Supplementary Materials II for "The everyday speech environments of preschoolers with and without cochlear implants"

Evaluating the relationship between caregiver speech intensity and child vocal contingency

Unlike the dependent measure of percentage of contingent vocalizations presented in the main results of the paper, the measure of contingent vocalization *timing* presents repeated measures within each child allowing us to assess the relationship between acoustic characteristics of *each* caregiver utterance and the timing of the subsequent child vocalization. However, as described in the Methods of the paper, we stress that *we do not have contingent vocalizations that occurred between approximately 0.00001-599.99 ms due to the LENA algorithm's diarization method*. Nevertheless, we are able to evaluate the relationship between caregiver speech intensity and child vocalization contingency for the range of data that we do have access to.

We examined if the timing of caregiver-child communication was faster in response to a louder caregiver utterance. To examine this, we fit a linear mixed effects model with child-level random intercepts and conducted a forwards model fitting procedure for the fixed effects (see Table 1 for model summary). The best model fit included the interaction of the parameters **Adult speech intensity (dB)** (continuous, centered at 0) and **Hearing group** (contrast-coded with "Cochlear implant" as the reference level as we wished to examine how this group differed from the two groups of children with TH). Overall, there is a negative relationship between caregiver speech intensity and vocal contingency timing: all children respond faster to louder caregiver utterances, replicating the single-measure analysis reported in the paper. Since "Cochlear implant" is the **Hearing group** reference level, the **Adult speech intensity** parameter demonstrates that for every increased decibel of caregiver speech, the model predicts that children with CIs will respond 3.24 ms faster. Furthermore, the interaction model parameters in the summary demonstrate that both groups of children with TH have stronger relationships between caregiver speech intensity and vocal contingency than the children with CIs (slopes of -6.61 and -4.97 for chronological and hearing age matches, respectively). So, the effect of caregiver speech intensity is even *more* pronounced for children with TH than children with CIs. However, the model is fit to somewhat unrealistic data (missing any contingencies within that 0.00001-599.99 range), so these model

statistics should be interpreted with caution. Nevertheless, we present this result to demonstrate that the effect of caregiver speech and child vocal contingency replicates in another analysis.

Table 1

Model predicting timing (ms) of contingent vocalizations.

Parameter	Estimate	S.E.	z-statistic	df	p-value	95% CI
Intercept	1185.48	9.83	120.58	42.90	0.00	1165.65 – 1205.31
Adult speech intensity (dB)	-3.24	0.94	-3.45	17768.31	0.00	-5.07 – -1.4
Match:Chronological	-6.88	14.13	-0.49	46.25	0.63	-35.31 – 21.56
Match:Hearing Age	-20.09	14.59	-1.38	44.98	0.18	-49.47 – 9.29
Adult speech intensity*Chronological Matches	-3.37	1.36	-2.48	16826.20	0.01	-6.04 – -0.7
Adult speech intensity*Hearing Age Matches	-1.73	1.37	-1.26	18139.18	0.21	-4.42 – 0.96