

Some Complex Concepts Require Language: An eye-tracking study with 12- to 24-mo-old infants and adults

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1 INTRODUCTION

- What is the relation between language and thought? Are they two completely different systems or two sides of the same coin?
- De Villiers (2014) suggests that language might be particularly required for building complex conceptual representations.
- In this study, we examine the building of abstract, three-term transitive events in 12-24-mo-olds and in verbal shadowing adults. Then we compare these to two-term intransitive events, with comparable stimuli.

2 DESIGN

The experiment starts with stills of both events on the screen

3.75s - Left video animates
3.75s - Right video animates
2.5s - Anticipatory period
6s - Target animates again with color and sound

16 seconds total (One trial)

32 Trials Total
16 Trials with target on the right, **Right Trials**
16 Trials with target on the left, **Left Trials**

PARTICIPANTS & PROCEDURE

- Infants: 45 infants, 12-24mo, recruited at UMass Boston Baby Lab
- Adults: 40 adults, undergraduate students recruited at UMass Boston
- We used Tobii TX300 Eye Tracker system to track the gaze of the participants while they watched the animated videos.
- Adults did verbal shadowing throughout the experiment, without stopping more than 2 seconds at any point.

8x Training Trials, with 4 dog/car pairs
16x Generalization Trials, with 8 novel dog/car pairs
8x Far-Generalization Trials, with 4 more novel dog/car pairs

2-Place Predicate 'Push': Dog Push Car vs Car Push Dog
1-Place Predicates 'Roll' and 'Jump': Dog Roll vs Dog Jump

4 SUMMARY

- For transitive events, neither infants nor verbal shadowing adults showed significant target anticipations.
- For intransitive events, we found significant anticipations towards targets versus non-targets in both infants and verbal shadowing adults.
- Successful anticipators showed significantly different looking patterns for Right and Left trials in the anticipatory period, anticipating the upcoming target correctly.

After data collection, the following treatments were applied to the data:

- We centered the gaze data to the center of the screen (0,0)
- We interpolated the eye tracking data at missing gaps that are smaller than 50ms.
- Outlier data points, top and bottom 5 percentiles, were removed.
- Trials with more than 33% missing data in the first 10 seconds of the trial (until the end of anticipatory period) were excluded.
- The first 8, i.e. Training Trials, were excluded from the analysis.
- Participants with less than two good trials (at least one Right and one Left) were excluded from analysis.
- After data cleanup, we compared the mean looking position for **Right** and **Left** trials in the Anticipatory Period.

5 CONCLUSIONS

- We suggest that representing three-term transitive events may be at a level of complexity that cannot be accomplished without language.
- Verbal shadowing seems to shut down computing of a three-term transitive event as a class, but not two-term intransitive events.
- For syntactically more complex concepts, we might need to rely on language more than we do for simpler concepts.

3 RESULTS

2-PLACE PREDICATES

INFANTS (12-24 mo)

Mean looking positions for Right and Left Trials in the Anticipatory Period

VERBAL SHADOWING ADULTS

Mean looking positions for Right and Left Trials in the Anticipatory Period

1-PLACE PREDICATES

INFANTS (12-24 mo)

Mean looking positions for Right and Left Trials in the Anticipatory Period

VERBAL SHADOWING ADULTS

Mean looking positions for Right and Left Trials in the Anticipatory Period

6 REFERENCES

- De Villiers, J., (2014). What kind of concepts need language? *Language Sciences*, 46, 100-114.

