

Introduction

How do kids learn the meanings of the universal quantifiers (*each* & *every*)?

These quantifiers have very similar meanings, but differ subtly e.g., in whether an individual- or set-based answer is expected in response to (1) [1]

(1) Ask someone whether {*each/every*} number in this list is odd

List: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

each: 1-yes; 2-no; 3-yes;...

every: no, some are even

Participants also treat them differently when evaluating sentences like (2) [2]:

(2) {*Each/Every*} circle is blue

Each → represent individual circles → no memory of group-properties

Every → represent set of circles → remember group-properties (e.g., #; center)

Current Question: How might learners arrive at these representations?

The Bootstrapping Hypothesis

Concepts paired w. *each* and *every*:

First-order universal (i.e., implicates no sets): $\forall x:a(x)[b(x)]$

Second-order universal (i.e., implicates at least 1 set): $A \subseteq B$



Each gets used for referring to specific instances:

- Each boy found a seat inside where he could rest his feet and ride.
- Pour some milk into each one of these cups.

Every gets used to make inductive generalizations that tolerate exceptions:

- Every time I see ya ya got something in your mouth
- Every time you get a pair of shoes on your feet you say they don't fit you!



These differences in intended meaning lead to distributional differences

Hypothesis: Learners pair first-order concept w. *each* and second-order concept w. *every* because of distributional differences in parents' speech

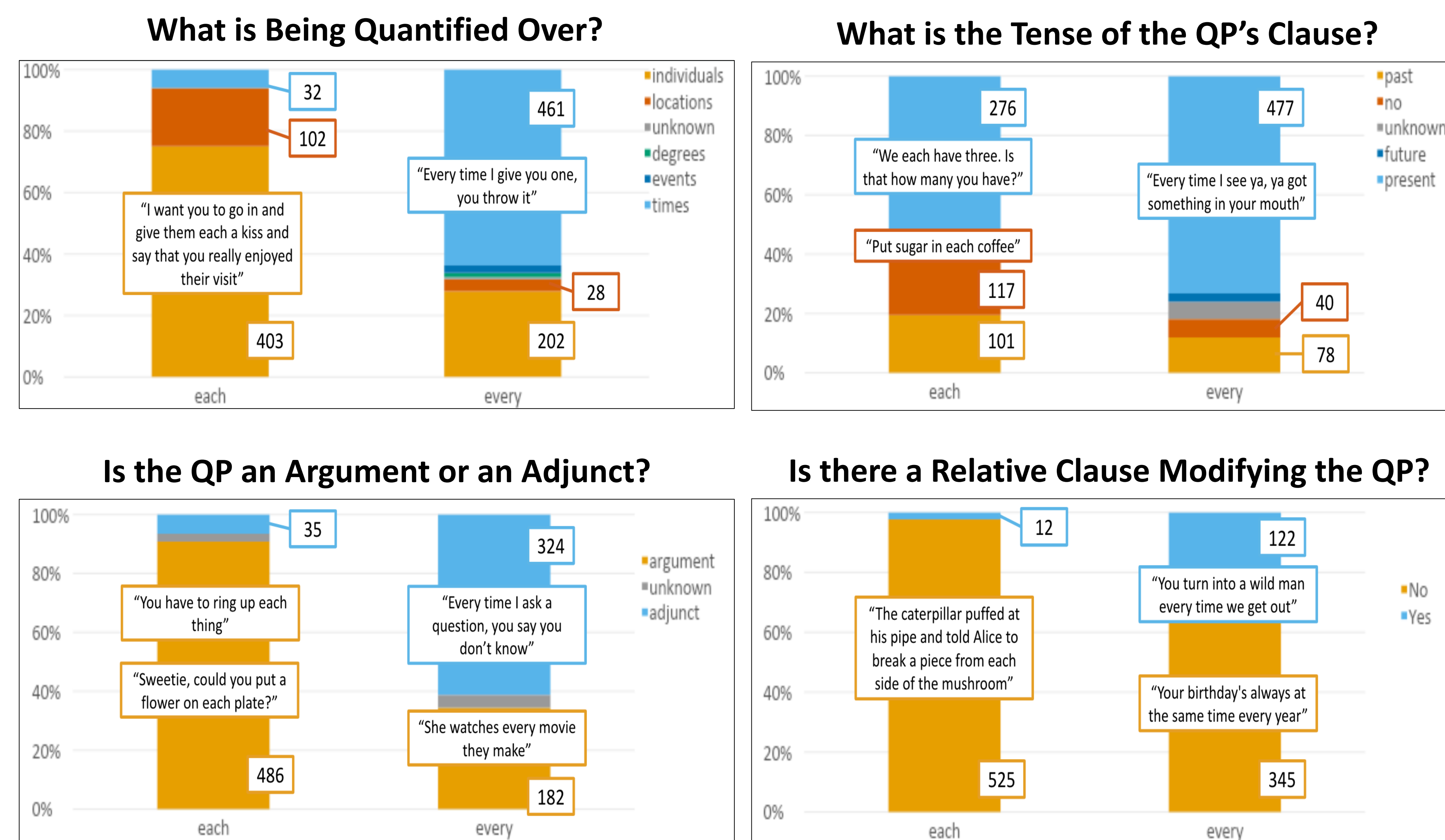
Corpus investigation: CHILDES Child Directed Speech

Predictions

- **Qover;** What is being quantified over semantically?
 - Individuals, Times
- **ClauseTense;** What's the tense of the clause in which the quantifier appears?
 - Present
- **ArgAdj;** Is the QP in an argument position or is it an adjunct?
 - Argument, Adjunct
- **Rel Clause;** Is the QP modified by a relative clause?
 - No, Yes

Also coded for & found no effect:

- **RCTense;** If RelClause == YES, what is the tense of the relative clause
- **Phrasal Cat;** Does the quantifier occur as a determiner (in a DP) or as an adverb?
- **Subcat;** If the quantifier heads a DP (i.e., when PhrasalCat = DP), what kind of DP is it?



There are very few instances of utterances with these two universal quantifiers (Out of nearly 1,706,381 utterances [5])

Each-utterances - 538 (0.0315%)
Every-utterances - 728 (0.0427%)

Conclusions:

- There is clear signal that kids may use to learn the *each/every* difference
- Set-based representation facilitates generalizations; individual-based representation facilitates specific claims

Future Work:

- A novel quantifier study [3-4] using sentence frames with these features to see if learners make use of these distributional differences (e.g., "gleeb day, Kermit paints a picture" vs. "Kermit painted gleebe of the pictures")