

The phonologisation of redundancy: length and quality in Welsh vowels

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Supplementary materials

Appendix A: test items, with expected pronunciations

blynyddau	[blə'nəð̥ɛ]	'years'
boddi	[ˈbɔːði]	'to perish'
bore	[ˈbɔːrɛ]	'morning'
brodor	[ˈbrɔːdɔːr]	'native (N)'
brodorol	[brɔːdɔːrɔl]	'native (ADJ)'
bwced	[ˈbʊkʰɛd]	'bucket'
bwgan	[ˈbʊːɡan]	'ghost'
byddin	[ˈbəð̥ɪn]	'army'
caletaf	[kʰaˈlɛtʰa]	'hardest'
cegin	[kʰɛːɡɪn]	'kitchen'
cerrig	[kʰɛrɪɡ]	'stones'
cigydd	[kʰiːɡɪð̥]	'butcher'
cludo	[kʰliːdɔ]	'to transport'
codi	[kʰɔːdi]	'to rise'
colli	[kʰɔːli]	'to lose'
copi	[kʰɔpʰi]	'copy'
crwtyn	[kʰrɔtʰɪn]	'boy'
curo	[kʰiːrɔ]	'to beat'
cwbul	[kʰuːbʊl]	'entire'
cwlwm	[kʰuːlɔm]	'knot'
cwpan	[kʰɔpʰan]	'cup'
cwprdd	[kʰɔpʰɔrθ]	'cupboard'
cwta	[kʰɔtʰa]	'curt'
cyfan	[kʰəvˈan]	'entire, all'
cyfle	[kʰəvˈlɛ]	'chance'

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cylllell	[kʰətːɛl]	‘knife’
cynnal	[kʰənːal]	‘to support’
cyson	[kʰəsːən]	‘regular’
defod	[de:vɔd]	‘ceremony’
diben	[di:bɛn]	‘purpose’
dibyn	[di:bm]	‘precipice’
difyr	[di:vɪr]	‘pleasant’
digon	[di:gɔn]	‘enough’
dillad	[dɪˈʌd]	‘clothes’
dilyn	[di:lm]	‘to follow’
diweddar	[diˈwe:ðar]	‘latest’
dwsin	[ˈdɔsɪm]	‘dozen’
Ebrill	[ˈɛbˌrɪl]	‘April’
edrych	[ˈɛdˌrɪχ]	‘to look’
enillwch	[ˈɛnɪˈʊχ]	‘win! (PL)’
ennill	[ˈɛnɪl]	‘to win’
enwocaf	[ɛnˈwɔkʰa]	‘most famous’
felly	[ˈvɛli]	‘so’
ffenestr	[ˈfɛnɛst]	‘window’
ffrwygd	[ˈfru:ɡɔd]	‘brawl’
ffyddlon	[ˈfɔðˌlɔn]	‘loyal’
gelyn	[ˈgɛ:lm]	‘enemy’
geni	[ˈgɛni]	‘to give birth’
goddef	[ˈgɔ:ðɛ]	‘to suffer’
gofal	[ˈgɔ:val]	‘care’
gofyn	[ˈgɔvɪm]	‘to ask’
gogledd	[ˈgɔgˌlɛð]	‘north’
gosod	[ˈgɔsːɔd]	‘to attack’
Guto	[ˈɡɪtʰɔ]	(personal name)
gwddw	[ˈɡu:ðɔg]	‘neck’
gwella	[ˈɡwɛlˌa]	‘to improve’
gyrru	[ˈgɛrɪ]	‘to drive’
heddiw	[ˈhɛ:ði]	‘today’
heddlu	[ˈhɛðˌli]	‘police’
hollol	[ˈhɔlˌɔ]	‘entire’
honni	[ˈhɔnˌi]	‘to claim’
hwnnw	[ˈhɔnˌu]	‘that’
hybu	[ˈhɔbˌi]	‘to promote’
Hydref	[ˈhɔdˌrɛ]	‘October’
ifanc	[ˈi:vɔŋk]	‘young’
isod	[ˈɪsːɔd]	‘below’
llety	[ˈlɛtʰi]	‘hotel’
llinell	[ˈlɪmˌɛl]	‘line’
lipa	[ˈlɪpʰa]	‘limp’
llogi	[ˈlɔ:gi]	‘to hire’
llonydd	[ˈlɔ:mið]	‘contented’
lludw	[ˈlɪ:du]	‘ashes’
llygad	[ˈlɔgˌad]	‘eye’
lwcus	[ˈlɔkʰɪs]	‘happy’

meddwl	[ˈmɛ:ðʊl]	‘to think’
minnau	[ˈmɪnˈɛ]	‘I (EMPH)’
modryb	[ˈmɔdˈrɪb]	‘aunt’
mwdwl	[ˈmu:dʊl]	‘haycock’
Nadolig	[(na)ˈdɔ:lɪg]	‘Christmas’
neges	[ˈnɛ:gɛs]	‘message’
nesaf	[ˈnɛsˈɑ]	‘next’
ogof	[ˈo:gɔv]	‘cave’
pecyn	[ˈpʰɛkʰɪm]	‘package’
pennod	[ˈpʰɛnˈɔd]	‘chapter’
personol	[pʰɛrˈsɔ:nɔl]	‘personal’
plygu	[pʰlɔgɪ]	‘to fold’
pobi	[pʰɔ:bi]	‘to bake’
pobol	[pʰɔ:bɔl]	‘people’
popeth	[pʰɔpʰɛθ]	‘everything’
posib	[pʰɔsɪb]	‘possible’
problem	[pʰrɔbˈlɛm]	‘problem’
pryder	[pʰrɔdˈɛr]	‘worry’
prynu	[pʰrɔnˈi, pʰɔrˈni]	‘to buy’
pysur	[pʰrɔsˈɪr]	‘busy’
pwysicaf	[pʰɔiˈsɪkʰɑ]	‘most important’
pysgota	[pʰɔsˈkɔtʰɑ]	‘to fish’
rhedeg	[ˈrʰɛ:dɛg]	‘to run’
rheswm	[ˈrʰɛsˈɔm]	‘reason’
sefyll	[ˈsɛ:vɪl]	‘to stay’
seren	[ˈsɛ:rɛn]	‘star’
siglo	[ˈsɪgˈlɔ, ˈɪgˈlɔ]	‘to shake’
suddo	[ˈsɪ:ðɔ]	‘to sink’
sydyn	[ˈsɔdɪn]	‘sudden’
tebycaf	[tʰɛˈbɔkʰɑ]	‘most similar’
tebyg	[tʰɛ:bɪg]	‘similar’
tecaf	[tʰɛkʰɑ]	‘fairest’
tipyn	[tʰɪpʰɪn]	‘little bit’
tlotyn	[tʰlɔtʰɪn]	‘poor person’
tocyn	[tʰɔkʰɪn]	‘ticket’
tonnau	[tʰɔnˈɛ]	‘waves’
torri	[tʰɔrˈi]	‘to break’
trefnu	[tʰrɛvˈni]	‘to arrange’
tybed	[tʰɔbˈɛd]	‘I wonder’
tyfu	[tʰɔvˈi]	‘to grow’
unig	[ˈi:nɪg]	‘only’
wedyn	[ˈwɛ:dɪn]	‘afterwards’
wynebau	[ɔjˈnɛ:bɛ, gwɪˈnɛ:bɛ]	‘faces’
ysbyty	[ɔsˈpɔtʰɪ]	‘hospital’

Appendix B: Regression modelling of vowel quality in final unstressed syllables

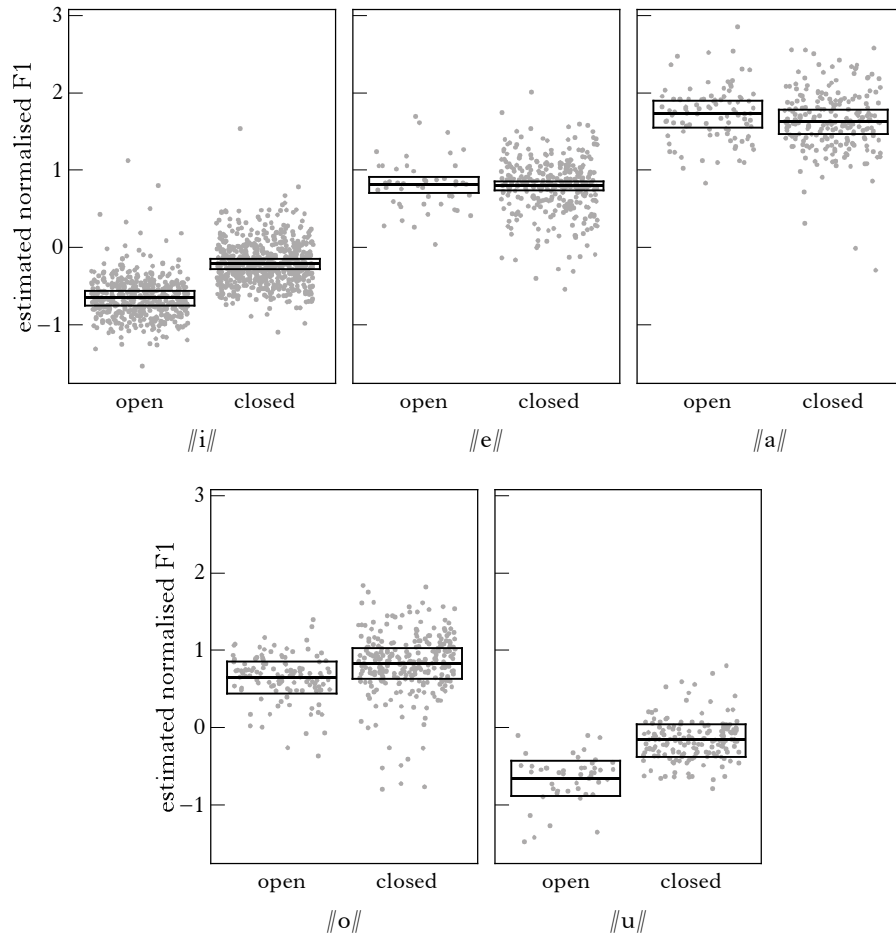


Figure 11

Estimated normalised F1, by final syllable type (open, closed) and vowel.

Appendix C: Regression modelling of vowel quality in stressed syllables

The tables show the estimated effect and the (inclusive) upper and lower boundaries of the 95% confidence interval. When zero falls outside this interval, the effect is considered significant; these cases are marked with an asterisk.

	no duration effect	no length effect	both duration and length	no random effect
Intercept	8.55* 8.41; 8.70	8.45* 8.30; 8.59	8.51* 8.37; 8.65	8.54* 8.43; 8.66
//ə//	0.54* 0.33; 0.75	0.43* 0.21; 0.64	0.51* 0.31; 0.71	0.51* 0.34; 0.67
//e//	0.76* 0.64; 0.88	0.70* 0.61; 0.79	0.77* 0.65; 0.89	0.77* 0.68; 0.86
//o//	0.88* 0.61; 1.14	0.79* 0.51; 1.07	0.89* 0.63; 1.14	0.81* 0.60; 1.03
//u//	0.12 -0.16; 0.40	0.20 -0.09; 0.48	0.10 -0.17; 0.36	0.02 -0.20; 0.24
Long vowel	-0.29* -0.46; -0.12		-0.19* -0.36; -0.02	-0.21* -0.35; -0.07
Long //e//	-0.14 -0.30; 0.02		-0.12 -0.27; 0.04	-0.13* -0.25; -0.01
Long //o//	-0.25* -0.47; -0.03		-0.23* -0.44; -0.01	-0.19* -0.37; -0.02
Long //u//	0.23 -0.02; 0.47		0.24* 0.01; 0.47	0.30* 0.11; 0.49
F2 smooth	8.77 -8.72; 26.25	8.68 -8.72; 26.09	8.76 -8.72; 26.24	8.71 -8.88; 26.31
Word (random)	63.45 -146.27; 273.16	76.51 -141.05; 294.06	58.88 -150.84; 268.59	
Duration smooth		3.24 -3.84; 10.33	3.14 -3.79; 10.07	3.17 -4.00; 10.34
AIC _c	-327.97	-310.40	-337.98	-322.74
AIC	-380.23	-382.63	-388.17	-325.85
BIC	-64.24	-19.67	-77.70	-241.76
Log likelihood	272.33	285.75	274.86	184.80
R ²	0.95	0.95	0.95	0.93
No. of observations	345	345	345	345

Table II
Models for log₂(F1) for Speaker 1.

	no height effect	no interaction	model with interaction
Intercept	-1.01* -1.24; -0.77	-1.06* -1.29; -0.83	-1.00* -1.18; -0.83
//ə//	0.70* 0.44; 0.97	0.65* 0.38; 0.91	0.79* 0.58; 1.00
//e//	1.54* 1.28; 1.81	1.43* 1.16; 1.70	1.58* 1.35; 1.82
//o//	1.59* 1.27; 1.91	1.51* 1.19; 1.83	1.54* 1.26; 1.81
//u//	0.26 -0.09; 0.60	0.14 -0.20; 0.49	0.29 -0.04; 0.62
Long vowel	-0.22 -0.49; 0.05	-0.28* -0.56; -0.01	-0.25* -0.47; -0.04
Long //e//	-0.26 -0.62; 0.10	-0.17 -0.52; 0.19	-0.83* -1.15; -0.52
Long //o//	0.00 -0.35; 0.36	0.06 -0.29; 0.42	-0.38* -0.68; -0.08
Long //u//	0.34 -0.09; 0.76	0.34 -0.09; 0.76	0.35 -0.16; 0.85
Duration smooth	1.86 -2.70; 6.42	1.53 -2.17; 5.24	2.23 -3.16; 7.61
F2 smooth	3.34 -4.05; 10.73	3.48 -4.06; 11.01	3.79 -3.97; 11.56
Speaker (random)	4.41 -5.39; 14.21	4.43 -5.37; 14.23	4.35 -5.45; 14.15
Word (random)	98.08 -117.51; 313.68	96.93 -118.67; 312.52	76.56 -123.35; 276.48
High post-tonic vowel		0.27* 0.15; 0.38	0.05 -0.27; 0.36
//e// before high			-0.08 -0.46; 0.29
//o// before high			0.02 -0.35; 0.38
//u// before high			-0.18 -0.60; 0.24
Long vowel before high			0.03 -0.35; 0.41
Long //e// before high			1.06* 0.58; 1.54
Long //o// before high			0.82* 0.35; 1.30
Long //u// before high			0.05 -0.59; 0.69

	no height effect	no interaction	model with interaction
AIC _c	2113.37	2105.94	2085.73
AIC	2098.96	2091.61	2074.11
BIC	2761.47	2752.27	2670.42
Log likelihood	-931.78	-928.44	-931.12
R ²	0.79	0.79	0.79
No. of observations	2057	2057	2057

Table III

Models for normalised F1 (south-western speakers).

	no duration effect	duration effect	model with interaction
Intercept	345.73* 286.15; 405.32	381.57* 327.99; 435.16	345.09* 271.91; 418.28
//ə//	99.06* 33.17; 164.95	88.54* 30.06; 147.02	155.20* 67.97; 242.42
//e//	294.38* 234.12; 354.65	250.44* 199.97; 300.90	277.96* 203.94; 351.98
//o//	197.05* 93.96; 300.13	114.78* 19.17; 210.40	191.61* 79.28; 303.94
//u//	47.06 -50.98; 145.11	31.88 -57.61; 121.37	59.40 -48.50; 167.30
Long vowel	13.43 -44.22; 71.08	-12.86 -40.49; 14.77	8.24 -51.54; 68.01
Long //e//	-2.26 -77.03; 72.51		-19.40 -96.29; 57.50
Long //o//	-63.91 -143.35; 15.53		-74.77 -157.25; 7.72
Long //u//	4.19 -81.50; 89.88		37.05 -51.42; 125.53
F2 smooth	2.77 -3.63; 9.17	2.76 -3.60; 9.11	2.81 -3.66; 9.28
Word (random)	17.86 -193.82; 229.54	21.02 -196.53; 238.58	16.89 -194.79; 228.56
Duration smooth		2.05 -2.86; 6.96	
Duration for //i//			1.49 -2.02; 4.99
Duration for //e//			1.00 -0.96; 2.96
Duration for //o//			1.40 -1.87; 4.68
Duration for //u//			2.86 -3.59; 9.31
AIC _c	4107.10	4090.27	4093.57
AIC	4100.75	4082.94	4083.92
BIC	4217.76	4208.36	4226.97
Log likelihood	-2109.75	-2008.64	-2004.52
R ²	0.67	0.69	0.69
No. of observations	337	337	337

Table IV
Models for F1 (Speaker 8).