes in human infants.

•Specific: To determine if detection of amodal cues will facilitate haptic habituation and discrimination processes in human infants.

Methods

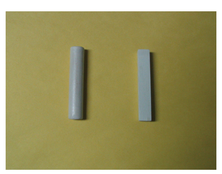
Participants

- 23 3-month-old infants participated with the following demographics:
  - Experimental group V(Cyl) T(Brick → cylinder) (*n* = 7; 4 females, 3 males)
    - *M* age = 97.1 days (*SE* = 4.6); *M* SES = 58.0 (*SE* = 9.4)
  - Control group V(0) T(Cylinder → Brick) (*n* = 7, all female)
    - *M* age = 94.8 days (*SE* = 3.2); *M* SES = 64.4 (*SE* = 9.0)
  - Control group, V(0) T(Brick → Cylinder) *n* = 9; 4 females, 5 males
    - *M* age = 93.3 days (*SE* = 3.7); *M* SES = 60.2 (*SE* = 8.6)

Apparatus

Infants in the Experimental group saw a mobile of 5 colored cylinders suspended above their heads. The cylinders on the mobile measure 8 x 1.5 cm, the same dimensions as the cylinder that was held.

A padded shield was used to prevent oral and visual exploration of the object that was held. The shield measures 63 cm in length and 19.5 cm in height. The aperture measures 10 x 8 cm.

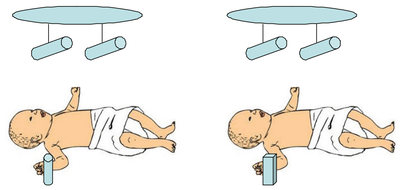


The cylinder and brick measure 8 x 1.5 cm and were made from wood dowels that were sanded, painted, and varnished.

Design/Groups:

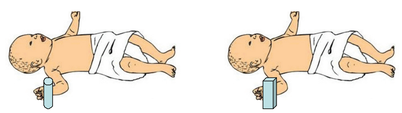
Experimental Group
V(Cyl) T(Cylinder-Brick)

Infants habituated haptically to a cylinder while seeing a mobile of cylinders, then tested for haptic discrimination to a brick.



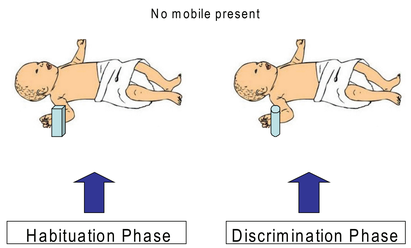
Control Group 1
V(0) T(Cylinder-Brick)

Infants habituated haptically to a cylinder while not seeing any cylinders, then tested for haptic discrimination to a brick.



Control Group 2
V(0) T(Brick-Cylinder)

Infants habituated haptically to a brick while not seeing any cylinders, then tested for haptic discrimination to a cylinder. This group served as a control for any differences in haptic responsivity to the two different objects



Procedure

•Habituation Phase

- •An infant-controlled habituation procedure was used
- •Maximum number of trials = 10
  - •Minimum trial length = 3 seconds
  - •Maximum trial length = 2 minutes
- •Habituation criterion = 50% decrease in the *M* holding time of Trials 1 and 2

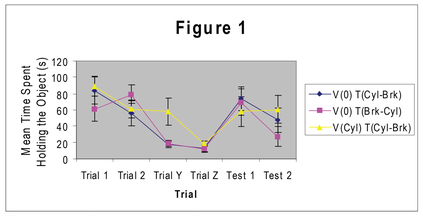
•Test Phase

- •Maximum number of trials = 2
  - •Minimum trial length = 3 seconds
  - •Maximum trial length = 2 minutes

Results

A 3 (Group) x 6 (Trials) ANOVA on the mean time spent holding the object revealed only a significant main effect of Trials, $F(5, 100) = 12.12$, $p < .05$, suggesting that regardless of group, all infant habituated to the objects and then showed discrimination to the new objects. See Figure 1. Visual examination of the data, however, reveals two interesting patterns: One, that infants given visual shape information showed increased holding time on Trial Y. Two, that infants given visual shape information showed no decrease in holding time across the two test trials.

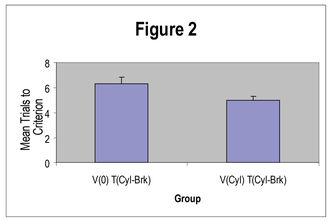
Figure 1



Trials 1 and 2 represent the first 2 trials of the habituation phase.
Trials Y and Z represent the last 2 trials of the habituation phase.
Tests 1 and 2 represent the 2 discrimination trials.

As seen in Figure 2, an independent t-test on the number of trials to criterion showed a significant difference between those infants who had amodal shape information and those who did not, $t(12) = 2.12$, $p = .05$, suggesting that presence of congruent amodal information facilitated learned as measured by the number of trials to criterion.

Figure 2



Discussion

•The preliminary results of the current study suggest that, in addition to being able to detect amodal cues (Bahrick, 1983; Lewkowicz, 1994; Spelke, 1981), infants also use such cues to facilitate simple learning processes such as habituation and discrimination.
•These results are in agreement with Bahrick and Lickliter's (2002) Intersensory Redundancy Hypothesis which predicts facilitated learning in a multimodal context for young infants.
•These results are in agreement with Bahrick and Lickliter's (2000) results showing facilitated rhythm discrimination in a multimodal context in 5-month-old infants.
•Increased sample size and an additional control group in which infants see cylinders but habituate to a brick are needed before stronger conclusions can be reached.

References

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