

Modern Standard Danish stop gradation explained diachronically

In certain morphophonological contexts, modern Standard Danish displays the stop gradation patterns seen in (1–4) (e.g. Uldall 1936; Rischel 1970; Basbøll 2005). With certain caveats, ‘strong’ form here refers to simple onset position in word-initial or stressed syllables, while ‘weak’ form refers to syllable-final position or simple onset before schwa (or [i] in a select group of morphemes).

	strong	weak
(1)	[p ^h t ^h k ^h]	[p t k]
(2)	[p]	[p ~ ɸ]
(3)	[t]	[ð ~ Ø]
(4)	[k]	[ɣ ~ ɸ ~ Ø]

Evidence for the patterns in (1–4) are limited to a few morphological contexts: strong verb conjugations, derivations of Graeco-Latinate loanwords, and noun+noun compounds. The alternations are seemingly productive to varying degrees (Pharao 2004), but there is little indication that the most problematic alternation (4) is productive. Nonetheless, the patterns are often taken as evidence that the ‘strong’ and ‘weak’ counterparts in (1–4) are synchronically allophones. We argue elsewhere that an analysis of Danish phonology should not be overly reliant on these alternations for a number of reasons. Importantly, some proposed allophones have no phonetic or phonological common ground in modern Standard Danish, and weak [ɣ, ɸ] also alternate with strong [j] and [v] respectively, leading to many neutralizations which cannot be dissolved. Hence, we argue that the subset of words showing the alternations in particularly (2) and (4) have suppletive roots, and that the sounds can no longer be considered allophonic.

However, if the alternations play no role in systematic synchronic Danish (morpho-) phonology, that leaves the question of why they are there. Here, we follow Blevins’ (2004) Evolutionary Phonology approach in assuming that sound patterns with well-motivated diachronic explanations do not also require synchronic explanation. We outline how well-motivated historical developments may have led to the synchronic stop gradation patterns.

In the past millennium, Danish has undergone well-documented related chains of obstruent weakening (e.g. Brøndum-Nielsen 1928–1973). In the spirant weakening chain, syllable-final voiced fricatives turned into approximants or were lost; in the plosive weakening chain, after several intermediate steps, syllable-final voiceless stops met the same fate. In a relatively recent previous stage of Danish, the ‘weak allophones’ of stops were voiced fricatives [β ð ɣ]. Our main contribution with this paper is to show how the multiple developments leading to Standard Danish stop gradation follow directly from well-known phonetic pressures. The development of a syllable-initial aspiration contrast in stops and the loss of syllable-final voiced fricatives are different reactions to the same phonetic-phonological pressure: speakers need to maintain laryngeal contrasts, but maintaining obstruent voicing is problematic due to rapid intraoral pressure buildup (Westbury & Keating 1986; Botma & van ‘t Veer 2013). The difference in syllable-initial and syllable-final strategies is likely due to a general tendency for syllable-final segments to be shorter, which in turn leads to gestural undershoot (Keating et al. 2004). The eclectic velar patterns follow from known facts about tongue control: fine control of the tongue body is more difficult than the tongue tip, leading to more extensive vowel-to-consonant coarticulation in dorsal consonants (Vilain et al. 1998; Ouni 2014). These established facts about historical Danish phonology and cross-linguistic phonetic pressure provide a diachronic description and explanation of Standard Danish stop gradation, which (following Blevins 2004) removes the need for a synchronic explanation.