

## Appendix A: Acoustic measures

For each utterance of “than I did,” the following phonetic segments were annotated: V1, the vowel [æ] of *than*; N1, the nasal [n] of *than*; V2, the diphthong [aɪ] of *I*; C3, the stop closure and burst of the initial [d] in *did*; and V3, the vowel [ɪ] of *did*. Ratio refers to V2/V3.

Acoustic measure	Description
duration_{V1,V2,V3,C3, ratio}	duration of segment (vowel, stop closure)
meanIntensity_{V1,V2,V3, ratio}	RMS Intensity over vowel
maxIntensity_{V1,V2,V3, ratio}	max RMS Intensity
minIntensity_{V1,V2,V3}	min RMS Intensity
rangeIntensity_{V1,V2,V3}	range of RMS Intensity in vowel
maxIntTime_{V1,V2,V3}	time of intensity max relative to vowel duration
minIntTime_{V1,V2,V3, ratio}	time of intensity min relative to vowel duration
energy_{V1,V2,V3, ratio}	mean energy over vowel
power_{V1,V2,V3, ratio}	mean power of vowel
amp_{V1,V2,V3, ratio}	mean amplitude of vowel
pulses_{V1,V2,V3}	number of glottal pulses
jitter_{V1,V2,V3, ratio}	jitter
shimmer_{V1,V2,V3, ratio}	shimmer
f0_{V1,V2,V3, ratio}	mean $F_0$ of vowel
maxf0_{V1,V2,V3, ratio}	max $F_0$ of vowel
minf0_{V1,V2,V3, ratio}	min $F_0$ of vowel
maxF0Time_{V1,V2,V3, ratio}	time of $F_0$ max relative to vowel duration
minF0Time_{V1,V2,V3, ratio}	time of $F_0$ min relative to vowel duration
rangeF0_{V1,V2,V3, ratio}	f0max - f0min
maxf1_{V1,V2,V3, ratio}	max F1 of vowel
minf1_{V1,V2,V3, ratio}	min F1 of vowel
maxf1Time_{V1,V2,V3, ratio}	time of F1 max relative to vowel duration

Acoustic measure	Description
minf1Time_{V1,V2,V3, ratio}	time of F1 min relative to vowel duration
rangef1_{V1,V2,V3, ratio}	F1max - F1min
f1TimeIntmax_{V1,V2,V3}	F1 value at time of intensity max
f1TimeF0max_{V1,V2,V3}	F1 value at time of $F_0$ maximum
f1Time{10,20... 90}_{V1,V2,V3}	F1 value at 10% 20%... 90% of vowel duration
f1bandIntmax_{V1,V2,V3}	F1 bandwidth value at time of intensity max
f1bandF0max_{V1,V2,V3}	F1 bandwidth value at time of $F_0$ maximum
f1band{10,20... 90}_{V1,V2,V3}	F1 bandwidth value at 10% 20%... 90% of vowel duration
maxf2_{V1,V2,V3, ratio}	max F2 of vowel
minf2_{V1,V2,V3, ratio}	min F2 of vowel
maxf2Time_{V1,V2,V3, ratio}	time of F2 max relative to vowel duration
minf2Time_{V1,V2,V3, ratio}	time of F2 min relative to vowel duration
rangef2_{V1,V2,V3, ratio}	F2max - F2min
f2TimeIntmax_{V1,V2,V3}	F2 value at time of intensity max
f2TimeF0max_{V1,V2,V3}	F2 value at time of $F_0$ maximum
f2Time{10,20... 90}_{V1,V2,V3}	F2 value at 10% 20%... 90% of vowel duration
f2bandIntmax_{V1,V2,V3}	F2 bandwidth value at time of intensity maximum
f2bandF0max_{V1,V2,V3}	F2 bandwidth value at time of $F_0$ maximum
f2band{10,20... 90}_{V1,V2,V3}	F2 bandwidth value at 10% 20%... 90% of vowel duration
f1f2TimeIntmax_{V1,V2,V3}	F2-F1 at time of intensity max
f1f2Timef0max_{V1,V2,V3}	F2-F1 at time of $F_0$ max
f1f2Time{10,20... 90}_{V1,V2,V3}	F2-F1 value at 10% 20%... 90% of vowel duration
h1minush2p0_{V1,V2,V3}	1st harmonic minus 2nd harmonic at time of $F_0$ maximum

Acoustic measure	Description
$h1\text{minush}3p0_{\{V1,V2,V3\}}$	1st harmonic minus 3rd harmonic at time of $F_0$ maximum
$h2\text{minush}3p0_{\{V1,V2,V3\}}$	2nd harmonic minus 3rd harmonic at time of $F_0$ maximum
$h1\text{minusa}1p0_{\{V1,V2,V3\}}$	1st harmonic minus amplitude of first formant at time of $F_0$ maximum
$h1\text{minusa}2p0_{\{V1,V2,V3\}}$	1st harmonic minus amplitude of second formant at time of $F_0$ maximum
$h1\text{minusa}3p0_{\{V1,V2,V3\}}$	1st harmonic minus amplitude of third formant at time of $F_0$ maximum
$h1\text{minush}2f1_{\{V1,V2,V3\}}$	1st harmonic minus 2nd harmonic at time of F1 maximum
$h1\text{minush}3f1_{\{V1,V2,V3\}}$	1st harmonic minus 3rd harmonic at time of F1 maximum
$h2\text{minush}3f1_{\{V1,V2,V3\}}$	2nd harmonic minus 3rd harmonic at time of F1 maximum
$h1\text{minusa}1f1_{\{V1,V2,V3\}}$	1st harmonic minus amplitude of first formant at time of F1 maximum
$h1\text{minusa}2f1_{\{V1,V2,V3\}}$	1st harmonic minus amplitude of second formant at time of F1 maximum
$h1\text{minusa}3f1_{\{V1,V2,V3\}}$	1st harmonic minus amplitude of third formant at time of F1 maximum