

Introduction

Perceptual impoverishment theory suggests that as infants get older they require fewer streams of perceptual information to form an object representation (Johnson, 2000). Because there are more streams of perceptual information available from 3D objects than 2D images, we hypothesized that it would be easier for older infants to imitate from a 2D screen than younger infants. The innovation of the present study is the use of a touch screen to permit tests within dimensions from 2D to 2D. We were then able to directly compare performance with 2D and 3D objects using an imitation task. To do this we built 3D button boxes and took digital pictures of these objects and depicted them on a 2D touchscreen.

Method

Participants: 46 9- (n=23) and 15-month-olds (n=23)

Experimental stimuli:

Each participant tested with 1 vehicle & 1 animal



Firetruck



School bus



Duck



Cow

Procedure:

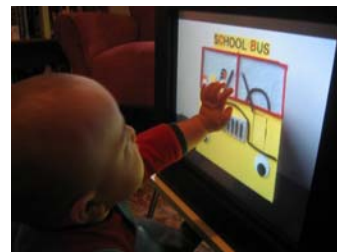
- Assigned to 2D or the 3D condition
- Pre-training phase for 2D condition



Pre-training

Between Subjects Design

- Baseline Only
 - 2D condition
 - Infant given 2 images to explore for 30 s each.
 - 3D condition
 - Infant given 2 objects to explore for 30s each.
- Demonstration/Immediate Test
 - 2D condition
 - an experimenter pushed a virtual button to produce an interesting sound effect on 2 touchscreen images. Infant given 2 images to explore for 30s each.
 - 3D condition,
 - An experimenter pushed a button on 2 real objects. Infant given 2 objects to explore for 30s each.



2D Baseline

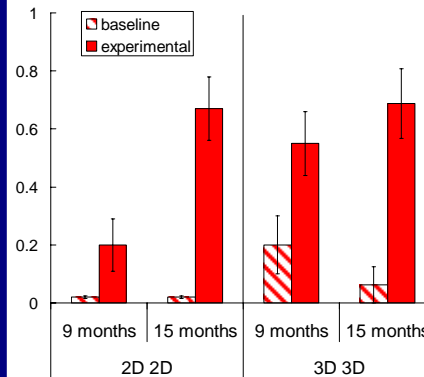
Results

Dimension-related changes:

- At both ages, infants in the 3D condition performed significantly above baseline.
- At 9 months, infants performed significantly more actions from 3D than 2D.
- At 15 months, infants imitated the same number of actions from 3D and 2D.

Age-related changes:

- There were age-related changes in performance; the 15-month-olds reproduced significantly more target actions than the 9-month-olds in the 2D condition.



Acknowledgements

A very special thank you to all the families who made this research possible. Support for this research was provided by NSF Grants to Sandra Calvert (#0126014) and Andrew Meltzoff (SBE-0354453) and NIH Grants to Andrew Meltzoff (5 R37 HD-02251420) and Peter Gerhardtstein (#1R01HD038315).

Discussion

Theoretical implications:

- Findings are consistent with the perceptual impoverishment hypothesis.
 - Older infants are more able to copy from 2D than younger infants suggesting that they require fewer streams of perceptual information to form an object representation.

Future Directions:

- Testing infants across dimension
 - 3D to 2D and 2D to 3D
- Preliminary data suggest that 15-month-olds who saw the actions modeled on a 3D object and were tested on a 2D touchscreen do not perform significantly above baseline.

- Transfer may be the rate-limiting step due to an additional mismatch in the availability of perceptual cues.

Practical Implications:

- A recent nationally representative survey reported, however, that children under 2 spend an average of 1-2 hrs/day exposed to television and computers. Parents also believe that there are beneficial effects of media exposure (Rideout & Hamel, 2006). Educational benefits may be tempered by basic perceptual processing limitations.

References

- Johnson, S. P. (2000). The development of visual surface perception: Insights into the ontogeny of knowledge. In C. Rovee-Collier, L. P. Lipsitt, & H. Hayne, (Eds.), *Progress in Infancy Research*, pp. 113-154. Erlbaum: Mahwah, NJ.
- Rideout, V. & Hamel, E. (2006). *The media family: Electronic media in the lives of infants, toddlers, preschoolers and their parents*. Menlo Park, CA: Kaiser Family Foundation.