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Gaps in initial RT clusters are accidental: evidence from dichotic listening

Cross-linguistic situation. Some languages restrict word-initial clusters to TR (T = obstruent, R = sonorant), while others also allow for sonority sequencing-violating RT, TT and RR. The former, TR-only languages, instantiate words with *all* logically possible *muta cum liquida* clusters (with the notable exception of tl, dl). By contrast, the latter, anything-goes languages (survey in Clements 1990), may or may not implement all logically possible non-#TR clusters. In Moroccan Arabic, all non-#TRs permitted by the consonantal inventory actually occur. In other anything-goes systems like many Slavic languages or (Modern) Greek, some non-#TRs occur but others are absent. Within this group, the size of the gap varies a great deal. Within Slavic, the most permissive languages are Czech (28 out of 108 possible #RTs, 26%) and Polish (20 out of 126 possible #RTs, 16%). Even these languages instantiate only a small subset of what is possible. Others feature 16 RTs (Russian), 12 (Ukrainian), 8 (Slovak), 5 (BCMS) or 6 in (Modern) Greek.

Systematic or accidental? The question raised by this situation is whether the missing non-#TRs in anything-goes languages are accidental or systematic gaps. The zero hypothesis is that for each language, the set of occurring and non-occurring clusters share some property, and that there is a grammatical (phonological) device that prohibits the existence of the unattested clusters (thus gaps are systematic).

The initial CV. In the framework of Strict CV (Lowenstamm 1999, Scheer 2012), the quality of initial clusters is regulated by what is called the initial CV. Rather than a typewriting diacritic such as # (SPE) or ω (Prosodic Hierarchy), the beginning of the word is represented by truly phonological material: empty syllabic space (an empty CV unit). Or rather, it may be, on a parametric basis: languages where the initial CV is present are TR-only, while those where it is absent are anything-goes. As a consequence, the cross-linguistic typology is predicted to be *strictly binary*: either a language has the initial CV (TR-only), or it does not (anything goes) – there is no third possibility. The prediction is thus that whatever variation is observed within languages that have #RTs has nothing to do with grammar: the gaps observed are accidental. Thus, whether a language shows 10%, 40% or indeed all logically possible #RT clusters is irrelevant: the grammar (initial CV absent) is identical.

Slavic: evidence against gaps being systematic. In Slavic languages, neither the set of occurring or the set of non-occurring forms can be established as a natural class (e.g. Cyran & Gussmann 1999 for Polish). The diachronic situation offers a straightforward reason for the split, though. Common Slavic was a TR-only language, and initial #RTs were created by the loss of two vowels (the yers) in an initial sequence #R-yer-TV. Since yers were regular phonemes whose occurrence is thus unpredictable, some #R-yer-TV sequences happened to exist, while others didn't. Thus modern Slavic languages have #mT clusters, but #nT is entirely missing. This correlates with the fact that Common Slavic featured many #m-yer-TV roots, but none with #n-yer-TV. This gap in #RTs thus appears to be inherited, stemming from a lexical accident in Common Slavic.

Evidence from dichotic listening. In this talk, we experimentally test our hypothesis that speakers of anything-goes languages do not make any difference between existing and non-existing #RTs. In dichotic experiments, subjects are exposed to two distinct stimuli through two distinct perceptive channels. They then perceive neither: the brain has fused them into something that is not present in any perceptive input. The best known case is the McGurk effect (McGurk & MacDonald 1976) where a visual and an auditory stimulus are fused: the video of somebody pronouncing [b] simultaneously administered with audio [g] creates the percept [d]. But dichotic effects may also be achieved with two distinct audio channels,

perceived through the left (L) and right ear (R). Cutting (1975) has shown that English natives perceive *play* when inputted with *pay* (L) and *lay* (R). Interestingly, the perception *play* is still achieved when *lay* has a 50 ms lead on *pay*, i.e. when in the physical input the #l precedes the #p. That English natives will not perceive *lpay* is understandable since (1) there is no such lexical item (lexical effect) and (2) their TR-only grammar prohibits #lp (phonological effect).

Czech perception is chance. In order to eliminate the lexical effect due to the presence of a target word in the lexicon, nonce words may be used: being absent from the lexicon, they cannot produce any lexical effect and what remains is the phonological effect. This is what we did in an experiment run with 50 Czech natives. The prediction is that since Czech grammar does not rule out any #RT, the simultaneous presentation of, say, *patat* (L) and *latat* (R) (source words, absent from the lexicon) will be perceived as either *platat* or *lpatat* (target words, also absent from the lexicon) at chance level: speakers have no evidence to go either way. This prediction was borne out by the results: of 1800 trials (36 nonce words submitted to 50 participants in free choice), fusion into TR or RT succeeded (i.e. the percept contained either) in 531 cases (=29.5%, about the fusion rate that Cutting has observed). Out of these CC-initial percepts, 51.8 % had #RT and 48.2% #TR: the difference is not significant (repeated measures ANOVA $F(1,49) = .164$; $p < .687$; $\eta^2 = .002$).

French perception is driven by phonology. In order to see whether this result is due to the anything-goes character of Czech, we ran a control experiment with French natives: French is a TR-only language. The prediction here is that the phonology of French imposes #TR perception, since non-#TRs are actively ruled out: when speakers are presented with nonce words such as *panfer* (L) and *lanfer* (R), they will perceive *planfer*, rather than *lpanfer*. The prediction was again borne out: of 1600 trials with 50 participants based on 32 target words in free choice, 178 percepts were either TR or RT (elsewhere the fusion did not succeed). Of these, 171 (96.1%) were TR and 7 (3.9%) RT (the difference being of course significant).

Czech existing vs. non-existing RTs. Recall that the goal of our investigation is to probe our hypothesis that existing and non-existing RTs are treated in the same way by speakers of an anything-goes language like Czech. Our main experiment thus tested #RT clusters that exist in Czech (rt, rd, lb) with respect to #RT clusters that do not occur (rb, rk). As before, we eliminated the lexical effect of words present in the Czech lexicon by using only nonce words. But we also need to take into account a possible lexical effect of the cluster (rather than of the word): the fact that speakers will find words in their lexicon that begin with with rt, rd, lb may favour their perception when they compete with non-existing clusters like rb, rk. This lexical effect cannot be eliminated, but it can be controlled for. The experiment had 50 participants and was based on 50 stimuli (for a total of 2700 trials) in a forced choice setting that enforces the competition of a possible RT percept with a possible TR percept. Thus speakers simultaneously received e.g. [pɛɛf] (L) and [rɛɛf] (R) and were then asked whether they perceived [rpɛɛf] or [prɛɛf], or neither. If our hypothesis is correct, they have no evidence for either percept, and their choice will be chance – *for existing and non-existing clusters alike*. In order to control for the putative lexical cluster effect, we first compared existing RTs with different lexical frequencies (taken from the Czech National Corpus). It turned out that such an effect indeed exists: high frequency RTs (rt, rd) produce significantly more RT percepts than low frequency RTs (lb). We then ran a repeated measures ANOVA to compare the effect of existing (rt, rd, lb) and non-existing (rb, rk) #RTs on the number of RT percepts. It revealed that the difference is statistically non-significant ($F(1,49) = .396$; $p < .532$; $\eta^2 = .002$). That is, the difference between RT percepts of existing and of non-existing RTs is statistically indistinguishable. We take this to be evidence that both cluster types are treated in the same way by the phonology of Czech. The documented lexical cluster effect does not appear to be strong enough to introduce a measurable bias in favour of existing RTs.

Conclusion. Our experimental results suggest that existing and non-existing RT clusters have

the same status in Czech: the phonology does not militate against the latter in any way. Their absence thus appears to be accidental, rather than systematic. Further work will need to show whether this is also the case in other anything-goes languages with gaps in #RT clusters.