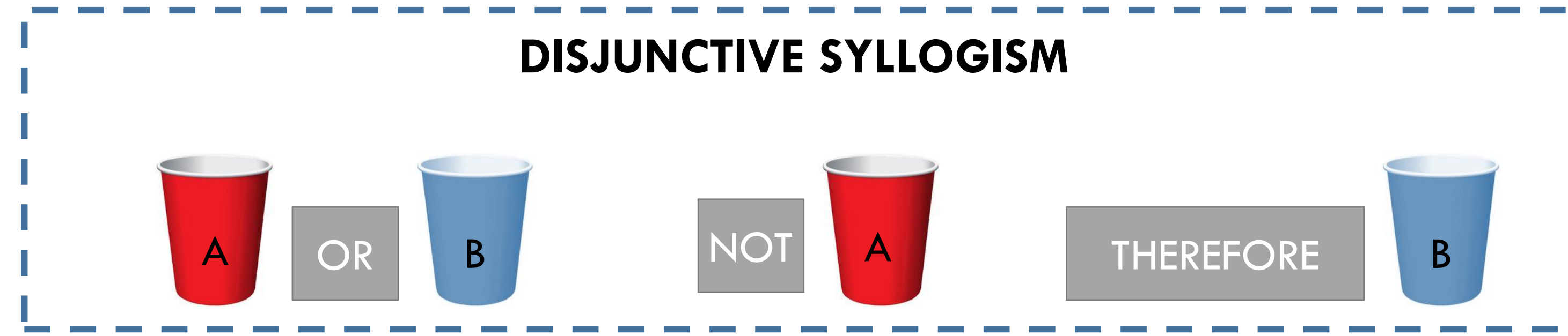


Background

- Whether abstract, combinatorial thought can exist in the absence of language is highly debated.¹⁻⁴
 - The **disjunctive syllogism** is a logical reasoning process that requires combinatorial thought.



- **Evidence** on whether young children can use the disjunctive syllogism appears **mixed**.⁵⁻⁷
 - In a **non-linguistic task**, where children searched for a reward across 4 possible locations after seeing that one location was empty, 3- to 5-year-olds succeeded but 2.5-year-olds failed.⁵
 - Such failures may suggest that very young (i.e., “pre-linguistic”) children do not yet have the logical concepts of disjunction (OR) and negation (NOT).
 - However, in a **linguistic version of the same task**, where cues to “emptiness” were conveyed with a negative statement (e.g., X is not in A), even 2.5-year-olds succeeded.⁶
 - Such successes may suggest that language (linguistic negation) facilitates the construction of the logical (negative) premise.

Current Study

- Does the modality of cues to “emptiness” (verbal vs. visual) affects children’s ability to reason with the disjunctive syllogism?
 - Systematic manipulation of the differences between the two prior studies.

Methods

Participants
18 **2.5-year-olds** (M = 32.3 months, range = 27.3–35.6); 30 **3-year-olds** (M = 41.5 months, range = 36.0–47.5); 23 **4-year-olds** (M = 53.6 months, range = 48.6–59.8)

Training Trials

(n=3)

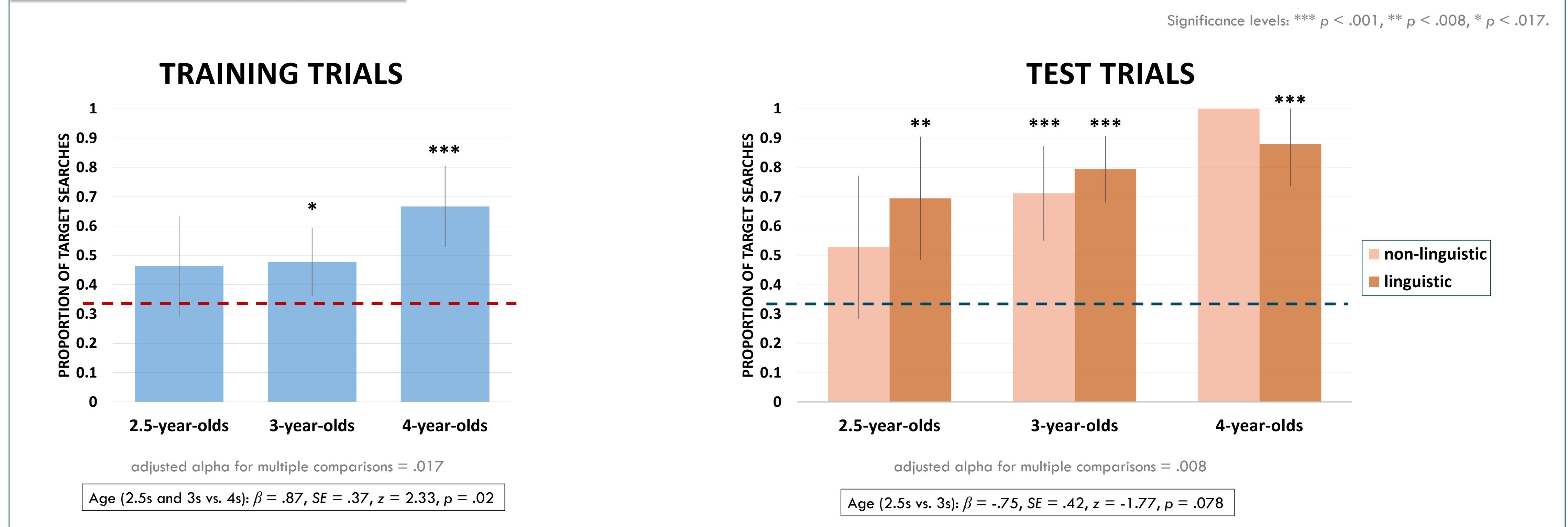
Negation Trials *between-subjects*

(n=2)

Test Trials

(n=4)

Results



Conclusion

- Children above the age of 3 (but not younger) **successfully reasoned over certainty**, with this ability still developing over preschool years.
 - In training trials, 3- and 4-year-olds (but not 2.5-year-olds) chose the target cup significantly above chance.
 - 4-year-olds performed significantly better than 3- and 2.5-year-olds.
- The **modality of cues** to “emptiness” (verbal vs. visual) **affected younger (but not older) children’s reasoning** with the disjunctive syllogism.
 - 2.5-year-olds chose the target cup significantly above change when presented with a linguistic cue (i.e., a negative statement), but at chance when presented with a visual cue (i.e., an empty cup).
 - Older children showed above chance performance in both conditions.
- Providing children with a negative proposition **verbally** rather than visually led to increased certainty in the relevant premise “NOT A”, thus leading to increased certainty in the conclusion.
 - If early successes in disjunctive reasoning tasks rely on probabilistic choices over multiple hypotheses, which are adjusted based on available evidence,⁴ linguistic evidence, as more reliable than visual evidence,⁸⁻⁹ led to higher degree of certainty in younger children’s guesses.

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