

Child-adult leading and responding in LENA recordings: quantitative measures that predict autism and other group differences

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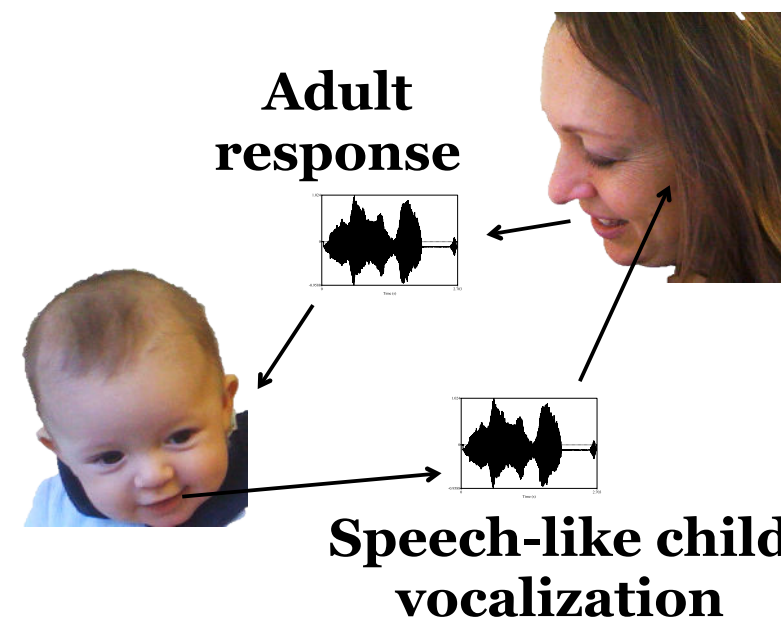
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Motivating questions

- Are child and adult interaction timings different in typical development vs. autism?
 - Reduced initiation of conversation is a diagnostic criterion (APA, 2000). Warren et al. (2010) found differences in LENA recordings at the conversation level. We extend this by investigating fine-grained interaction dynamics.*
- What is the relationship between child vocalization acoustics and adult responsiveness?
 - Sheinkopf et al. (2000) and Oller et al. (2010) have shown differences in the acoustics of vocalizations by children with autism. Speech delay is a diagnostic criterion for ASD (APA, 2000).*
 - Gros-Louis et al. (2006) and Goldstein & Schwade (2008) argue based on lab data for an important role of contingent response. We look at longer, very naturalistic samples. We also ask whether there are differences across autism, SES, and age groups in adult responses.*
- Is there a social feedback loop that is diminished in autism?



Data

- From the LENA Foundation's Autism and Normative Databases (Warren, Gilkerson, Richards, Oller, Xu, Yapanel, & Gray, 2010).
- 238 x 12+ hour recordings (5,256+ hours total)
- Longitudinal: 16- to 48-month-olds
- 26 children with autism, 72 typical
- Matching on age and mother's education
- Note: Overlap and "faint" segments are ignored (nontrivial assumptions; might differ across groups). Only segments with at least some speech-related.

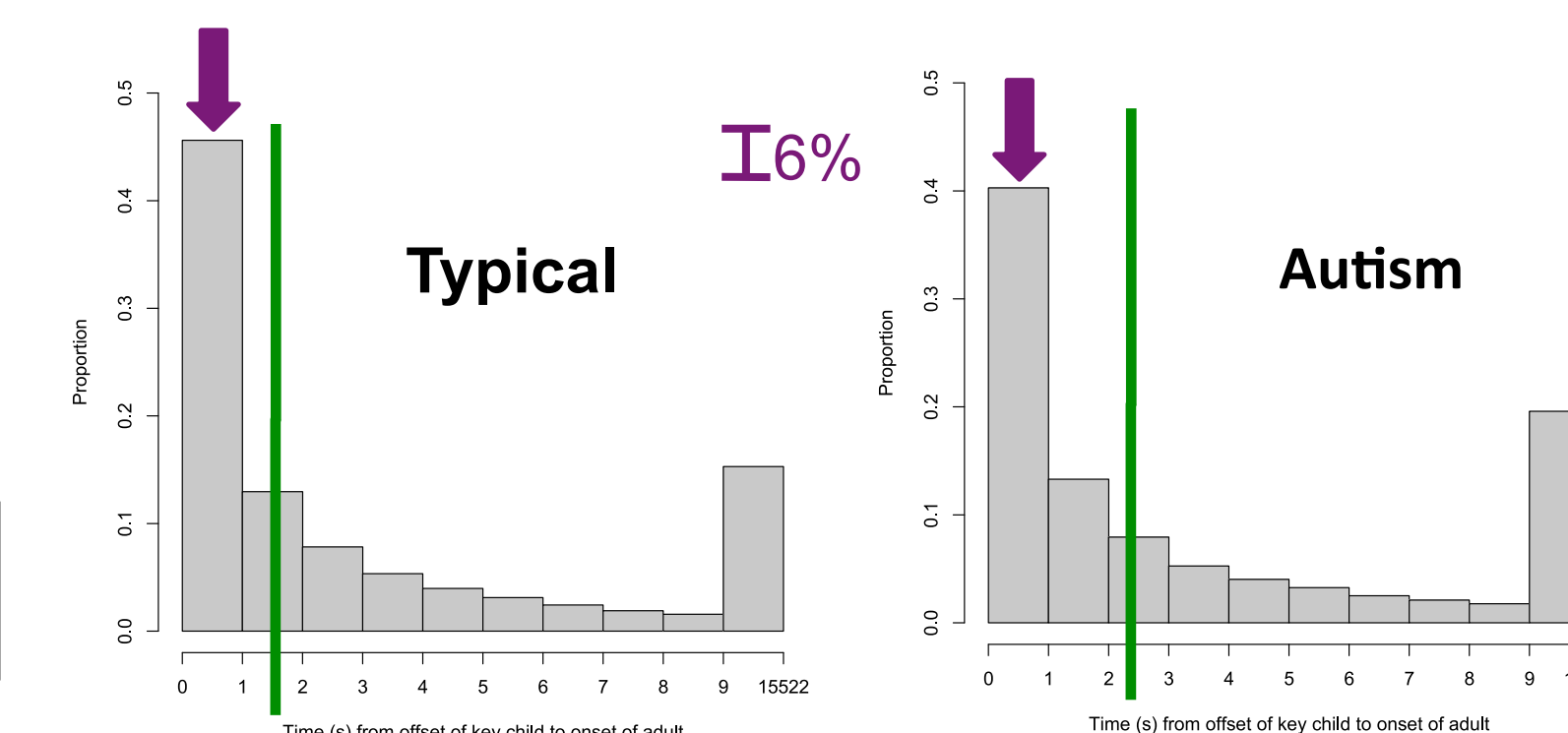
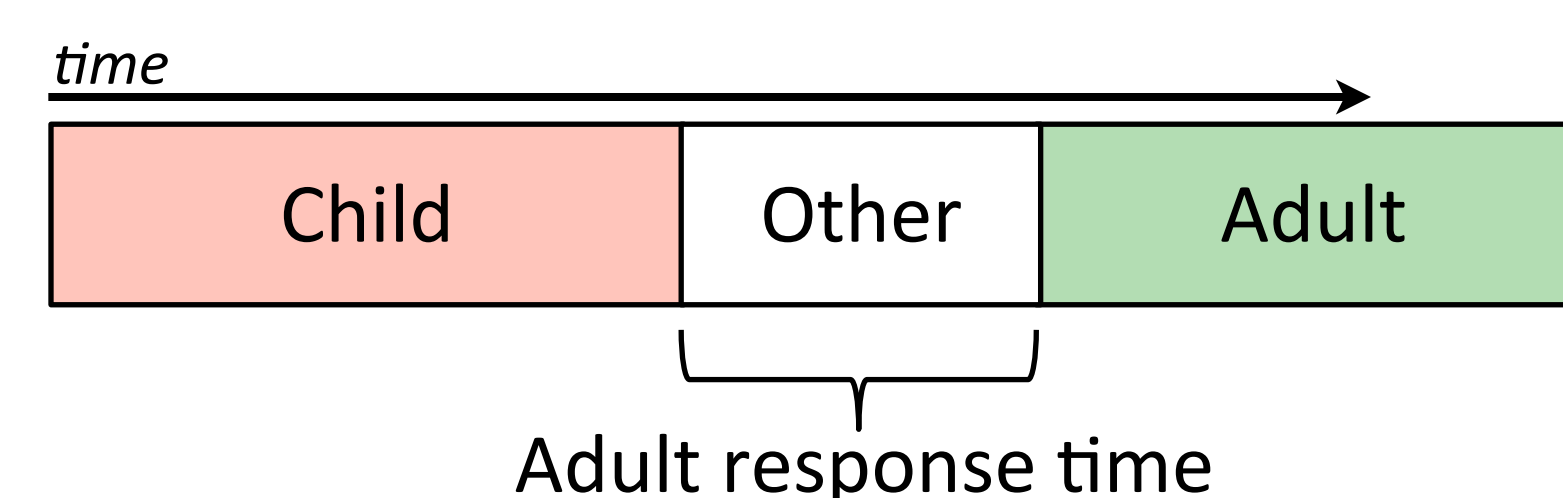
Two measures of leading and responding

(Warlaumont, Oller, Dale, Richards, Gilkerson, Xu, 2010)

A few lines from a LENA .its file

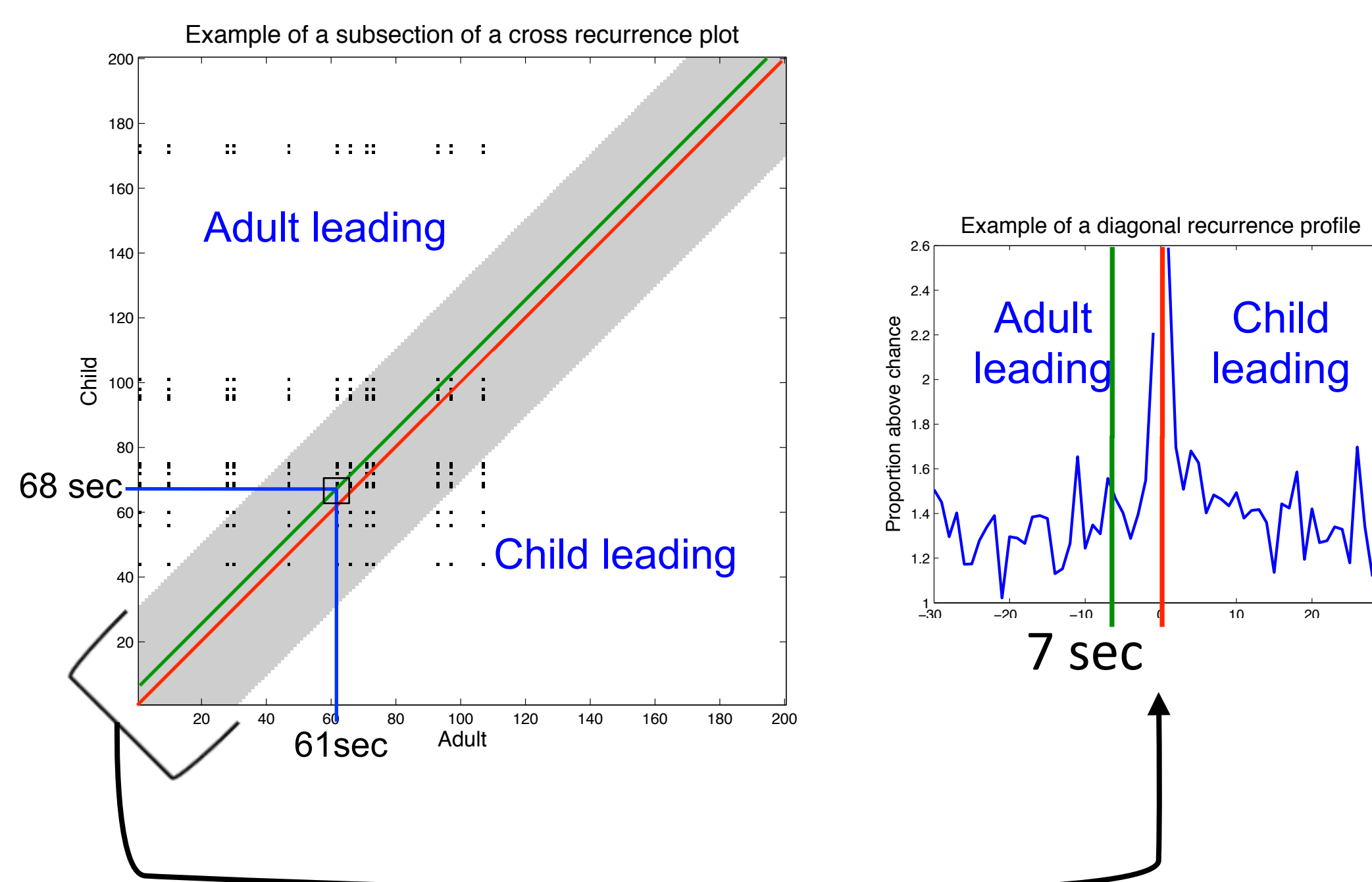
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1. Response Time

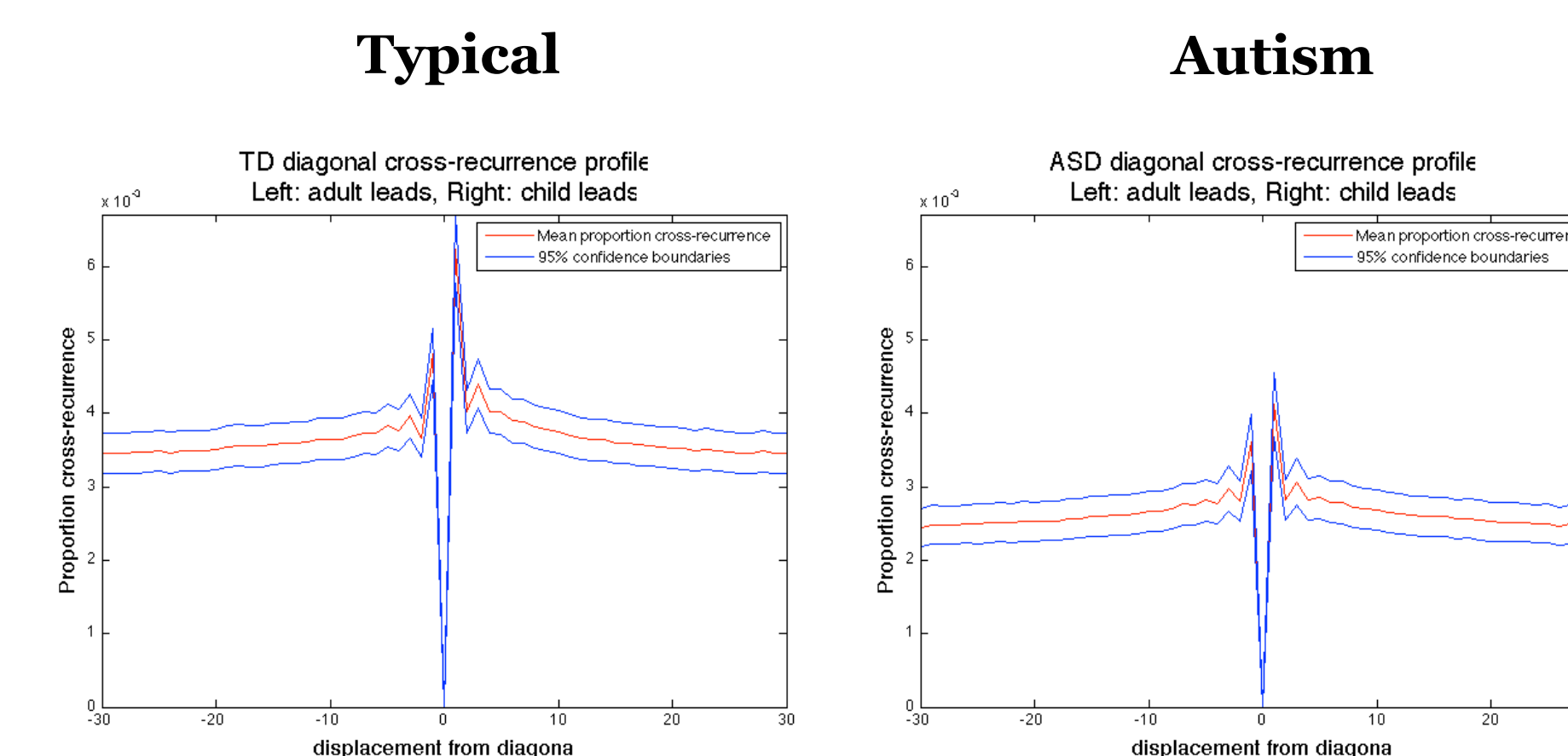


Proportionally fewer adult response times ≤ 1 sec in autism, $\beta = -.35, p < .001$
Median response time is lower in autism, $\beta = .33, p < .001$
A similar pattern was found as education decreases.

2. Diagonal cross-recurrence profile



(Dale, Warlaumont, & Richardson, in press)

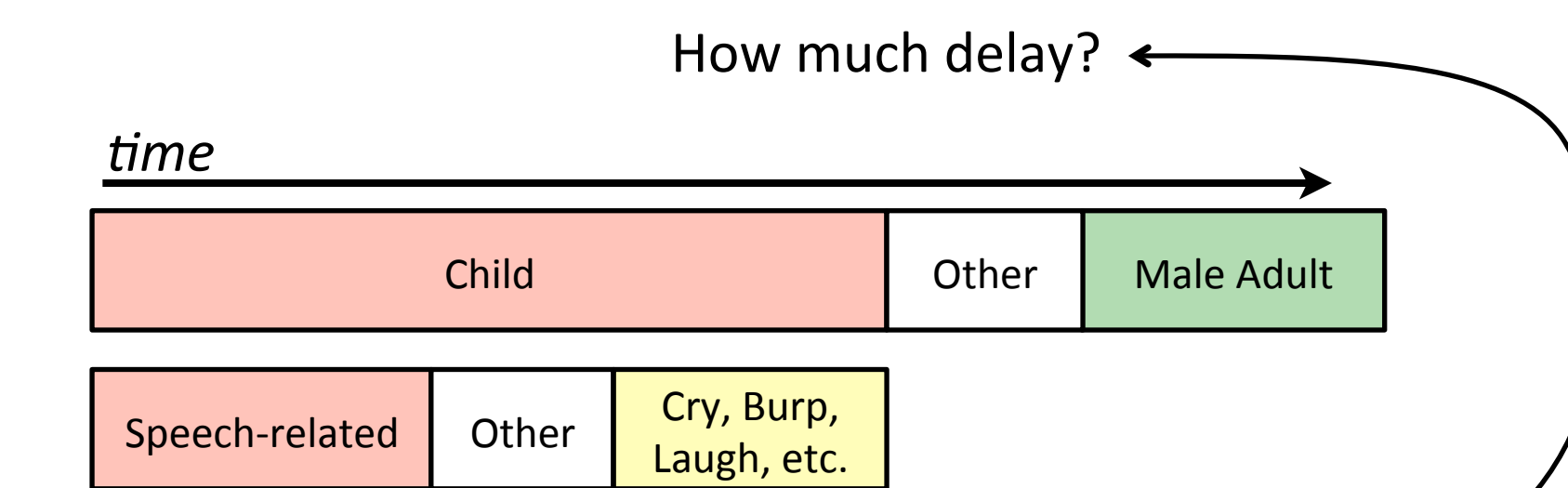


Overall height (i.e., overall cross-recurrence) is a general measure of amount of interaction.

- Lower in autism, $\beta = .238, p < .001$
- Higher with education, $\beta = -.310, p < .001$
- Higher with age, $\beta = .250, p < .001$

Right side < (Child leading relative to adult leading)
Left side
• Lower in autism, $\beta = .391, p < .001$
• Higher with education, $\beta = -.14, p = .01$

A relationship between adult response time and child



How much speech-related?

How much delay?

More speech-related vocalization predicts faster adult response, $p < 0.001$.

More cry/fixed/vegetative does not predict adult response.

In autism, less speech-related within each segment and more cry/vegetative/etc., $\beta = -0.07, p = 0.03$, and $\beta = 0.06, p = 0.01$.

As age increases, more speech-related and less cry/vegetative/etc. $\beta = .001, p < 0.001$, and $\beta = -.001, p = 0.003$.

Conclusions

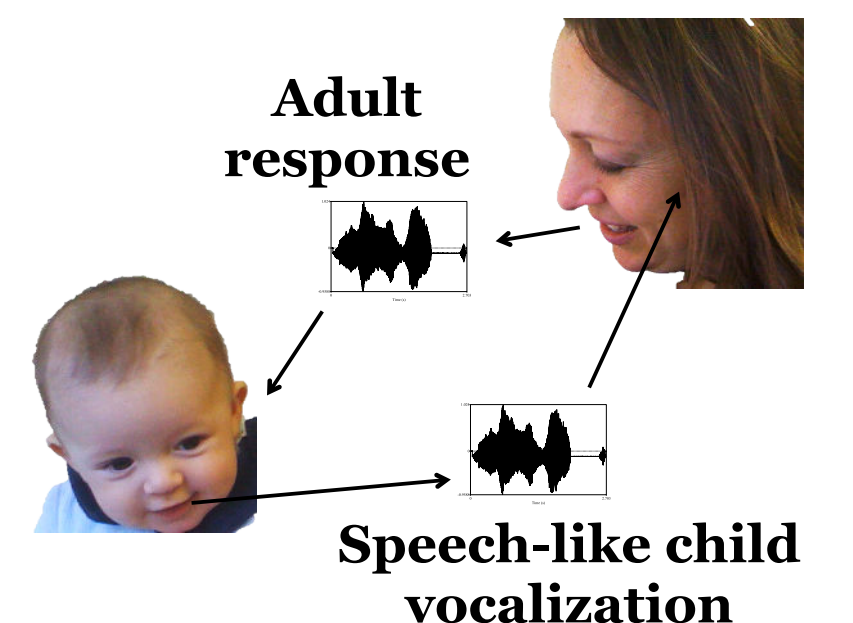
We use LENA for fine-grained analysis of interaction dynamics.

Differences found in autism:

- Lower overall level of interaction.
- The child does less leading and adult responses take longer and/or are fewer.
- Child produces less speech-related material.

For both groups, the quantity of speech-related utterance predicts adult response time.

Results suggest autism may diminish a healthy feedback loop involving child vocal maturation and adult contingent response.



Acknowledgements

- Special thanks to the LENA Foundation, Jeff Richards, Jill Gilkerson, Dongxin Xu, and Kim Coulter
- Funded by a U.S. Dept. of Energy Computational Science Graduate Fellowship, DE-FG02-97ER25308, and a University of Memphis Institute for Intelligent Systems Student Travel Award.

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