

Supplemental Material S3. Additional analysis of duration of hearing aid (HA) use before cochlear implant (CI) surgery on tonal acquisition.

Twelve children with CIs also had a record of HA use before CI surgery (age at implantation: 1 child was implanted before age 2, 5 children were implanted from 2 to 3 years, 5 children were implanted from 3 to 4 years, and the remaining 1 child was implanted from 4 to 5 years; CI experience: 7 children had 2 to 3 years’ CI experience, 4 children had 1 to 2 years’ CI experience, and 2 children had less than 1 year of CI experience). Six of these children received HA and CI at the same time, and thus their HA experience before CI is 0 month; the other six children received the HAs at 1 to 19 months before the CI surgery.

To explore the effect of the length of HA experience before CI on these children’s tonal acquisition, we conducted regression analyses with HA experience before CI and other predictors on their tonal productions. The results are presented in Tables S3 to S7, showing that HA experience before CI was a significant predictor in predicting lexical tone, neutral tone and trisyllabic tone sandhi pitch productions from children with CIs, but with smaller effects than age at implantation, as reflected by the standardized coefficients. This suggests that long HA experience before CI might benefit children with CIs’ tonal acquisition, but early implantation is critical for them to acquire typical tone productions.

Table S3. Results of linear regression model of lexical tone pitch slopes with different predictors.

Predictor	ΔR^2	<i>B</i>	<i>SE (B)</i>	β	<i>p</i>
Tone category	0.54	—	—	—	—
HA experience before CI	0.08	0.010	0.003	0.074	< .05*
Age at implantation	0.28	0.001	0.005	0.306	< .01**
CI experience	0.09	0.030	0.005	-0.120	< .05*
Chronological age	0.06	-0.001	0.006	-0.007	< .05*
Residual hearing	0.04	-0.009	0.003	0.001	.091

Table S4. Results of linear regression model of neutral tone pitch slope with different predictors.

Predictor	ΔR^2	<i>B</i>	<i>SE (B)</i>	β	<i>p</i>
Context	0.03	0.239	0.042	0.172	< .05*
Type	0.03	-0.221	0.038	-0.180	< .05*
HA experience before CI	0.04	0.017	0.002	0.108	< .05*
Age at implantation	0.03	-0.021	0.004	-0.286	< .05*
CI experience	0.01	-0.004	0.004	-0.277	.285
Chronological age	0.04	0.013	0.005	0.108	< .05*
Residual hearing	0.02	-0.012	0.003	-0.161	< .05*

Table S5. Results of linear regression model of neutral tone duration with different predictors.

Predictor	ΔR^2	<i>B</i>	<i>SE (B)</i>	β	<i>p</i>
Context	0.03	0.224	0.121	0.149	.072
Type	0.16	-0.480	0.112	-0.361	< .001***
HA experience before CI	0.05	0.002	0.010	0.025	.828
Age at implantation	0.16	0.312	0.163	4.624	< .05*
CI experience	0.06	0.338	0.163	4.361	< .05*
Chronological age	0.04	-0.260	0.152	-1.980	.087
Residual hearing	0.06	0.019	0.011	0.226	< .05*

Table S6. Results of linear regression model of pitch slope of disyllabic tone sandhi words (Syllable 1) with different predictors.

Predictor	ΔR^2	<i>B</i>	<i>SE (B)</i>	β	<i>p</i>
Context	0.06	0.353	0.023	0.243	< .001***
HA experience before CI	0.01	0.001	0.001	0.014	.539
Age at implantation	0.09	0.011	0.002	0.147	< .001***
CI experience	0.04	0.001	0.002	0.118	< .001***
Chronological age	0.03	-0.010	0.002	-0.095	< .001***
Residual hearing	0.03	0.008	0.001	0.002	.935

Table S7. Results of linear regression model of pitch slope of trisyllabic tone sandhi words (Syllables 1 and 2) with different predictors.

Predictor	Syllable	ΔR^2	<i>B</i>	<i>SE (B)</i>	β	<i>p</i>
Context	1	0.01	0.029	0.042	0.03	.492
	2	0.08	0.355	0.048	0.3	< .001***
HA experience before CI	1	0.03	0.008	0.003	0.203	< .001***
	2	0.01	-0.159	0.003	-0.308	< .001***
Age at implantation	1	0.08	-0.007	0.004	-0.283	< .05*
	2	0.2	0.042	0.004	0.664	< .001***
CI experience	1	0.01	0.005	0.003	-0.265	.154
	2	0.01	-0.007	0.004	-0.085	.069
Chronological age	1	0.07	-0.023	0.004	-0.131	< .001***
	2	0.01	-0.009	0.005	-0.098	.050
Residual hearing	1	0.05	-0.013	0.003	0.072	< .001***
	2	0.01	0.001	0.003	0.016	.732