



Perception and Production of Means-End Goal Structures in Eight-Month-Old Infants



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MOTIVATION

Background

Adults readily interpret hierarchical action sequences in terms of an ultimate goal, which is critical to discerning others' intentions, allowing us to categorize and interpret novel events and predict future actions based on our perception. Recent findings suggest that infants' understanding of others' means-end actions coincides with the emergence of their own means-end abilities. In a visual habituation paradigm, 12-month-olds' responses indicated an interpretation of other's actions as means to an end (they looked longer if an actor's ultimate goal changed than if her means to achieving that goal changed); in contrast, 10-month-olds' responses suggested a lower level of analysis (Sommerville & Woodward, 2005). Furthermore, 10-month-olds' tendency to interpret others' actions as means to an end correlated with their tendency to produce means-end sequences.

Current Questions

- Is there a causal relationship between infants' perception and production of means-end action structure?
- If so, do infants' own actions provided unique insight into the structure of the observed sequence, or do infants learn by observing the effects of these actions?

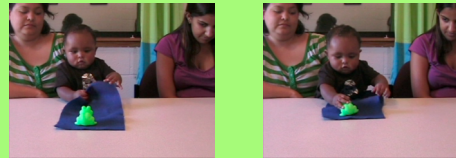
ABSTRACT

Here, we tested whether infants' own means-end actions influence their perceptions of others'. We trained 8-month-olds to pull a cloth in order to retrieve a toy, which increased their tendency to produce well-structured means-end actions; they produced more successful attempts post-training than pre-training. Further, it influenced their subsequent responses to observed means-end actions in a habituation study. Post-training, infants showed a significant looking-time pattern indicating that they represented the means-end structure of an observed cloth-pulling event. Another group of 8-month-olds watched an experimenter demonstrate successful cloth-pulling instead of engaging it themselves and then participated in the same habituation paradigm. These infants, as well as a control group of infants, who had no prior exposure to cloth-pulling, responded randomly in the habituation paradigm.

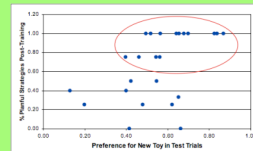
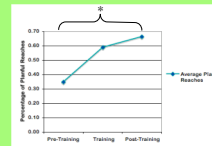
METHODS & RESULTS

Subjects: 8-month-olds tested at the Maryland Infant Studies Laboratory (n = 24 per condition) participated in one of the following training conditions, followed by the habituation task

Active Condition



- Infants were given four pre-training trials, five training trials, and four post-training trials. After training, infants showed significantly more planful strategies than pre-training
- Infants' performance post-training positively correlated strongly with preference for the new goal on the habituation task, $r(22) = .489, p < .02$



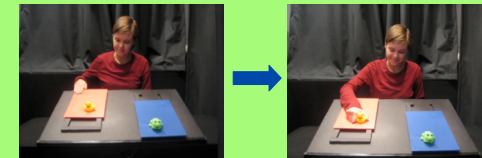
- An ANCOVA with planfulness (proportion of planful solutions in infants' own actions after training) as a covariate revealed a significant trial type (new-toy versus new-cloth) by planfulness interaction, $F(1,22) = 6.95, p < .02$.
- Infants above the median action score looked reliably longer on new-toy than new-side trials, $t(13) = 2.40, p < .04$, whereas infants below the median did not differ

Observation Condition

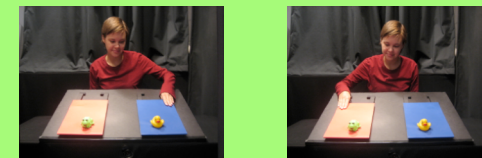


- This condition was identical to the active condition except that instead of engaging in cloth-pulling themselves, infants watched an experimenter model the successful action
- Each infant was matched to an infant in the active condition in terms of the duration of time spent engaged in cloth-pulling
- There was no correlation between amount of observation and new goal preference

Habituation Task



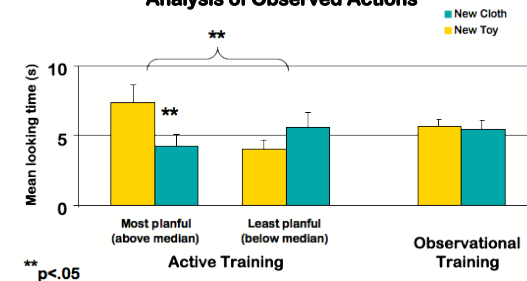
Habituation



New Cloth Test Trial

New Toy Test Trial

Effects of Means-End Training on Analysis of Observed Actions



CONCLUSIONS

- With training, 8-month-old infants successfully learned to pull on a cloth to retrieve a toy
- Once successful, these infants were able to interpret the cloth-pulling actions of an experimenter as directed on the toy rather than on the cloth itself (as indicated by longer looking on the new-cloth than the new-toy trials)
- A correlation between infants' own performance and their perception of the habituation task indicates that training that led to well-organized actions in the infants affected their subsequent perception of others' means-ends actions as organized by an overarching goal
- Infants who merely observed someone else pull on a cloth to retrieve a toy or were not exposed to cloth-pulling at all did not interpret the actions of the experimenter as a means to an end, and there was no correlation between amount of observation and habituation task performance
- These results provide evidence that infants' interpretations of others' actions is supported by developments in their own actions
- Additionally, these findings indicate that infants' own actions (as compared to observing the actions of others) provide stronger, or perhaps unique information that can then be used to discern structure in others' actions