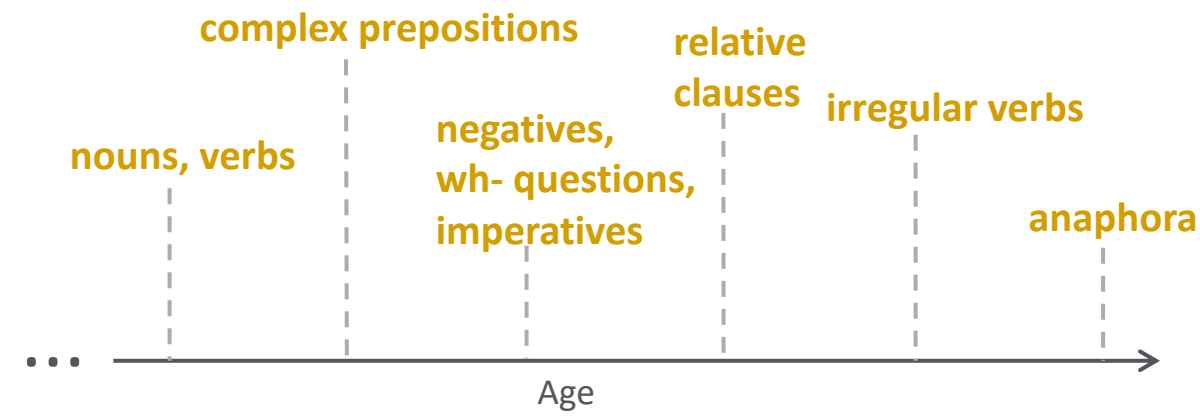
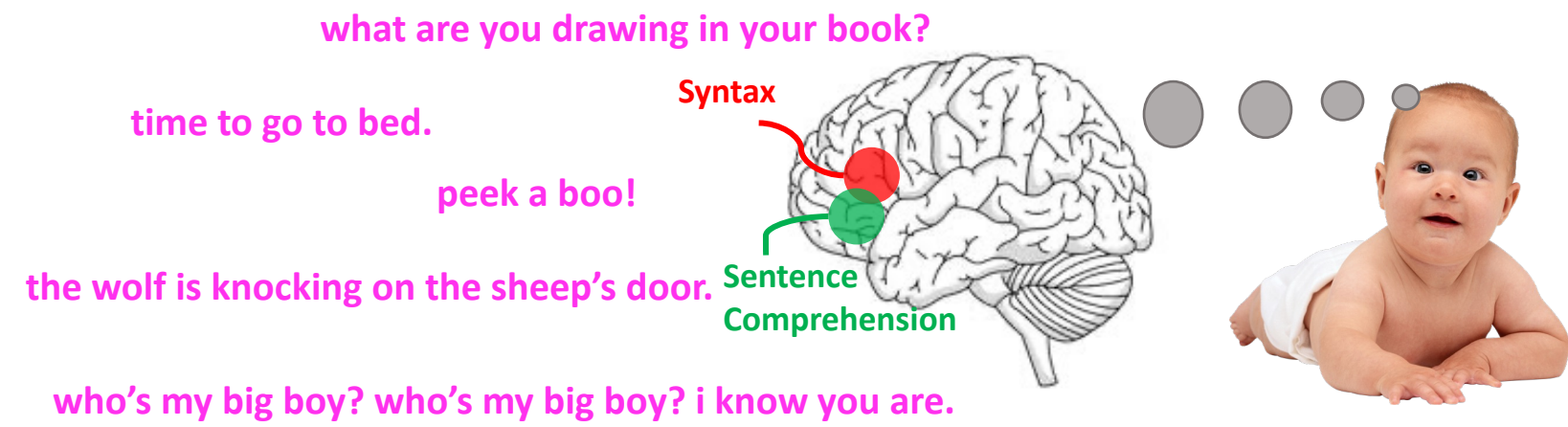


## Motivation

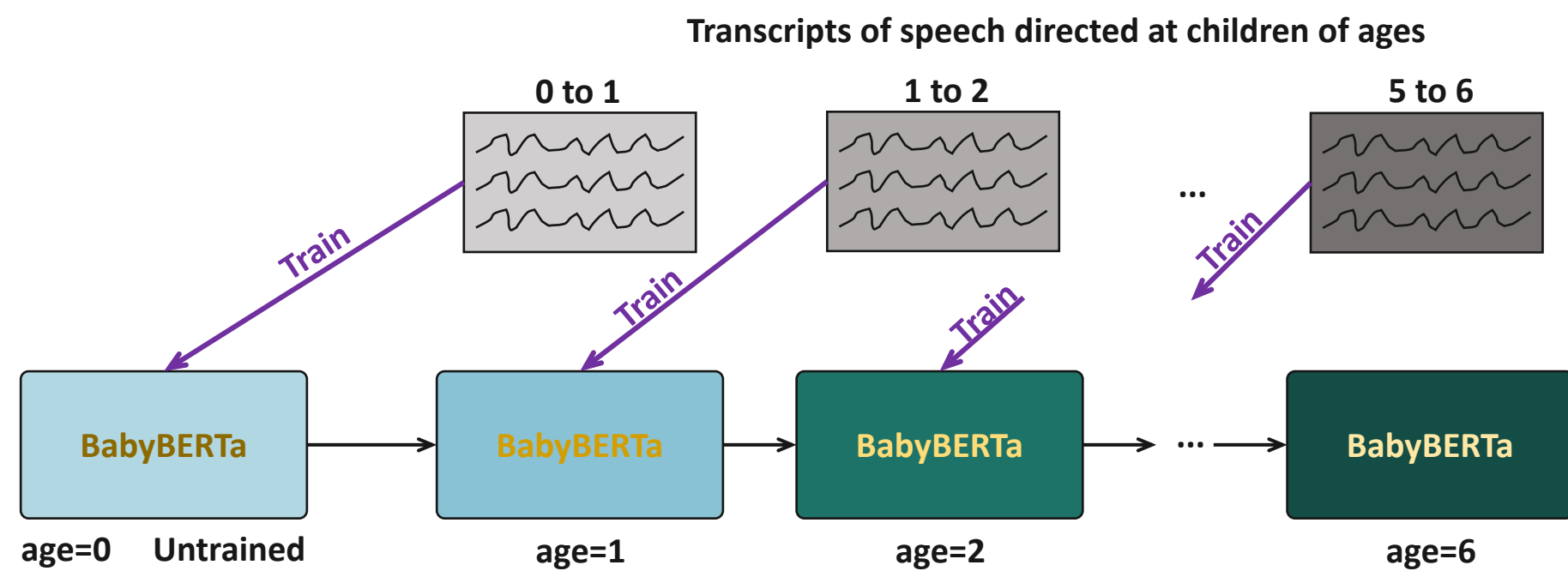
**Language Acquisition:** Infants acquire linguistic skills (syntactic and semantic) gradually over different early stages during their lifetimes



**Adults (parents or caregivers) adapt how they speak to children over time:** the verbal stimuli that an infant receives is very different from what a preschooler receives



## Methods



**Model:** BabyBERTa<sup>1</sup>—a scaled down version of RoBERTa (masked LM)

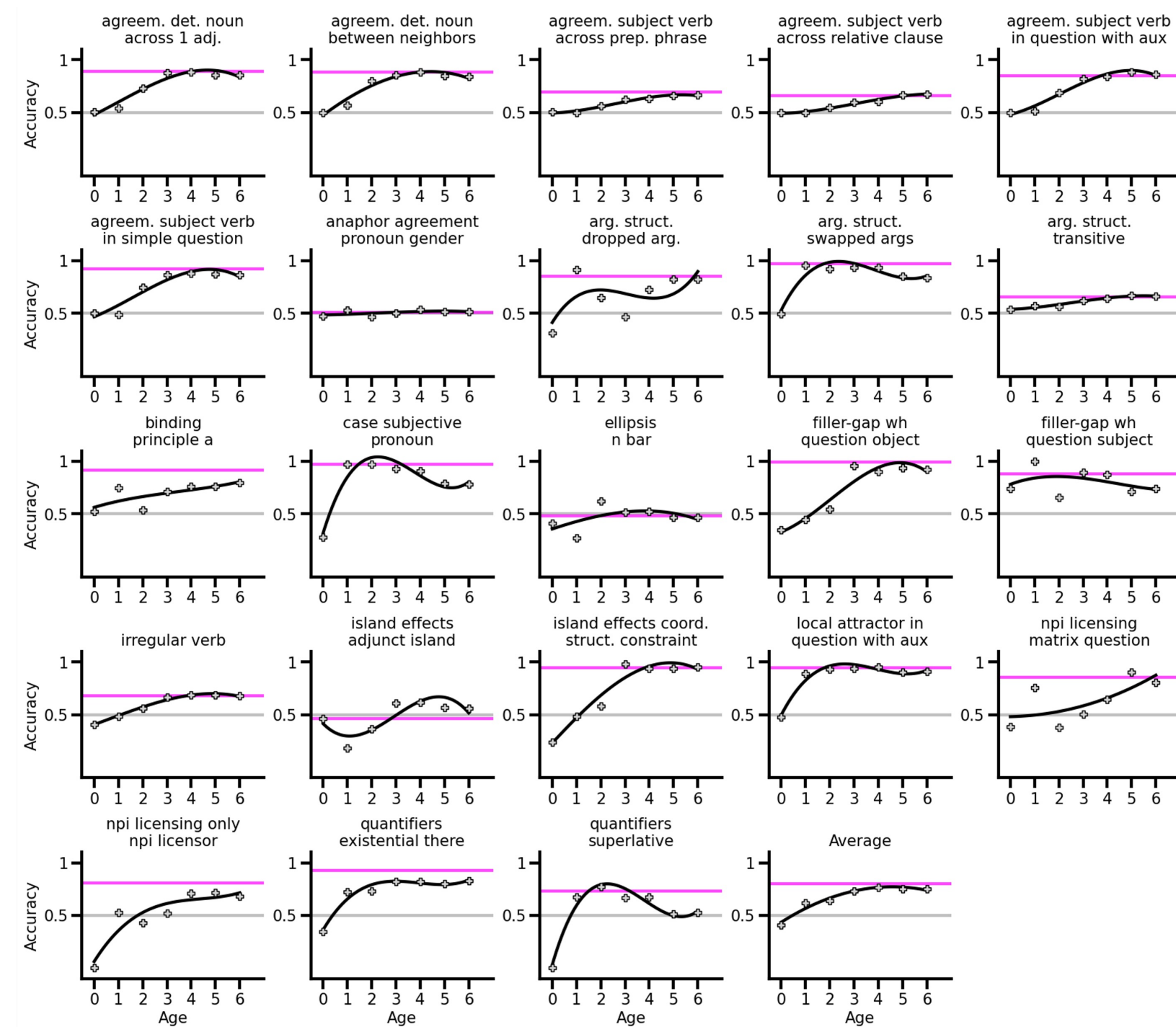
**Data:** Age-Ordered CHILDES<sup>2</sup> dataset—transcripts of child-directed speech

**Evaluation:**

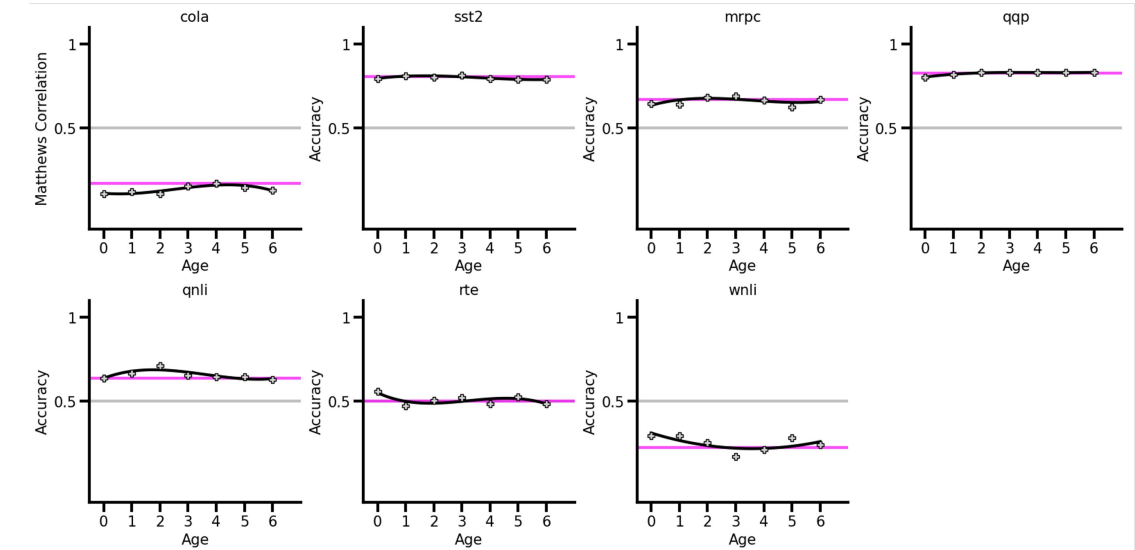
- **Syntactic:** Zorro benchmark w/ preference scores (cross-entropy scores) *apple fall down* vs. *apple fell down*
- **Semantic:** GLUE benchmark w/ top-1 accuracy *paraphrasing, sentiment analysis, entailment, etc.*

## Results

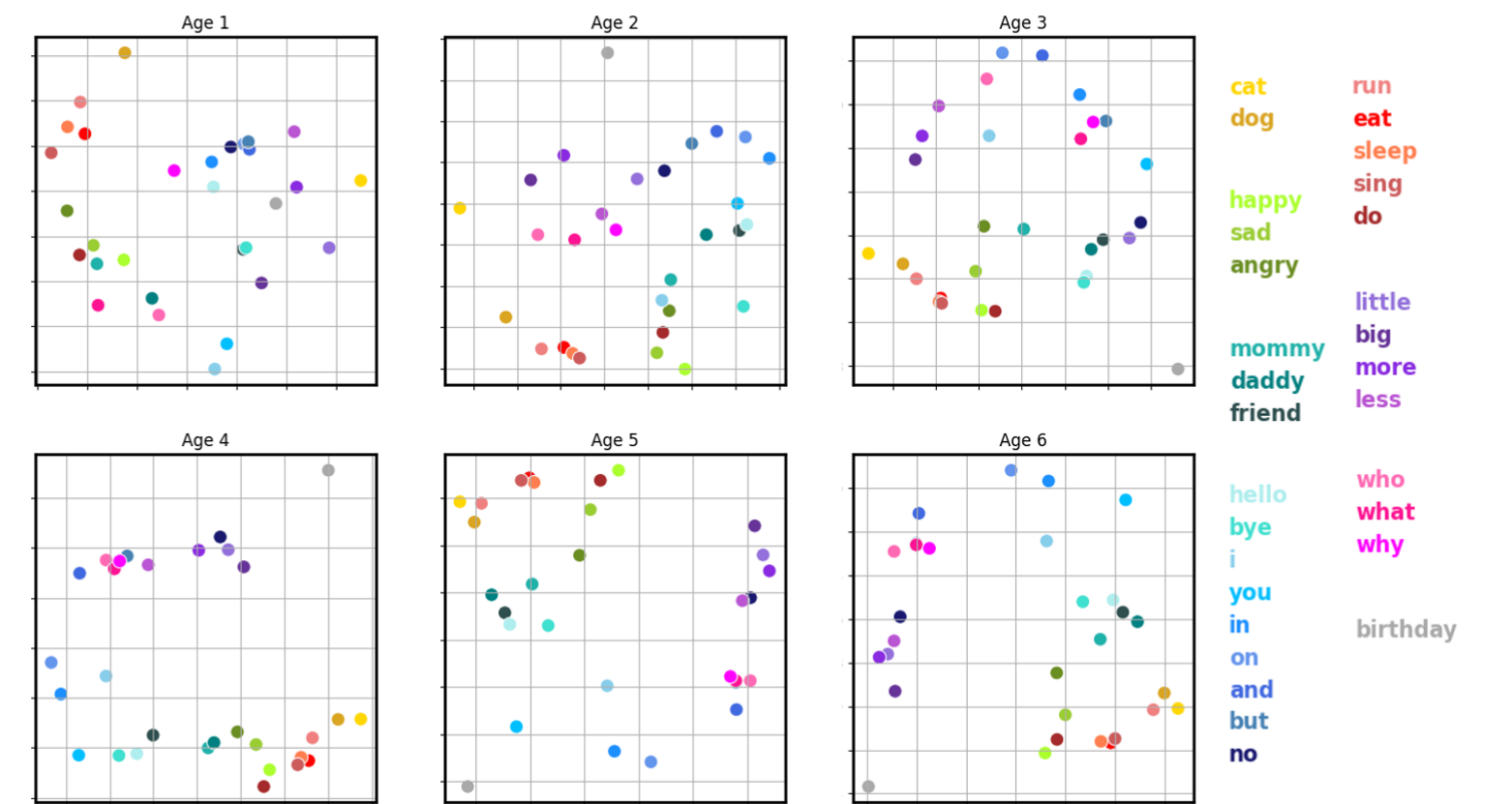
**1. With age, developmentally-plausible trajectories of syntactic knowledge acquisition emerge for different phenomena**



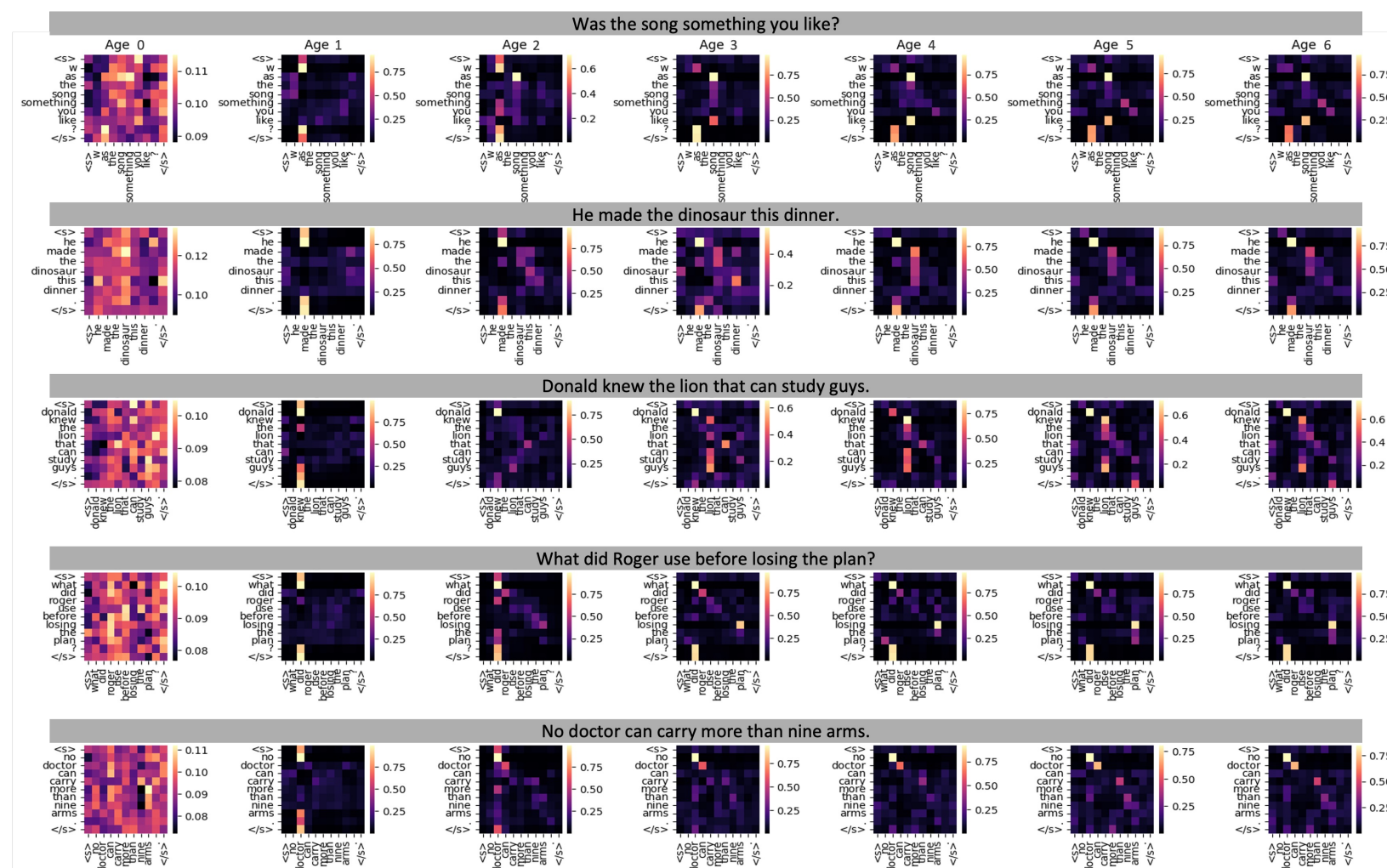
**2. Complex semantic understanding requires cognitive development beyond the first few (=6) years of life**



**4. Children form increasingly meaningful textual representation clusters as they grow, especially since an age of 4**



**3. The sentence components that children attend to during comprehension evolves with age**



## Future Work

**Prosody:** Moving from text toward speech and using models of audition to incorporate stress and intonations which encode substantial linguistic information and require manual detection of word, phrase, and sentence boundaries.

**Second language acquisition:** Analyzing brain development for second language acquisition in the presence of “critical periods” beyond which learning of syntactic relationships becomes difficult.

## References

- <sup>1</sup>Huebner, Sulem, Cynthia, and Roth. BabyBERTa: Learning More Grammar With Small-Scale Child-Directed Language. In *CoNLL*, 2021.
- <sup>2</sup>Huebner and Willits. Using lexical context to discover the noun category: Younger children have it easier. In *Psychology of learning and motivation*, 2021.