Children's quantification of time: A case study of the comparative "more"

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Background

- Despite the prevalence of temporal quantification in natural language (e.g., "That meeting was so long"), little is known about its acquisition
- Children struggle to learn time words[1-2], for multiple potential reasons: 1) Children may not discriminate temporal durations, 2) Children may struggle to map durations onto time words, and 3) Children may not view temporal magnitudes as a viable hypothesis for word meaning
- Three-year-old children understand the comparative "more" for number and space[3]

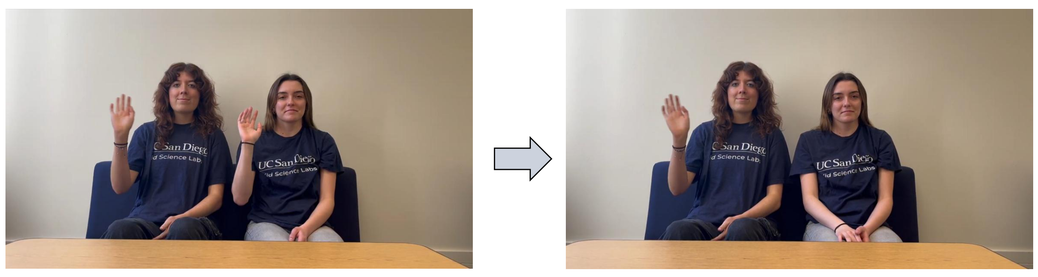
Current Project

- **Research goal:** Examine children's acquisition of "more" in the temporal domain as a case study of temporal quantification
- Can three-year-old children apply the meaning of "more" to time?
- How does children's comprehension of "more" for time compare to their comprehension for number?

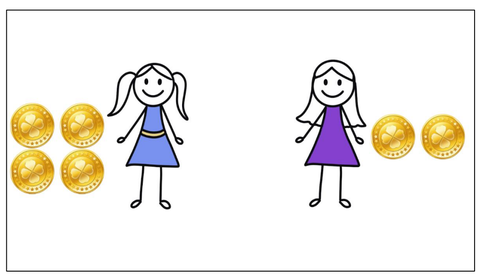
Experiment 1

Method

- Participants: 60 children (M_{age} = 3;10) performed two tasks
- Temporal Quantification Task (see below): Children made a "more" judgment between an eight-second event and a four-second event (e.g., "Who did more waving?")

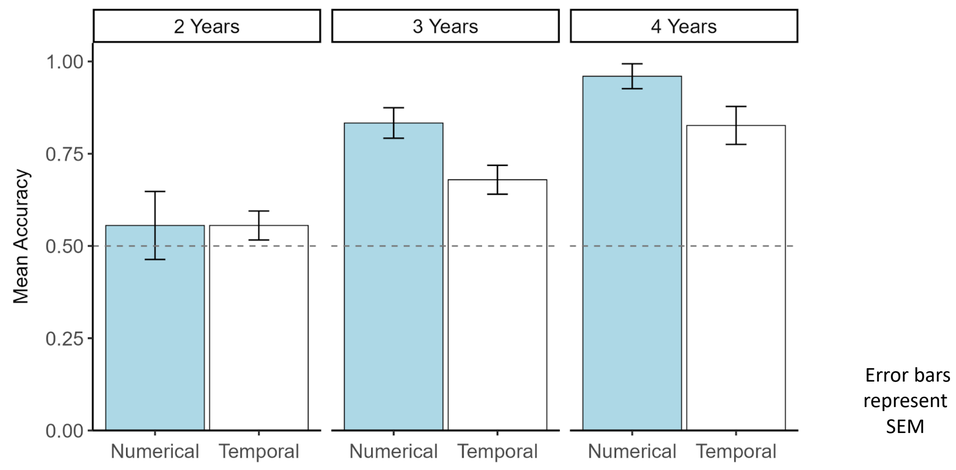


- Numerical Quantification Task (see right): Children made a "more" judgment for two groups of objects (e.g., "Who had more coins/pencils?")



Results

- Three-year-old children performed above chance in the Temporal Quantification Task (M = 0.68, SD = 0.2), p < .001
- Children performed better in the Numerical Quantification Task (M = 0.84) than the Temporal Quantification Task (M = 0.72), p = .001



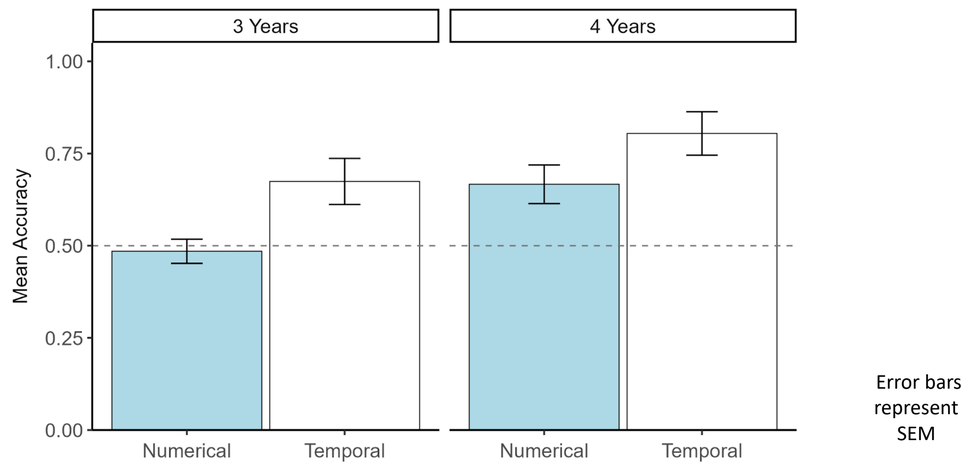
Experiment 2

Method

- Did children perform better on the numerical task in Exp. 1 because presentation was static and arrays were available at test, unlike in the temporal task?
- Participants: 90 children (M_{age} = 4;0)
- Children performed either the Temporal Quantification Task or a novel Numerical Quantification Task with sequential, video presentation of objects (see sample frame right)

Results

- Three-year-old children performed above chance in the Temporal Quantification Task (M = 0.67, SD = 0.29), p = .01
- Unlike in Exp. 1, children performed better in the Temporal Quantification Task (M = 0.74) than the Temporal Quantification Task (M = 0.58), p = .002



Experiment 3

- Could children's success on the Temporal Quantification Task in Exp. 1 and 2 be explained by a bias to select the person who performed the action last rather than comprehension of "more"?

Method

- 45 children (M_{age} = 4;0) completed the Temporal Quantification Task with a nonce word in place of "more" in the test question (e.g., "Who did *tiv* waving?")

Results

- Children chose the person who did the action longer (M = 0.62) less than children in Exp. 2 who heard "more" (M = 0.74), p = .02
- Performance in prior experiments cannot be fully explained by a response bias, rather suggesting comprehension of "more" for time

Discussion

- **Main finding:** Three-year-old children apply the meaning of "more" to temporal duration, around when they do so for number
- Why might children take several more years to learn other time words (e.g., "minute", "yesterday")[1-2] after learning "more" for duration?
- Due to inequivalent task demands, it cannot be concluded whether children acquire the meaning of "more" for number before time
  - Children may have performed better on number in Exp. 1 due to static presentation of arrays but worse in Exp. 2 due to working memory demands of sequential presentation of objects

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References

1. Tillman, K. A., & Barner, D. (2015). Learning the language of time: Children's acquisition of duration words. Cognitive Psychology, 78, 57–77.
2. Tillman, K. A., Marghetis, T., Barner, D., & Srinivasan, M. (2017). Today is tomorrow's yesterday: Children's acquisition of deictic time words. *Cognitive Psychology*, *92*, 87–100.
3. Odic, D., Pietroski, P., Hunter, T., Lidz, J., & Halberda, J. (2013). Young children's understanding of "more" and discrimination of number and surface area. *Journal of experimental psychology. Learning, memory, and cognition*, *39*(2), 451–461.