

Supplementary Section: The phonetics of tone and voice quality interactions in Sylheti

The one-way ANOVA is done for all the parameters (CPP, Energy, H1*-H2*, H1*-A1*, H1*-A2*, and H1*-A3*) in SPSS (version 26). The $p < 0.05$ is considered to be significant in our study. The summary results are given below in Table T1-T12.

Table T1: ANOVA_CPP_F

		Sum of Squares	df	Mean Square	F	Sig.
CPP_T1	Between Groups	9.089	1	9.089	.513	.476
	Within Groups	1897.083	107	17.730		
	Total	1906.172	108			
CPP_T2	Between Groups	.378	1	.378	.032	.858
	Within Groups	1253.705	107	11.717		
	Total	1254.083	108			
CPP_T3	Between Groups	3.648	1	3.648	.643	.424
	Within Groups	606.713	107	5.670		
	Total	610.361	108			
CPP_T4	Between Groups	7.725	1	7.725	2.170	.144
	Within Groups	380.883	107	3.560		
	Total	388.608	108			
CPP_T5	Between Groups	2.638	1	2.638	.699	.405
	Within Groups	404.022	107	3.776		
	Total	406.660	108			
CPP_T6	Between Groups	.029	1	.029	.007	.936

	Within Groups	475.803	107	4.447		
	Total	475.832	108			
CPP_T7	Between Groups	.150	1	.150	.030	.862
	Within Groups	533.387	107	4.985		
	Total	533.538	108			
CPP_T8	Between Groups	5.217	1	5.217	.683	.411
	Within Groups	817.679	107	7.642		
	Total	822.896	108			
CPP_T9	Between Groups	46.719	1	46.719	4.348	.039
	Within Groups	1149.763	107	10.745		
	Total	1196.482	108			

Table T2: ANOVA_Energy_F

		Sum of Squares	df	Mean Square	F	Sig.
Energy_T1	Between Groups	1320.578	1	1320.578	.562	.456
	Within Groups	183400.430	78	2351.288		
	Total	184721.008	79			
Energy_T2	Between Groups	506.474	1	506.474	.227	.635
	Within Groups	174249.909	78	2233.973		
	Total	174756.383	79			
Energy_T3	Between Groups	22.336	1	22.336	.010	.920
	Within Groups	170853.894	78	2190.435		
	Total	170876.230	79			
Energy_T4	Between Groups	105.991	1	105.991	.047	.829
	Within Groups	175995.565	78	2256.353		
	Total	176101.557	79			
Energy_T5	Between Groups	160.041	1	160.041	.068	.795
	Within Groups	183688.917	78	2354.986		
	Total	183848.958	79			
Energy_T6	Between Groups	138.091	1	138.091	.061	.806
	Within Groups	176519.350	78	2263.069		
	Total	176657.441	79			
Energy_T7	Between Groups	295.511	1	295.511	.139	.710
	Within Groups	166040.345	78	2128.722		
	Total	166335.856	79			
Energy_T8	Between Groups	458.825	1	458.825	.217	.643
	Within Groups	164836.130	78	2113.284		

	Total	165294.956	79			
Energy_T9	Between Groups	33.788	1	33.788	.015	.901
	Within Groups	170381.848	78	2184.383		
	Total	170415.636	79			

Table T3: ANOVA_CPP_M

		Sum of Squares	df	Mean Square	F	Sig.
CPP_T1	Between Groups	14.943	1	14.943	1.302	.256
	Within Groups	1228.277	107	11.479		
	Total	1243.221	108			
CPP_T2	Between Groups	34.174	1	34.174	3.193	.077
	Within Groups	1145.117	107	10.702		
	Total	1179.291	108			
CPP_T5	Between Groups	143.653	1	143.653	15.483	.000
	Within Groups	992.786	107	9.278		
	Total	1136.439	108			
CPP_T3	Between Groups	85.544	1	85.544	8.450	.004
	Within Groups	1083.207	107	10.123		
	Total	1168.751	108			
CPP_T4	Between Groups	104.799	1	104.799	11.128	.001
	Within Groups	1007.686	107	9.418		
	Total	1112.485	108			
CPP_T6	Between Groups	145.068	1	145.068	13.549	.000
	Within Groups	1145.660	107	10.707		
	Total	1290.728	108			

CPP_T7	Between Groups	252.202	1	252.202	25.268	.000
	Within Groups	1067.977	107	9.981		
	Total	1320.178	108			
CPP_T8	Between Groups	222.886	1	222.886	20.726	.000
	Within Groups	1150.680	107	10.754		
	Total	1373.566	108			
CPP_T9	Between Groups	116.212	1	116.212	10.380	.002
	Within Groups	1197.953	107	11.196		
	Total	1314.165	108			

Table T4: ANOVA_Energy_M

		Sum of Squares	df	Mean Square	F	Sig.
Energy_T1	Between Groups	8734.154	1	8734.154	1.555	.215
	Within Groups	600999.866	107	5616.821		
	Total	609734.020	108			
Energy_T2	Between Groups	3306.924	1	3306.924	.615	.435
	Within Groups	575269.098	107	5376.347		
	Total	578576.021	108			
Energy_T3	Between Groups	2177.054	1	2177.054	.420	.518
	Within Groups	554029.067	107	5177.842		
	Total	556206.121	108			
Energy_T4	Between Groups	1519.094	1	1519.094	.297	.587
	Within Groups	546465.090	107	5107.150		
	Total	547984.183	108			
Energy_T5	Between Groups	762.004	1	762.004	.161	.689
	Within Groups	505079.780	107	4720.372		
	Total	505841.785	108			
Energy_T6	Between Groups	233.868	1	233.868	.055	.815
	Within Groups	453089.857	107	4234.485		
	Total	453323.726	108			
Energy_T7	Between Groups	.007	1	.007	.000	.999
	Within Groups	411109.745	107	3842.147		
	Total	411109.751	108			
Energy_T8	Between Groups	6.569	1	6.569	.002	.966
	Within Groups	393854.422	107	3680.882		
	Total	393860.992	108			
Energy_T9	Between Groups	193.145	1	193.145	.047	.829
	Within Groups	442746.869	107	4137.821		

	Total	442940.014	108			
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Table T5: ANOVA_H1*-H2*_F

		Sum of Squares	df	Mean Square	F	Sig.
H1H2_T1	Between Groups	196.076	1	196.076	12.520	.001
	Within Groups	1221.590	78	15.661		
	Total	1417.666	79			
H1H2_T2	Between Groups	182.055	1	182.055	12.534	.001
	Within Groups	1132.935	78	14.525		
	Total	1314.990	79			
H1H2_T3	Between Groups	171.121	1	171.121	13.461	.000
	Within Groups	991.560	78	12.712		
	Total	1162.681	79			
H1H2_T4	Between Groups	181.390	1	181.390	13.948	.000
	Within Groups	1014.333	78	13.004		
	Total	1195.723	79			
H1H2_T5	Between Groups	54.148	1	54.148	4.052	.048
	Within Groups	1042.283	78	13.363		
	Total	1096.432	79			
H1H2_T6	Between Groups	7.780	1	7.780	.408	.525
	Within Groups	1485.628	78	19.047		
	Total	1493.409	79			
H1H2_T7	Between Groups	2.968	1	2.968	.185	.668
	Within Groups	1248.977	78	16.013		
	Total	1251.945	79			
H1H2_T8	Between Groups	12.096	1	12.096	.673	.415
	Within Groups	1402.702	78	17.983		
	Total	1414.798	79			
H1H2_T9	Between Groups	.410	1	.410	.020	.887

	Within Groups	1578.782	78	20.241		
	Total	1579.192	79			

Table T6: ANOVA_H1*-A1*_F

		Sum of Squares	df	Mean Square	F	Sig.
H1A1_T1	Between Groups	.002	1	.002	.000	.997
	Within Groups	11492.594	78	147.341		
	Total	11492.597	79			
H1A1_T2	Between Groups	7.495	1	7.495	.064	.800
	Within Groups	9086.024	78	116.487		
	Total	9093.520	79			
H1A1_T3	Between Groups	34.967	1	34.967	.541	.464
	Within Groups	5038.664	78	64.598		
	Total	5073.631	79			
H1A1_T4	Between Groups	76.206	1	76.206	2.042	.157
	Within Groups	2910.870	78	37.319		
	Total	2987.076	79			
H1A1_T5	Between Groups	270.353	1	270.353	11.687	.001
	Within Groups	1804.436	78	23.134		
	Total	2074.789	79			
H1A1_T6	Between Groups	309.414	1	309.414	14.079	.000
	Within Groups	1714.228	78	21.977		
	Total	2023.642	79			
H1A1_T7	Between Groups	156.639	1	156.639	7.059	.010
	Within Groups	1730.865	78	22.191		
	Total	1887.504	79			
H1A1_T8	Between Groups	199.940	1	199.940	5.576	.021
	Within Groups	2796.760	78	35.856		

	Total	2996.699	79			
H1A1_T9	Between Groups	62.720	1	62.720	1.213	.274
	Within Groups	4033.946	78	51.717		
	Total	4096.667	79			

Table T7: ANOVA_H1*-A2*_F

		Sum of Squares	df	Mean Square	F	Sig.
H1A2_T1	Between Groups	55.419	1	55.419	.524	.471
	Within Groups	8247.441	78	105.736		
	Total	8302.860	79			
H1A2_T2	Between Groups	182.432	1	182.432	1.982	.163
	Within Groups	7177.741	78	92.022		
	Total	7360.173	79			
H1A2_T3	Between Groups	230.452	1	230.452	2.324	.131
	Within Groups	7734.397	78	99.159		
	Total	7964.850	79			
H1A2_T4	Between Groups	501.759	1	501.759	5.185	.026
	Within Groups	7548.063	78	96.770		
	Total	8049.822	79			
H1A2_T5	Between Groups	939.403	1	939.403	10.532	.002
	Within Groups	6957.547	78	89.199		
	Total	7896.950	79			
H1A2_T6	Between Groups	917.634	1	917.634	12.577	.001
	Within Groups	5690.849	78	72.960		
	Total	6608.482	79			
H1A2_T7	Between Groups	481.671	1	481.671	9.345	.003
	Within Groups	4020.153	78	51.540		
	Total	4501.824	79			
H1A2_T8	Between Groups	441.169	1	441.169	8.039	.006
	Within Groups	4280.698	78	54.881		

	Total	4721.867	79			
H1A2_T9	Between Groups	86.598	1	86.598	1.277	.262
	Within Groups	5289.872	78	67.819		
	Total	5376.470	79			

Table T8: ANOVA_H1*-A3*_F

		Sum of Squares	df	Mean Square	F	Sig.
H1A3_T1	Between Groups	46.623	1	46.623	.407	.526
	Within Groups	8943.752	78	114.663		
	Total	8990.375	79			
H1A3_T2	Between Groups	158.956	1	158.956	1.674	.200
	Within Groups	7407.538	78	94.968		
	Total	7566.494	79			
H1A3_T3	Between Groups	474.065	1	474.065	5.518	.021
	Within Groups	6701.259	78	85.914		
	Total	7175.324	79			
H1A3_T4	Between Groups	1112.783	1	1112.783	11.066	.001
	Within Groups	7843.305	78	100.555		
	Total	8956.088	79			
H1A3_T5	Between Groups	1828.244	1	1828.244	15.415	.000
	Within Groups	9250.974	78	118.602		
	Total	11079.217	79			
H1A3_T6	Between Groups	1642.623	1	1642.623	15.341	.000
	Within Groups	8351.901	78	107.076		
	Total	9994.524	79			
H1A3_T7	Between Groups	1370.119	1	1370.119	13.899	.000
	Within Groups	7689.008	78	98.577		
	Total	9059.126	79			
H1A3_T8	Between Groups	1135.332	1	1135.332	16.271	.000

	Within Groups	5442.472	78	69.775		
	Total	6577.804	79			
H1A3_T9	Between Groups	267.160	1	267.160	5.135	.026
	Within Groups	4057.766	78	52.023		
	Total	4324.925	79			

Table T9: ANOVA_H1*-H2*_M

		Sum of Squares	df	Mean Square	F	Sig.
H1H2_T1	Between Groups	3.651	1	3.651	.191	.663
	Within Groups	2043.068	107	19.094		
	Total	2046.719	108			
H1H2_T2	Between Groups	3.260	1	3.260	.191	.663
	Within Groups	1828.981	107	17.093		
	Total	1832.241	108			
H1H2_T3	Between Groups	12.210	1	12.210	.712	.401
	Within Groups	1834.616	107	17.146		
	Total	1846.827	108			
H1H2_T4	Between Groups	3.946	1	3.946	.252	.617
	Within Groups	1675.909	107	15.663		
	Total	1679.856	108			
H1H2_T5	Between Groups	4.016	1	4.016	.233	.630
	Within Groups	1840.921	107	17.205		
	Total	1844.938	108			
H1H2_T6	Between Groups	10.378	1	10.378	.603	.439
	Within Groups	1840.737	107	17.203		
	Total	1851.115	108			
H1H2_T7	Between Groups	10.666	1	10.666	.588	.445
	Within Groups	1939.545	107	18.127		
	Total	1950.211	108			

H1H2_T8	Between Groups	.843	1	.843	.042	.838
	Within Groups	2141.208	107	20.011		
	Total	2142.050	108			
H1H2_T9	Between Groups	.795	1	.795	.037	.847
	Within Groups	2276.646	107	21.277		
	Total	2277.441	108			

Table T10: ANOVA_H1*-A1*_M

		Sum of Squares	df	Mean Square	F	Sig.
H1A1_T1	Between Groups	6.815	1	6.815	.067	.796
	Within Groups	18939.452	187	101.280		
	Total	18946.267	188			
H1A1_T2	Between Groups	.087	1	.087	.001	.973
	Within Groups	14442.258	187	77.231		
	Total	14442.345	188			
H1A1_T3	Between Groups	55.355	1	55.355	1.002	.318
	Within Groups	10330.316	187	55.242		
	Total	10385.670	188			
H1A1_T4	Between Groups	101.118	1	101.118	2.312	.130
	Within Groups	8179.186	187	43.739		
	Total	8280.304	188			
H1A1_T5	Between Groups	154.448	1	154.448	3.804	.053
	Within Groups	7593.079	187	40.605		
	Total	7747.527	188			
H1A1_T6	Between Groups	108.504	1	108.504	2.498	.116
	Within Groups	8121.609	187	43.431		
	Total	8230.114	188			
H1A1_T7	Between Groups	35.892	1	35.892	.887	.347

	Within Groups	7563.744	187	40.448		
	Total	7599.636	188			
H1A1_T8	Between Groups	25.167	1	25.167	.504	.479
	Within Groups	9338.980	187	49.941		
	Total	9364.147	188			
H1A1_T9	Between Groups	6.721	1	6.721	.126	.723
	Within Groups	10005.259	187	53.504		
	Total	10011.979	188			

Table T11: ANOVA_H1*-A2*_M

		Sum of Squares	df	Mean Square	F	Sig.
H1A2_T1	Between Groups	47.829	1	47.829	.542	.462
	Within Groups	16492.495	187	88.195		
	Total	16540.324	188			
H1A2_T2	Between Groups	243.669	1	243.669	3.198	.075
	Within Groups	14249.384	187	76.200		
	Total	14493.053	188			
H1A2_T3	Between Groups	534.312	1	534.312	6.714	.010
	Within Groups	14881.400	187	79.580		
	Total	15415.712	188			
H1A2_T4	Between Groups	936.918	1	936.918	10.956	.001
	Within Groups	15992.025	187	85.519		
	Total	16928.943	188			
H1A2_T5	Between Groups	1367.298	1	1367.298	14.485	.000
	Within Groups	17652.094	187	94.396		
	Total	19019.392	188			
H1A2_T6	Between Groups	1260.902	1	1260.902	13.720	.000
	Within Groups	17185.859	187	91.903		
	Total	18446.761	188			

H1A2_T7	Between Groups	555.370	1	555.370	7.061	.009
	Within Groups	14707.391	187	78.649		
	Total	15262.761	188			
H1A2_T8	Between Groups	333.544	1	333.544	3.923	.059
	Within Groups	15899.149	187	85.022		
	Total	16232.693	188			
H1A2_T9	Between Groups	108.541	1	108.541	1.293	.257
	Within Groups	15694.632	187	83.929		
	Total	15803.173	188			

Table T12: ANOVA_H1*-A3*_M

		Sum of Squares	df	Mean Square	F	Sig.
H1A3_T1	Between Groups	.078	1	.078	.001	.979
	Within Groups	20662.791	187	110.496		
	Total	20662.870	188			
H1A3_T2	Between Groups	19.059	1	19.059	.211	.646
	Within Groups	16875.558	187	90.244		
	Total	16894.617	188			
H1A3_T3	Between Groups	225.370	1	225.370	2.527	.114
	Within Groups	16676.325	187	89.178		
	Total	16901.694	188			
H1A3_T4	Between Groups	567.303	1	567.303	5.292	.063
	Within Groups	20046.601	187	107.201		
	Total	20613.905	188			
H1A3_T5	Between Groups	868.909	1	868.909	6.889	.509
	Within Groups	23587.751	187	126.138		
	Total	24456.660	188			
H1A3_T6	Between Groups	790.287	1	790.287	6.134	.114
	Within Groups	24093.953	187	128.845		

	Total	24884.240	188			
H1A3_T7	Between Groups	611.727	1	611.727	5.051	.265
	Within Groups	22645.750	187	121.100		
	Total	23257.477	188			
H1A3_T8	Between Groups	467.426	1	467.426	4.318	.391
	Within Groups	20244.589	187	108.260		
	Total	20712.015	188			
H1A3_T9	Between Groups	72.126	1	72.126	.785	.377
	Within Groups	17191.317	187	91.932		
	Total	17263.443	188			

Tables T13-T24 describe the output of the statistical models.

Table T13: CPP

Residuals:

Min	1Q	Median	3Q	Max
-12.8048	-1.9346	0.2094	2.0505	10.7919

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	19.27608	0.34909	55.219	< 2e-16	***
ToneT	-0.98909	0.14812	-6.678	3.28e-11	***
GenderM	0.08881	0.44944	0.198	0.843376	
TimeT2	4.69857	0.48355	9.717	< 2e-16	***
TimeT3	7.72031	0.48355	15.966	< 2e-16	***
TimeT4	9.06166	0.48355	18.740	< 2e-16	***
TimeT5	10.05077	0.48355	20.785	< 2e-16	***
TimeT6	10.55296	0.48355	21.824	< 2e-16	***
TimeT7	10.38422	0.48355	21.475	< 2e-16	***
TimeT8	9.46452	0.48355	19.573	< 2e-16	***
TimeT9	8.14960	0.48355	16.854	< 2e-16	***
GenderM:TimeT2	-2.16335	0.63551	-3.404	0.000679	***
GenderM:TimeT3	-2.90418	0.63551	-4.570	5.24e-06	***
GenderM:TimeT4	-2.56009	0.63551	-4.028	5.86e-05	***
GenderM:TimeT5	-2.90725	0.63551	-4.575	5.12e-06	***
GenderM:TimeT6	-3.39589	0.63551	-5.344	1.04e-07	***
GenderM:TimeT7	-3.52532	0.63551	-5.547	3.36e-08	***
GenderM:TimeT8	-3.31406	0.63551	-5.215	2.07e-07	***
GenderM:TimeT9	-3.71415	0.63551	-5.844	6.09e-09	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '.' 0.1 ' ' 1

Residual standard error: 3.058 on 1691 degrees of freedom
Multiple R-squared: 0.5061, Adjusted R-squared: 0.5008
F-statistic: 96.25 on 18 and 1691 DF, p-value: < 2.2e-16

Table T14: Energy

Residuals:

Min	1Q	Median	3Q	Max
-212.273	-37.296	7.952	42.188	199.003

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	129.716	6.854	18.925	<2e-16	***
ToneL	3.433	2.917	1.177	0.2393	
GenderM	75.511	8.841	8.541	<2e-16	***
TimeT2	9.313	9.493	0.981	0.3267	
TimeT3	9.526	9.493	1.003	0.3158	
TimeT4	9.006	9.493	0.949	0.3429	
TimeT5	8.554	9.493	0.901	0.3677	
TimeT6	5.813	9.493	0.612	0.5404	
TimeT7	2.882	9.493	0.304	0.7615	
TimeT8	-2.936	9.493	-0.309	0.7572	
TimeT9	-22.331	9.493	-2.352	0.0188	*
GenderM:TimeT2	5.279	12.501	0.422	0.6729	
GenderM:TimeT3	9.869	12.501	0.789	0.4299	
GenderM:TimeT4	11.583	12.501	0.927	0.3543	
GenderM:TimeT5	9.965	12.501	0.797	0.4255	
GenderM:TimeT6	8.167	12.501	0.653	0.5136	
GenderM:TimeT7	2.473	12.501	0.198	0.8432	
GenderM:TimeT8	-7.238	12.501	-0.579	0.5627	
GenderM:TimeT9	-11.934	12.501	-0.955	0.3399	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 60.04 on 1682 degrees of freedom
Multiple R-squared: 0.3263, Adjusted R-squared: 0.3191
F-statistic: 45.25 on 18 and 1682 DF, p-value: < 2.2e-16

Table T15: H1*-H2*

Residuals:

Min	1Q	Median	3Q	Max
-16.5514	-2.6607	-0.4034	2.3934	13.2644

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	3.6731	0.4762	7.713	2.08e-14	***
ToneL	0.9643	0.2017	4.780	1.90e-06	***
GenderM	-1.6470	0.6115	-2.694	0.00714	**
TimeT2	-1.4874	0.6566	-2.265	0.02362	*
TimeT3	-1.5655	0.6566	-2.384	0.01722	*

TimeT4	-0.8445	0.6566	-1.286	0.19853
TimeT5	-0.4125	0.6566	-0.628	0.52991
TimeT6	-0.3387	0.6566	-0.516	0.60604
TimeT7	-0.3583	0.6566	-0.546	0.58530
TimeT8	0.1533	0.6566	0.233	0.81544
TimeT9	0.6675	0.6566	1.017	0.30949
GenderM:TimeT2	1.1681	0.8646	1.351	0.17687
GenderM:TimeT3	1.3935	0.8646	1.612	0.10720
GenderM:TimeT4	0.7732	0.8646	0.894	0.37132
GenderM:TimeT5	0.3288	0.8646	0.380	0.70376
GenderM:TimeT6	0.3233	0.8646	0.374	0.70851
GenderM:TimeT7	0.4529	0.8646	0.524	0.60048
GenderM:TimeT8	0.0883	0.8646	0.102	0.91866
GenderM:TimeT9	-0.1385	0.8646	-0.160	0.87279

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 4.153 on 1682 degrees of freedom
Multiple R-squared: 0.04618, Adjusted R-squared: 0.03597
F-statistic: 4.524 on 18 and 1682 DF, p-value: 8.904e-10

Table T16: H1*-A1*

Residuals:

Min	1Q	Median	3Q	Max
-18.217	-5.113	-1.022	3.959	27.866

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	20.53243	0.85474	24.022	<2e-16	***
ToneL	0.78114	0.36370	2.148	0.0319	*
GenderM	-0.25062	1.10248	-0.227	0.8202	
TimeT2	-0.67159	1.18383	-0.567	0.5706	
TimeT3	-0.08424	1.18383	-0.071	0.9433	
TimeT4	0.11860	1.18383	0.100	0.9202	
TimeT5	0.09140	1.18383	0.077	0.9385	
TimeT6	0.09139	1.18383	0.077	0.9385	
TimeT7	0.73689	1.18383	0.622	0.5337	
TimeT8	0.76850	1.18383	0.649	0.5163	
TimeT9	1.17041	1.18383	0.989	0.3230	
GenderM:TimeT2	0.32428	1.55886	0.208	0.8352	
GenderM:TimeT3	0.35573	1.55886	0.228	0.8195	
GenderM:TimeT4	0.89315	1.55886	0.573	0.5668	
GenderM:TimeT5	1.36962	1.55886	0.879	0.3797	
GenderM:TimeT6	1.75945	1.55886	1.129	0.2592	
GenderM:TimeT7	1.15242	1.55886	0.739	0.4598	
GenderM:TimeT8	1.64117	1.55886	1.053	0.2926	
GenderM:TimeT9	1.84415	1.55886	1.183	0.2370	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 7.487 on 1682 degrees of freedom

Multiple R-squared: 0.01949, Adjusted R-squared: 0.008994
F-statistic: 1.857 on 18 and 1682 DF, p-value: 0.01553

Table T17: H1*-A2*

Residuals:

Min	1Q	Median	3Q	Max
-32.711	-5.071	-0.083	5.712	26.107

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	19.8114	1.0328	19.183	< 2e-16	***
ToneL	3.0505	0.4395	6.942	5.52e-12	***
GenderM	0.7680	1.3321	0.577	0.56432	
TimeT2	-1.9016	1.4304	-1.329	0.18388	
TimeT3	-2.1583	1.4304	-1.509	0.13151	
TimeT4	-3.2614	1.4304	-2.280	0.02273	*
TimeT5	-4.2463	1.4304	-2.969	0.00303	**
TimeT6	-3.7525	1.4304	-2.623	0.00878	**
TimeT7	-2.9937	1.4304	-2.093	0.03650	*
TimeT8	-2.6979	1.4304	-1.886	0.05945	.
TimeT9	-2.0172	1.4304	-1.410	0.15865	
GenderM:TimeT2	1.5853	1.8835	0.842	0.40009	
GenderM:TimeT3	1.5765	1.8835	0.837	0.40273	
GenderM:TimeT4	2.8494	1.8835	1.513	0.13052	
GenderM:TimeT5	3.9782	1.8835	2.112	0.03482	*
GenderM:TimeT6	3.7241	1.8835	1.977	0.04818	*
GenderM:TimeT7	3.6065	1.8835	1.915	0.05570	.
GenderM:TimeT8	4.0025	1.8835	2.125	0.03373	*
GenderM:TimeT9	3.8190	1.8835	2.028	0.04276	*

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 9.047 on 1682 degrees of freedom
Multiple R-squared: 0.07606, Adjusted R-squared: 0.06617
F-statistic: 7.692 on 18 and 1682 DF, p-value: < 2.2e-16

Table T18: H1*-A3*

Residuals:

Min	1Q	Median	3Q	Max
-38.097	-7.059	-0.146	6.839	27.019

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	15.8903	1.1881	13.375	< 2e-16	***
ToneL	2.5814	0.5055	5.106	3.66e-07	***
GenderM	-2.8483	1.5324	-1.859	0.0632	.
TimeT2	-1.1137	1.6455	-0.677	0.4986	
TimeT3	-1.4974	1.6455	-0.910	0.3629	
TimeT4	-2.1084	1.6455	-1.281	0.2003	
TimeT5	-2.9666	1.6455	-1.803	0.0716	.


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TimeT6          -2.8483      1.6455   -1.731    0.0836 .
TimeT7          -2.0129      1.6455   -1.223    0.2214
TimeT8          -1.0378      1.6455   -0.631    0.5283
TimeT9           0.2781      1.6455    0.169    0.8658
GenderM:TimeT2   0.9455      2.1668    0.436    0.6626
GenderM:TimeT3   1.3053      2.1668    0.602    0.5470
GenderM:TimeT4   1.5165      2.1668    0.700    0.4841
GenderM:TimeT5   2.2500      2.1668    1.038    0.2992
GenderM:TimeT6   2.3880      2.1668    1.102    0.2706
GenderM:TimeT7   2.4223      2.1668    1.118    0.2638
GenderM:TimeT8   2.5443      2.1668    1.174    0.2405
GenderM:TimeT9   2.4423      2.1668    1.127    0.2598
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Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 10.41 on 1682 degrees of freedom
Multiple R-squared:  0.02746,    Adjusted R-squared:  0.01706
F-statistic: 2.639 on 18 and 1682 DF, p-value: 0.0002074

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Table 19. Pairwise comparisons of EMMs of the vowels specified for contrastive tones (H and L) for each timepoint as derived from the model f0 for male (M) and female (F). Positive estimate values indicate higher values of the first element in the comparison.

V_portio n	Contrast	Estimate (in ratio)	t value (in ratio)	p value
T1	H_F vs.	1.15	24.259	<0.0001
	L_F			*
	H_M vs.	1.23	23.705	<0.0001
	L_M			*
T2	H_F vs.	1.15	24.195	<0.0001
	L_F			*
	H_M vs.	1.23	23.691	<0.0001
	L_M			*
T3	H_F vs.	1.16	24.152	<0.0001
	L_F			*
	H_M vs.	1.23	23.690	<0.0001
	L_M			*
T4	H_F vs.	1.16	24.128	<0.0001
	L_F			*
	H_M vs.	1.23	23.699	<0.0001
	L_M			*
T5	H_F vs.	1.16	24.123	<0.0001
	L_F			*
	H_M vs.	1.23	23.724	<0.0001
	L_M			*
T6	H_F vs.	1.16	24.134	<0.0001
	L_F			*
	H_M vs.	1.23	23.759	<0.0001
	L_M			*

T7	H_F vs.	1.16	24.152	<0.0001
	L_F			*
	H_M vs.	1.23	23.795	<0.0001
	L_M			*
T8	H_F vs.	1.16	24.174	<0.0001
	L_F			*
	H_M vs.	1.22	23.830	<0.0001
	L_M			*
T9	H_F vs.	1.16	24.167	<0.0001
	L_F			*
	H_M vs.	1.22	23.837	<0.0001
	L_M			*

Table 20. Pairwise comparisons of EMMs of the vowels specified for contrastive tones (H and L) for each timepoint as derived from the model CPP for male (M) and female (F). Positive estimate values indicate higher values of the first element in the comparison.

V_portio n	Contrast	Estimate (in ratio)	t value (in ratio)	p value
T1	H_F vs.	1.054	6.617	<0.0001
	L_F			*
	H_M vs.	1.054	6.649	<0.0001
	L_M			*
T2	H_F vs.	1.043	6.637	<0.0001
	L_F			*
	H_M vs.	1.047	6.656	<0.0001
	L_M			*
T3	H_F vs.	1.038	6.645	<0.0001
	L_F			*
	H_M vs.	1.043	6.661	<0.0001
	L_M			*
T4	H_F vs.	1.036	6.648	<0.0001
	L_F			*
	H_M vs.	1.040	6.663	<0.0001
	L_M			*
T5	H_F vs.	1.035	6.650	<0.0001
	L_F			*
	H_M vs.	1.039	6.664	<0.0001
	L_M			*
T6	H_F vs.	1.034	6.651	<0.0001
	L_F			*
	H_M vs.	1.039	6.664	<0.0001
	L_M			*
T7	H_F vs.	1.034	6.650	<0.0001
	L_F			*
	H_M vs.	1.039	6.664	<0.0001
	L_M			*
T8	H_F vs.	1.036	6.649	<0.0001
	L_F			*
	H_M vs.	1.040	6.663	<0.0001
	L_M			*

T9	H_F vs.	1.037	6.646	<0.0001
	L_F			*
	H_M vs.	1.043	6.660	<0.0001
	L_M			*

Table 21. Pairwise comparisons of EMMs of the vowels specified for contrastive tones (H and L) for each timepoint as derived from the model H1*-H2* for male (M) and female (F). Positive estimate values indicate higher values of the first element in the comparison, whereas the negative estimate values indicate lower values of the first element.

V_portio n	Contrast	Estimate (in ratio)	t value (in ratio)	p value
T1	H_F vs.	0.792	-4.160	0.0002
	L_F			*
	H_M vs.	0.678	-3.744	0.0011
	L_M			*
T2	H_F vs.	0.694	-3.575	0.0020
	L_F			*
	H_M vs.	0.639	-3.519	0.0025
	L_M			*
T3	H_F vs.	0.686	-3.526	0.0024
	L_F			*
	H_M vs.	0.658	-3.630	0.0017
	L_M			*
T4	H_F vs.	0.746	-3.895	0.0006
	L_F			*
	H_M vs.	0.670	-3.699	0.0013
	L_M			*
T5	H_F vs.	0.772	-4.047	0.0003
	L_F			*
	H_M vs.	0.668	-3.691	0.0013
	L_M			*
T6	H_F vs.	0.776	-4.069	0.0003
	L_F			*
	H_M vs.	0.676	-3.735	0.0011
	L_M			*
T7	H_F vs.	0.775	-4.063	0.0003
	L_F			*
	H_M vs.	0.687	-3.801	0.0009
	L_M			*
T8	H_F vs.	0.799	-4.196	0.0002
	L_F			*
	H_M vs.	0.702	-3.880	0.0006
	L_M			*
T9	H_F vs.	0.818	-4.296	0.0001
	L_F			*
	H_M vs.	0.726	-4.013	0.0004
	L_M			*

Table 22. Pairwise comparisons of EMMs of the vowels specified for contrastive tones (H and L) for each timepoint as derived from the model H1*-A1* for male (M) and female (F). Positive estimate values indicate higher values of the first element in the comparison, whereas the negative estimate values indicate lower values of the first element.

V_portio n	Contrast	Estimate (in ratio)	t value (in ratio)	p value
T1	H_F vs.	0.963	-2.141	0.1405
	L_F			
	H_M vs.	0.963	-2.139	0.1413
	L_M			
T2	H_F vs.	0.962	-2.141	0.1407
	L_F			
	H_M vs.	0.962	-2.138	0.1414
	L_M			
T3	H_F vs.	0.963	-2.141	0.1406
	L_F			
	H_M vs.	0.963	-2.139	0.1413
	L_M			
T4	H_F vs.	0.964	-2.141	0.1405
	L_F			
	H_M vs.	0.965	-2.139	0.1411
	L_M			
T5	H_F vs.	0.964	-2.141	0.1405
	L_F			
	H_M vs.	0.965	-2.140	0.1410
	L_M			
T6	H_F vs.	0.964	-2.141	0.1405
	L_F			
	H_M vs.	0.966	-2.140	0.1410
	L_M			
T7	H_F vs.	0.965	-2.142	0.1404
	L_F			
	H_M vs.	0.966	-2.140	0.1410
	L_M			
T8	H_F vs.	0.964	-2.141	0.1404
	L_F			
	H_M vs.	0.967	-2.141	0.1409
	L_M			
T9	H_F vs.	0.965	-2.141	0.1403
	L_F			
	H_M vs.	0.968	-2.141	0.1408
	L_M			

Table 23. Pairwise comparisons of EMMs of the vowels specified for contrastive tones (H and L) for each timepoint as derived from the model H1*-A2* for male (M) and female (F). Positive estimate values indicate higher values of the first element in the comparison, whereas the negative estimate values indicate lower values of the first element.

V_portio n	Contrast	Estimate (in ratio)	t value (in ratio)	p value
T1	H_F vs.	0.867	-6.593	<0.0001
	L_F			*
	H_M vs.	0.871	-6.649	<0.0001
	L_M			*
T2	H_F vs.	0.854	-6.524	<0.0001
	L_F			*
	H_M vs.	0.869	-6.642	<0.0001
	L_M			*
T3	H_F vs.	0.853	-6.514	<0.0001
	L_F			*
	H_M vs.	0.868	-6.635	<0.0001
	L_M			*
T4	H_F vs.	0.844	-6.464	<0.0001
	L_F			*
	H_M vs.	0.869	-6.639	<0.0001
	L_M			*
T5	H_F vs.	0.836	-6.411	<0.0001
	L_F			*
	H_M vs.	0.869	-6.643	<0.0001
	L_M			*
T6	H_F vs.	0.840	-6.438	<0.0001
	L_F			*
	H_M vs.	0.871	-6.649	<0.0001
	L_M			*
T7	H_F vs.	0.846	-6.476	<0.0001
	L_F			*
	H_M vs.	0.874	-6.663	<0.0001
	L_M			*
T8	H_F vs.	0.849	-6.490	<0.0001
	L_F			*
	H_M vs.	0.878	-6.678	<0.0001
	L_M			*
T9	H_F vs.	0.854	-6.520	<0.0001
	L_F			*
	H_M vs.	0.880	-6.688	<0.0001
	L_M			*

Table 24. Pairwise comparisons of EMMs of the vowels specified for contrastive tones (H and L) for each timepoint as derived from the model H1*-A3* for male (M) and female (F). Positive estimate values indicate higher values of the first element in the comparison, whereas the negative estimate values indicate lower values of the first element.

V_portio n	Contrast	Estimate (in ratio)	t value (in ratio)	p value
T1	H_F vs.	0.860	-4.824	<0.0001
	L_F			*
	H_M vs.	0.835	-4.761	<0.0001
	L_M			*

T2	H_F	vs.	0.851	-4.786	<0.0001
	L_F				*
	H_M	vs.	0.833	-4.754	<0.0001
	L_M				*
T3	H_F	vs.	0.848	-4.771	<0.0001
	L_F				*
	H_M	vs.	0.833	-4.753	<0.0001
	L_M				*
T4	H_F	vs.	0.842	-4.745	<0.0001
	L_F				*
	H_M	vs.	0.828	-4.735	<0.0001
	L_M				*
T5	H_F	vs.	0.834	-4.704	<0.0001
	L_F				*
	H_M	vs.	0.827	-4.729	<0.0001
	L_M				*
T6	H_F	vs.	0.835	-4.710	<0.0001
	L_F				*
	H_M	vs.	0.830	-4.741	<0.0001
	L_M				*
T7	H_F	vs.	0.843	-4.749	<0.0001
	L_F				*
	H_M	vs.	0.839	-4.778	<0.0001
	L_M				*
T8	H_F	vs.	0.852	-4.778	<0.0001
	L_F				*
	H_M	vs.	0.849	-4.817	<0.0001
	L_M				*
T9	H_F	vs.	0.862	-4.832	<0.0001
	L_F				*
	H_M	vs.	0.859	-4.853	<0.0001
	L_M				*