

Is #sC special? A dichotic listening study of Cypriot Greek initial consonant clusters

There is a growing body of morphophonemic and speech-production evidence suggesting that word-initial clusters consisting of a sibilant plus consonant ('#sC', e.g. English **spin**, German **Spitz**) are not syllabified as complex onsets, as clusters of rising sonority are. Is the anomalous syllabic behaviour of #sC is due to some property specific to sibilants or to some more general property of falling-sonority clusters? We investigate this by means of a dichotic-listening experiment.

Existing studies show that English listeners, when simultaneously presented with words containing different initial singleton consonants to each ear, hear certain pairs as fusing into single-word percepts, but not others. Pairs consisting of an obstruent (**pay**) and a liquid (**lay**) are readily fused and sequenced in the order obstruent-liquid (e.g. **play**), i.e. as a complex rising onset (Cutting & Day 1975). However, pairs consisting of /s/ (**sign**) and another consonant (**pie**) are much less likely to be fused (Chiu *et al.* 2016).

To understand whether sibilance uniquely accounts for the non-fusing behaviour of #sC, we turned to Cypriot Greek, which has both #sC and clusters with initial non-sibilant fricatives (fC), including /#fc, #xt/. Morphophonemic evidence shows that #sC and #fC pattern together and are not syllabified in the same way as rising clusters. For example, the consonant of the proclitic /en/ assimilates to a following consonant in rising clusters (e.g. /ek-klameni/ 'she is tearful') but deletes before #sC or #fC (e.g. /e-spasmeno/ 'it is broken', /e-ftanos/ 'he is silly').

42 native Cypriot Greek listeners were dichotically presented with pairs of nonwords containing different initial singleton consonants in varying sonority combinations (e.g. /kovi/ and /sovi/). Participants then indicated which of four alternatives they heard (e.g. /kovi/, /sovi/, /skovi/, /ksovi/).

2 × 2 chi square tests were conducted per pair to test for the relation between fusion (fused or unfused) and sonority sequencing (rising or falling). In line with previous studies, obstruent-liquid pairs were found to favour fusion and, when fused, there were more rising clusters than expected. For fricative-stop pairs, in contrast, observed values did not deviate at all from statistically expected values in both fusion and sequencing behaviour. Crucially, this result was found for both sibilant and non-sibilant fricatives. This co-patterning is consistent with the shared morphophonemic behaviour of #sC and #fC and suggests that neither is syllabified like rising onset clusters. It also suggests that sibilance is not special and that there is some more general constraint disfavouring the syllabification of falling clusters as complex onsets.

How much of what phonologists know about do speakers know?

A simple, unnatural rule in English

There is a well-established collection of speaker-independent methods for discovering phonotactic patterns in languages, e.g. comparative reconstruction, phonological analysis, and computational learning. There is also an increasingly varied collection of experimental methods for ascertaining how much of this patterning is actually internalised by speaker-hearers. In seeking to determine what makes a phonotactic pattern learnable or not, researchers have focused on a variety of factors, including phonological regularity, productivity, naturalness, and formal simplicity. Experimental studies have investigated various permutations of these factors, with results that are more or less surprising. For example, speakers have been shown to have internalised and to be able to productively apply (a) patterns that are regular, simple and natural (e.g. **wug** tests of English **-s**) but also (b) patterns that are irregular, relatively complex and not synchronically natural, such as English velar softening (e.g. Pierrehumbert 2006).

In this paper, we examine the English phonotactic pattern where consonants following /aw/ are restricted to coronals; hence **tout**, but not */tawk/, */tawp/ (e.g. Halle & Clements 1983). The pattern ('awT') is pretty regular, more so than velar softening. It is general, in that it affects a large swath of the lexicon. It is formally quite simple, arguably more so than the **-s** pattern. And it is not natural. It is the synchronically accidental outcome of a series of largely unrelated sound changes; each of the changes might be natural, but their cumulative effect is not. Moreover, the pattern is readily overturned in closely related Germanic languages (cf. German **Raum**, **taub**, **Rauch**, **saugen**, **schaukeln**, or Scots **cowp**, **bowk**).

We report the results of a non-word judgement experiment designed to test the extent to which native speakers of English have tacit knowledge of the awT pattern. Listeners were presented with non-word stimuli containing the diphthongs /aw/, /ow/, /ij/, followed by a range of consonants, and were asked to rate how English-like they sounded. The selection of the non-words was controlled for lexical neighbourhood density, weighted by frequency.

The question of whether speakers have implicit knowledge of a given phonotactic pattern can be approached in two stages: (a) do they have any tacit awareness of the pattern at all and, if so, (b) is the awareness commensurate with the pattern being stored as a grammatical rule? Broadly speaking, the results of the rating experiment shows weak evidence of an awareness of awT but little or no evidence that this reflects grammaticalised knowledge. That is, to the extent that speakers have any tacit inkling of the pattern at all, it is probably not encapsulated in anything like a phonologist's rule or constraint. Where a coronal preference is observable, it does not generalise across different manners of articulation, as would be expected if there were a rule-driven bias towards formal simplicity. Also, the preference is influenced by onset size and lexical neighbourhood factors, which suggests subjects were making on-the-fly judgements of how much the non-words resemble real words.

We conclude that awT is a case where phonologists know more about a phonotactic pattern than speakers know. In the light of our results, we consider whether this should be attributed to the fact that awT is not natural (cf. Hayes & White 2013) or to other factors, such as that it is not involved in alternations. The study has a cautionary tale to tell phonologists: before building a formal account of any given phonological pattern, we need to be confident that it has indeed been internalised by native speakers.