

Lifespan Vowel Change and Lexical Frequency Effects in a Single Speaker: Evidence from David Attenborough

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Overview: This study presents acoustic evidence of longitudinal vowel changes in Sir David Attenborough, a nature documentary narrator who speaks with Received Pronunciation (RP), and investigates whether lexical frequency modulates these changes at the individual level. Previous studies have shown that RP monophthongs are undergoing diachronic changes, with DRESS (/ɛ/) and TRAP (/æ/) shifting to a lower and more central location, while GOOSE (/u:/) and FOOT (/ʊ/) front and LOT (/ɑ/) and THOUGHT (/ɔ/) raise as seen in Figure 1 [1-5]. This is part of a broader anticlockwise shift around the vowel quadrilateral. This study examines whether Attenborough participates in these ongoing changes, rejects them in favor of conservative norms, or simply maintains earlier-acquired patterns, and whether any changes are conditioned by lexical frequency.

Methods: A total of 16,871 stressed vowels were extracted from Attenborough's public speech between 1950 and 2020. Audio was transcribed and force-aligned using the Montreal Forced Aligner [6], and vowel formants were extracted and normalized using the Lobanov's [7] procedure. Linear mixed-effects models assessed changes in F1 and F2 across three time points corresponding to Attenborough's thirties, sixties, and nineties.

Results: The results reveal that Attenborough's vowels shifted to reflect ongoing community changes, although he also exhibits retrograde change in TRAP and FOOT at a later stage (see Table 1). From his thirties to sixties, he showed significant lowering and retraction of DRESS and TRAP and significant fronting of GOOSE, resembling the vowel shifts observed in Queen Elizabeth II in approximating towards the modern RP vowel system [8-10]. From his sixties to nineties, GOOSE-fronting continued, though with diminished magnitude, and significant LOT-raising was observed — notably actuated after age sixty, indicating that phonetic change can be initiated in later life despite the reduced malleability typically associated with aging [11]. Concurrently, however, he exhibited significant raising and retraction of TRAP and retraction of FOOT, representing a return to more conservative realizations. While TRAP remained comparatively modern due to only a partial retreat from its earlier lowering, FOOT showed retrograde retraction with no prior evidence of fronting, consistent with previous findings of aging speakers becoming more conservative in the face of community change in the opposite direction [12-15].

The effect of the interaction of age and lexical frequency was largely non-significant across vowels, indicating that high-, mid-, and low-frequency words changed at a similar pace for most vowel categories. For FOOT, however, a significant age-by-frequency interaction revealed that low-frequency words were realized with more fronted F2 values at age 90 compared to high-frequency words ($p < 0.01$), suggesting differential lexical trajectories at this specific life stage. This interaction did not constitute a systematic pattern of lexically graded diffusion across the vowel space [16-17].

Discussion: These findings underscore the flexibility of the adult phonological system and add to the growing literature on retrograde change in later life. The limited frequency effects on these changes suggest that sound change propagates through the lexicon in frequency-sensitive ways at the level of an individual speaker, offering limited support for exemplar-based accounts of sound change at the individual level [18-19].

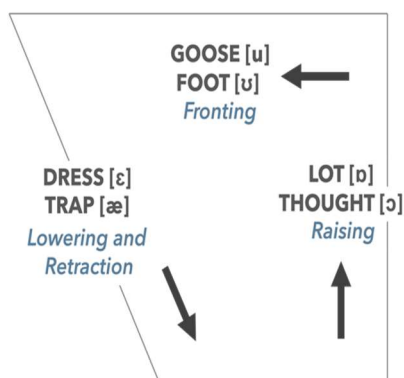


Figure 2 Attenborough's vowels across time periods

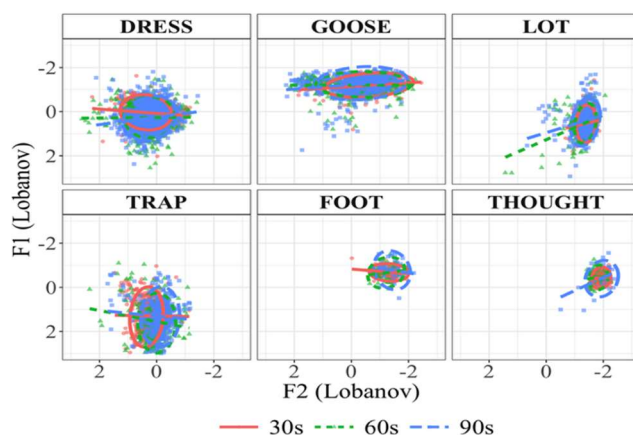


Figure 1 An anticlockwise shift in the Received Pronunciation (RP) vowel system

Table 1 Coefficient and significance level of each predictor (*p < 0.05; **p < 0.01; ***p < 0.001).

		30s – 60s		60s – 90s		30s – 90s			
		Estimate	p-value	Estimate	p-value	Estimate	p-value		
DRESS (n = 3890)	F1	0.221	< 0.001 ***	0.023	0.20	0.244	< 0.001 ***		
	F2	-0.108	< 0.001 ***	0.004	0.78	-0.105	< 0.001 ***		
TRAP (n = 1364)	F1	0.297	< 0.001 ***	-0.129	< 0.05 *	0.168	< 0.01 **		
	F2	-0.334	< 0.001 ***	-0.079	< 0.01 **	-0.414	< 0.001 ***		
GOOSE (n = 1735)	F1	0.005	0.81	-0.044	< 0.05 *	-0.039	0.17 .		
	F2	0.237	< 0.001 ***	0.069	< 0.01 **	0.306	< 0.001 ***		
FOOT (n = 218)	F1	-0.009	0.86	-0.086	0.11	-0.094	0.07 .		
	F2	0.013	0.75	-0.209	< 0.001 ***	-0.197	< 0.001 ***		
LOT (n = 1516)	F1	-0.006	0.86	-0.094	< 0.01 **	-0.099	< 0.01 **		
	F2	0.049	< 0.001 ***	0.026	0.17	0.024	0.12		
THOUGHT (n = 278)	F1	-0.024	0.56	0.055	0.29	0.031	0.55		
	F2	0.095	< 0.01 **	-0.069	< 0.05 *	0.025	0.47		

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