Toddlers’ eye-movements reflect (un)certainty about their knowledge of a word’s meaning

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Toddlers’ eye-movements reflect (un)certainty about their knowledge of a word’s meaning

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BACKGROUND

- How children learn the meanings of words in an environment flooded with uncertainty while receiving very little feedback about their knowledge state, remains a great puzzle.
- To achieve this feat, it has been suggested that children come equipped with hardwired constraints on what words are more likely to map onto [1] together with the general-purpose ability to keep track of the statistical regularities between word occurrences and the environment [2].
- Learning, however, cannot be reduced to a passive observational process of the external world
- There is increasing evidence that infants actively engage in self-directed learning to learn about the physical, social and linguistic world surrounding them.
- infants using pointing in an interrogative fashion [3]
- request information from others when they do not know [4]
- orient selectively their attention [5]
- But how do infants decide where to look and what to listen to?
- In adults, efficient self-directed learning is predicted by accurate epistemic monitoring [6]
- Yet, it is an open question whether children can monitor the uncertainty of their own knowledge and actively guide their learning behaviour on the basis of this monitoring [7]

RESEARCH QUESTION

Our focus is on the impact of uncertainty monitoring in guiding information selection during the word learning process. Can children estimate the degree of certainty they have about word meanings and detect their own errors without relying on external feedback?

IMPLICIT MEASURE OF (UN)CERTAINTY

While children’s knowledge about word meanings can be easily accessed, knowledge about knowledge is not directly observable. We based our approach on a 2-steps procedure used to assess metacognitive sensitivity in animals and infants [8,9].

1. Children perform a choice, which allows for an objective scoring of their understanding of a target word (Performance).
2. A secondary behaviour contingent on an evaluation of the initial choice is elicited, in the absence of any external feedback on performance (Uncertainty monitoring).

METHOD

Participants: 53 18- to 30-month olds (68 tested)

Procedure: We adapted a version of the post-decision persistence wagering paradigm (see [8] in rats and [9] in infants) with an anticipation eye-movement paradigm using an eyetracker.

- 5 trials with known words (as attested by parental report)
- 5 trials with unknown words (e.g., “blicket”) (control)

MEASURES AND HYPOTHESIS

- Performance: first anticipative look during the delay period
- Uncertainty: children’s willingness to persist in looking toward the side of their first gaze.

RESULTS: (UN)CERTAINTY

Relationship between persistence and accuracy depending on word type

Children showed increased persistence in their initial gaze after making a correct as compared to an incorrect gaze only when the meaning of the word was known, suggesting an appropriate evaluation of their knowledge.

RESULTS: PERFORMANCE

Mean accuracy of the first anticipative look

First anticipative look seems to be a poor indicator of performance:
- no difference between known and unknown words
- marginal above chance performance for known words

Possible reason: First look measured from target word onset, this may not leave sufficient time for children to process the word and retrieve the correct location.

REFERENCES