# Optimality Theory II

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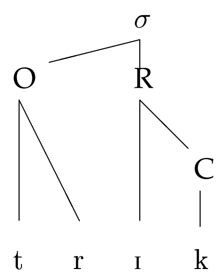
## Background

- The previous class gave an introduction to the basics of Optimality Theory; here, we will extend our insight into this theory with a few more examples from syllable structure.
- The two topics we will concentrate on are epenthesis and coda effects.[1]

## 1 Syllables and OT

Last week we have already seen analyses of certain syllable-based phenomena in terms of Optimality Theory. In order to extend this, we have to refine our view of syllable structure somewhat — still in accordance with what you have learned in previous classes. We assume the following structure:

(1)



The only refinement we have made is that we have given a name to the final consonant, which we call a *coda*. We have already seen several times that coda consonants are weak, and dispreferred in many different languages. As a matter of fact, there is quite an array of languages which do not have coda

[1] This class is based for a large part on chapter 3 of Kager (1999).

consonants at all. Examples of these are Fijian, Mazateco and Cayuvava. As a matter of fact, the following implicational universal seems to hold over known phonological systems:

(2) If a language has closed syllables, then it also has open syllables.

All languages have open syllables (syllables without a coda), but only a subset also has closed syllables.

As we mentioned, Fijian is an example of a language without closed syllables. In order to repair potential violations of this generalisation, the language (or at least its Boumaa dialect) employs **vowel epenthesis**, the insertion of a vowel. We can see this at work in loanword adaptation. If a word with a closed syllable is borrowed (from English), a vowel is inserted to satisfy the constraint against closed syllables:

(3) NOCODA: *C $]_\sigma$

(4) Vowel epenthesis in Boumaa Fijian
  a. kaloko 'clock'
  b. aapolo 'apple'
  c. tʃone 'John'

Like all constraints, NOCODA is assumed to be universal, it is present in all grammars. The difference is one in constraint ranking with respect to a faithfulness constraint (ignoring a few segmental differences between the languages):

(5) a. NOEPENTHESIS: (= a subtype of faithfulness) Do not insert vowels
  b. English grammar: NOEPENTHESIS≫NOCODA
  c. Fijian grammar: NOCODA≫NOEPENTHESIS

(6) a. English

| /ʤɔn/ | NOEPENTHESIS | NOCODA |
|---|---|---|
| ☞ʤɔn | | * |
| ʤɔne | *! | |

b. Fijian

| /ʤɔn/ | NOCODA | NOEPENTHESIS |
|---|---|---|
| ʤɔn | *! | |
| ☞ʤɔne | | * |

If we now look at the other side of the syllable template in (1). The typological behaviour of the constituent we find there is quite different. We can also posit an implicational universal, but it runs in the opposite direction:

(7) If a language has syllables that lack an onset, then it also has syllables that have an onset.

In other words, all languages have so-called CV syllables, but not all languages have syllables that consist of only a V; we have seen an instance of such a language last week: Axininca Campa. We have expressed this informally before in the observation that the onset is the consonantal domain and the rhyme the domain of the vowels.

In order to describe this situation, we need a constraint of the following type:

(8) ONSET: *V $[_\sigma$

Note that this constraint is almost exactly the mirror image of NOCODA; together they describe the ideal syllable template CV, which all languages have. Formally, the reason for this is that no matter how high or how low we rank the faithfulness constraints with respect to these two constraints, CV syllables will always surface.

Another thing which follows from these two constraints is yet another universal:

(9) An underlying (monomorphemic) sequence VCV will be syllabified in all languages as V.CV

(9) is not completely self-evident. It is not hard to imagine a world in which it would not be true. For instance, in Dutch *oom* 'uncle' [om] and *a* 'A (letter)' [a] are both well-formed syllables, so why do we syllabify *oma* 'grandmother' [oma] as [o.ma] rather than *[om.a]? The answer is that these two constraints conspire to this result:

(10) a.

| /oma/ | ONSET | NOCODA |
|---|---|---|
| ☞o.ma | | |
| om.a | *! | * |

b.

| /oma/ | NOCODA | ONSET |
|---|---|---|
| ☞o.ma | | |
| om.a | *! | * |

In other words, every language which has *oma* will syllabify it in the Dutch way. Faithfulness constraints are irrelevant, at least as long as we assume that there is no syllabification in underlying representation (a standard assumption although it is something contested).

## 2 Epenthesis

We have seen that both Fijian and Axininca Campa solve their problems with syllable structure by way of vowel epenthesis. We will now go into this a little bit deeper for the latter language.

The ONSET constraint is very strong in Axininca. Whenever the concatenation of morphemes would result in an onsetless syllable, an epenthetic [t] is inserted:

| | | | | |
|---|---|---|---|---|
| (11) | a. | /no-ŋ-koma-i/ | [noŋkomati] | 'he will paddle' |
| | b. | /no-ŋ-koma-aa-i/ | [noŋkomataati] | 'he will paddle again' |
| | c. | /no-ŋ-koma-ako-i/ | [noŋkomatakoti] | 'he will paddle for' |
| | d. | /no-ŋ-koma-ako-aa-i/ | [noŋkomatakotaati] | 'he will paddle for it again' |

We already have all the constraints set in place to describe this behaviour:

(12)

| /no-ŋ-koma-i/ | ONSET | NOEPENTHESIS |
|---|---|---|
| ☞noŋ.ko.ma.ti | | * |
| noŋ.ko.ma.i | *! | |

However, given the properties of the Gen function, we should also take into account numerous other candidates. Most interesting among these are those forms which satisfy *both* ONSET and NOEPENTHESIS at the same time. This is certainly possible; for an input /no-ŋ-koma-i/ there is an output candidate [noŋ.ko.ma] in which nothing is epenthesized, but there is also no ONSET violation. The point is, of course that here a different type of faithfulness constraint is violated, viz. one against deletion:

(13) NODELETION: Underlying segments (vowels) must be preserved in the output.

Apparently, this constraint dominates NOEPENTHESIS in Axininca:

(14)

| /no-ŋ-koma-i/ | ONSET | NODELETION | NOEPENTHESIS |
|---|---|---|---|
| ☞noŋ.ko.ma.ti | | | * |
| noŋ.ko.ma.i | *! | | |
| noŋ.ko.ma.i | | *! | |

We have ordered ONSET $\gg$NODELETION, but it is not very hard to see that we would have got the same result if we would have ordered these constraints in the opposite order. In cases like this, we say that the ordering is irrelevant, which we write down as ONSET, NODELETION.

More generally, we can order three constraints in 3! = 3x2x1 = 6 different ways. This gives us six different possible grammars. Yet some of these grammars produce exactly the same result. If we write down all possible orders for a given set of constraints, we get a **factorial typology**. The prediction is that every individual grammar should describe some (possible) human language. You should check the validity of the descriptions below:

(15) Factorial typology for { ONSET, NODELETION, NOEPENTHESIS }:

1. ONSET, NODELETION≫NOEPENTHESIS: Consonant epenthesis to create onset (e.g. Axininca)
2. ONSET, NOEPENTHESIS≫NODELETION: Vowel deletion to create onset (e.g. Modern Greek)
3. NOEPENTHESIS, NODELETION≫ONSET: Onsetless syllables freely allowed (e.g. English)

It is one prediction of Optimality Theory that changes will never happen without a cause. If we delete something, we violate NODELETION; of we insert something, we violate NOEPENTHESIS. This will incur a violation which will only be allowed if it helps us satisfy a higher-ranked constraint. Violation of constraints is always **minimal**, because there will always be a competing candidate which has less violations, and unnecessary violation of constraints will not help a candidate in the struggle for life.

In order to see this, we study an example from Lenakel. The relevant syllable structure constraint in this language is a little different from what we have seen so far, although it is clearly related:

(16) *COMPLEX: Onsets and codas should not contain more than one consonant.

This constraint is responsible for the fact that consonant clusters are broken up by an epenthetic vowel [ɨ] if they would result in syllables with complex marginal clusters:

| | | | | |
|---|---|---|---|---|
| (17) | a. | /t-n-ak-ol/ | [tɨ.na.gɔl]<br>*[tna.gɔl] | ‘you will do it’ |
| | b. | /ark-ark/ | [ar.ga.rɨk]<br>*[ar.gark] | ‘to growl’ |
| | c. | /kam-n-m̄an-n/ | [kam.nɨ.m̄a.nɨn]<br>*[kam.nm̄ann], *[kamn.m̄ann] | ‘for her brother’ |

This can be described by assuming the ranking *COMPLEX(, NOINSERTION)≫NOEPENTHESIS for Lenakel. Now study the following alternative candidates for these forms:

(18) a. *[a.rɨ.ga.rɨ.kɨ]

b. *[tɨ.na.gɔ.lɨ]
c. *[ka.mɨ.nɨ.m̄a.nɨ.nɨ]

Like the real winners, all these candidates satisfy *COMPLEX and violate NOEPENTHESIS. The problem is, however, that they violate this constraint more than necessary. (It would be necessary to violate NOEPENTHESIS as often as these forms do it, if Lenakel would have a high-ranking NOCODA, but apparently this is not the case: Lenakel allows closed syllables, so that the language can be assumed to have the following constraint ranking:

(19) *COMPLEX≫NOEPENTHESIS≫NOCODA

Yet even in a language which disallows closed syllables, a candidate such as the following would never win:

(20) *[a.rɨ.ga.rɨ.ɨ.kɨ]

It is safe to assume that this particular form would never win in any language, given the input we studied. It contains an epenthesis which does not improve anything, and it is **harmonically bound** by other forms which do not violate this constraint.

Another sense in which vowel epenthesis in Lenakel is minimal is in its choice of the central vowel [ɨ] as the epenthetic vowel. This vowel (as well as its non-high counterpart [ə]) very often serve as the epenthetic vowel. We know why this is: these vowels are quite empty, since they do not contain place features. By inserting them rather than place-bearing vowels, we epenthesize as little as possible into our phonological structure.

## 3 Coda conditions

Coda's are marked positions for consonants. In some languages, they are disallowed altogether, but even in languages which do have them, they are restricted. French word-final floating consonants only show up if there is an onset position created for them, rather than a coda position. Nasals in the rhyme borrow their place features from their neighbour. Obstruents undergo final devoicing in the coda in many languages. We will study a few more examples in this chapter.

Japanese only allows coda consonants if they share a place of articulation with the immediately following consonant. We thus find words such as those in (21a), whereas the forms in (21b) are not allowed.

(21) a. *kap.pa* 'a legendary being', *kit.te* 'stamp', *gak.koo* 'school', *tom.bo* 'dragonfly', *non.do* 'tranquil', *kaŋ.gae* 'thought'

b. **kap.ta*, **tog.ba*, **pa.kap*, etc.

The constraint which is responsible for this is the so-called Coda Condition, well-known from the study of Japanese phonotactics:

(22) CODA-COND: Consonantal place features should occur in a position outside the coda

Note that the constraint is satisfied by the forms in (21a) under autosegmental assumptions: the place features are all in an onset postion; CODA-COND does not care that they are *also* in a coda. The only structure it militates against is one where place features occur in a coda position exclusively.

The CODA-COND is not exclusive for Japanese; we also find it in an unrelated language such as Ponapean. In this language, we can see that it takes a phonological effect: it causes vowel epenthesis, as the following examples demonstrate:

| | | | | |
|---|---|---|---|---|
| (23) | /ak-dei/ | a.ke.dei | *ak.dei | 'a throwing contest' |
| | /kitik-men/ | ki.ti.ki.men | *ki.tik.men | 'rat INDEF' |
| | /naŋkep/ | *na.ŋi.kep | naŋ.kep | 'inlet' |

Another way in which CODA-COND can be satisfied is by deletion of the offending consonant. Also this is attested in some of the world's languages, e.g. in Diola Fogny:

| | | | | |
|---|---|---|---|---|
| (24) | /let-ku-jaw/ | le.ku.jaw | *let.ku.jaw | 'they won't go' |
| | /jaw-bu-ŋar/ | ja.bu.ŋar | *jaw.bu.ŋar | 'voyager' |
| | /jaw-bu-ŋar/ | *ja.bu.ŋa | ja.bu.ŋar | 'voyager' |

(We leave it as an open question why it is the first consonant which is deleted rather than the second one.)

We can now see CODA-COND as one member of a family of constraints, all of them having parallel definitions:

(25) a. CODA-COND: Consonantal place features should occur in a position outside the coda
b. FINALDEVOICING: Consonantal [voice] should occur in a position outside the coda
c. NASALHARMONY: Nasal place features should occur in a position outside the coda
d. NOCODA: Consonantal features should occur in a position outside the coda

If one is doing constraint-based phonology, one should obviously have a theory about what is a possible constraint. If we are allowed to freely formulate new constraints all the time, we cannot say that we have much of a theory. Within OT, we posit that all constraints are universal; but if we can freely invent constraints, than we can have a constraint X and a different constraint ¬X which says exactly the opposite, and which would 'explain' why we do not see the effect of X in all languages (because many of them would happen to have ¬X≫X).

Organizing constraints into families is a first step towards building a theory of constraints. We could build one schematic constraint from which the various concrete instances in (25) can be derived by instantiating the variable F in different ways:

(26) CODA-COND(F): Consonantal feature F should occur in a position outside the coda

We could now say that the universal set of constraints consist only of concrete instances of a small set of constraint schemes (or even that an individual language chooses one or more instances of the scheme in its actual grammar).

## Bibliography

Kager, René (1999). *Optimality Theory*. Cambridge: Cambridge University Press.

## Exercise 6

In de taal Hariri vinden we het volgende patroon van epenthese (alle vormen zijn afgeleid van de wortel /sbr/ 'breken'; de epenthetische klinker is [i], over de verschillende plaats van de ä in de werkwoordstijden hoef je je geen zorgen te maken, die kun je als gegeven beschouwen:

| | | | | | |
|---|---|---|---|---|---|
| (27) | a. *perfective* | 2 MASC | /t-säbr/ | [tisäbri] |
| | | 2 FEM | /t-säbr-i/ | [tisäbri] |
| | | 3 MASC | /y-säbr/ | [yisäbri] |
| | | 3 FEM | /t-säbr/ | [tisäbri] |
| | b. *negative imperfective* | 2 MASC | /zä-t-sbär/ | [zätsibär] |
| | | 2 FEM | /zä-t-sbär-i/ | [zätsibäri] |
| | | 3 MASC | /zä-y-sbär/ | [zäysibär] |
| | | 3 FEM | /zä-t-sbär/ | [zätsibär] |

Geef een analyse van deze verschijnselen in termen van de in dit hoofdstuk gegeven constraints.