

Week 10 – More on Rules and OT

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1 Rule-based analyses and OT

We have emphasized in this class two kinds of linguistic generalizations:

Phonotactic Generalizations. These are true statements about what sequences of sounds are allowable (or not) in surface forms.

Phonological Processes. These are statements that describe transformations from abstract underlying forms to surface forms.

Both of these generalizations seem equally valid to me in that they capture a person's knowledge of language.

The rules in rule-based analyses *directly* describe phonological processes. However, the phonotactic generalizations are *derived*. More discussion on this later below.

The highly-ranked markedness constraints in OT analyses *directly* describe phonotactic generalizations. The phonological processes *emerge* through the interaction of ranked markedness and faithfulness constraints.

So the two theories place primacy on different kinds of generalizations. In some sense, analyses tend to reflect the generalizations the analytical frameworks inherently favor. This is why, even if they describe the same mapping from UFs to SFs, they are different. They describe the mapping in different terms. They factor it differently.

1.1 Interlude on conducting and writing-up OT analyses

When doing linguistic analysis (for both rules and OT), there are always two steps:

1. Developing an analysis
2. Writing it up so others can understand it

These are distinct tasks that come with their own methods, practice, and experience.

When determining an OT analysis, you need to figure out what constraints to use, how they are ranked. To do this, you need to determine the underlying forms and determine which candidates to consider.

How do I know which candidates and constraints to consider when developing my analysis? Here is a procedure that usually works reasonable well:

1. Start with the winning candidate and the fully faithful candidate.
2. If the winning candidate \neq the fully faithful candidate...
 - (a) Add markedness constraint(s) that rule out the fully faithful candidate.
 - (b) Add faithfulness constraints that the winning candidate violates.
 - (c) Think of other ways to satisfy the markedness constraints that rule out the fully faithful candidate. Add those candidates, and the faithfulness and markedness constraints that rule them out. You have to use your judgment in deciding how far to take this step.

How do I write up my OT analysis? Once you have the analysis, you now need to present it in written form. In general, I think organizing a paper around the phenomenon makes the most sense. For each phenomenon, you need to introduce the constraints, show how they are ranked to produce the relevant phenomenon.

When establishing a constraint ranking, use the *smallest* tableaux that establishes the ranking. The smallest tableaux should include the fully-faithful constraint, the winning candidate, and preferably a single other candidate that establishes the ranking. It should also include all faithfulness constraints violated by these candidates, and all relevant markedness constraints. If you want to establish multiple constraint rankings, it is much easier for the reader to examine many small tableaux than one large one.

In fact, a large tableaux is only appropriate as a ‘summary’ tableaux towards the end of the write-up (or some significant section of it). Similarly, a Hasse diagram is not needed after every established ranking, but only when it is useful to remind the reader where we are.

1.2 Interlude on Entailed Ranking Arguments (ERCs)

Here are some useful things to keep in mind about how to interpret ERCs. All examples below assume 6 constraints in the following order

$$\langle C_1, C_2, C_3, C_4, C_5, C_6 \rangle.$$

1. If there is exactly one W and one L then you can be certain that the constraint associated with W outranks the constraint associated with L.

$$\begin{array}{ll} e, e, e, W, e, L & C_4 \gg C_6 \\ e, W, e, e, L, e & C_2 \gg C_5 \end{array}$$

2. If there is exactly one W and more than one L then you can be certain that the constraint associated with W outranks *every* constraint associated with L.

$$\begin{array}{ll} L, e, e, W, e, L & C_4 \gg C_1, C_6 \\ e, W, L, e, L, e & C_2 \gg C_3, C_5 \end{array}$$

3. If there is more than one W and exactly one L then you can be certain that one of the constraints associated with W outranks the constraint associated with L.

$$\begin{array}{ll} W, e, e, W, e, L & C_1 \gg C_6 \text{ or } C_4 \gg C_6 \\ W, W, e, e, L, e & C_1 \gg C_5 \text{ or } C_2 \gg C_5 \end{array}$$

4. If there is more than one W and more than one L then you can be certain that for each constraint associated with L, there is at least one constraint associated with W which outranks it.

$$\begin{array}{ll} W, W, e, L, L, e & (C_1 \gg C_4 \text{ or } C_2 \gg C_4) \text{ and } (C_1 \gg C_5 \text{ or } C_2 \gg C_5) \\ W, e, L, W, e, L & (C_1 \gg C_3 \text{ or } C_4 \gg C_3) \text{ and } (C_1 \gg C_6 \text{ or } C_4 \gg C_6) \end{array}$$

5. If there is at least one W no Ls then there is no ranking information at all.

$$\begin{array}{l} W, e, e, e, e, e \\ e, e, e, W, W, e \end{array}$$

6. If there is at least one L no Ws then the candidate you think is the winner is not the winner!! There is a problem with your analysis. Doublecheck the constraint violations were assigned, add constraints, ...

$$\begin{array}{l} e, e, L, e, e, e \\ e, L, e, e, L, e \end{array}$$

7. If there are all e then there is a candidate equally optimal with the winner. The current constraint set does NOT distinguish them.

$$e, e, e, e, e, e$$

2 Morpheme Structure Constraints, Surface Phonetic Constraints, or Both?

As we have seen there are (at least) two levels of representation in phonology: the underlying and surface forms. **Morpheme structure constraints** (MSCs) are language-specific restrictions on what constitutes a ‘legal’ UR. Similarly, **Morpheme structure rules** (MSRs) are rules that apply over the abstract, mental lexicon to ensure that every entry conforms to a certain shape.

Surface Phonetic Constraints (SPCs) are language-specific restrictions on what constitutes a ‘legal’ surface form. The term **phonotactics**, as far as I can tell, originally refers to SPCs, but is often used as a cover term meaning ‘legal sequences over some domain (or level)’.

Since underlying forms are abstract, what kind of evidence could distinguish MSCs from SPCs?

Consider English, which has no codas like [kd], though it has ones like [kt] (e.g. [ækt] *act*). The prohibition on [kd]_σ must be expressed somewhere in the grammar of English, since speakers know it (they would reject [ækd] as a new word). A MSC just bans them from the underlying representation. A MSR could change underlying [kd] to [kt].

This comes back to the ‘lexical symmetry’ idea in K&K’s discussion of Russian final devoicing. The grammar needs to explain, one way or another, why certain types of underlying forms don’t seem to occur.

For example, in Toba Batak (Hayes, 1986, Austronesian), a voicing contrast exists among obstruents. There are phonemes /p,b,t,d,k,g/. However, no Batak root ends in a voiced obstruent.

[marisap]	‘smoke’
[maŋihut]	‘according to’
[pɛddek]	‘short’

Many Batak roots may appear with a suffix, but *in no case does a putative underlying /b,d,g/ ever manifest itself*. Every case patterns like [marisap] ~ [marisapan], and never like [marisap] ~ [marisaban].

The observed pattern of alternation in Toba Batak case suggests that voiced obstruents are banned word-finally in underlying forms. So are SPCs needed at all?

2.1 Earlier approaches to Phonotactic Generalizations

Chomsky and Halle (1968), *Sound Pattern of English*:

1. Place constraints on possible underlying representations.
2. Morphology concatenates these

3. Rules apply to the result
4. Hence, surface phonotactics are derived.

2.2 Conceptual Arguments against Surface Phonetic Constraints

Given MSCs and the phonological rules, some argue that constraints on surface forms are redundant. ?, 214 writes

“an independent phonotactics is necessarily and in all cases useless and redundant in its entirety... [because] ... every fact which such a separate phonotactics describes is accounted for ... by the morpheme-internal restrictions on morphophoneme combinations [MSCs] and the morphophonemic rules which must exist in any event.”

(Johnson, 1972) also writes “On the other hand, there seems to be no need at all for a special component to describe the set of admissible phonetic strings, since this set is determined indirectly by morpheme structure component and the phonological rules.”

2.3 Conceptual Arguments for Surface Phonetic Constraints

Shibatani (1973, 99) argues as follows:

“It is the SPCs of his language which intrude into the pronunciation of a foreign language when an adult learner speaks. The SPCs are acquired in an early stage of mother-tongue acquisition, and they are deeply rooted in the competence of a native speaker.”

Shibatani (1973, 94) also writes:

“Postal’s and Johnson’s view is tantamount to saying that the well-formedness of phonetic representations can be examined only by applying all the phonological rules to all the possible inputs. However, if one claims that a grammar represents a particular speaker’s competence (the view held by a generative phonologist), then the position maintained by Postal and Johnson is untenable. For, as has been documented by Moskowitz 1971, a child learns the constraints of phonetic representations during the stage which she calls the period of early acquisition, which is earlier than the stage where a child acquires morphophonemic alternations. Obviously, at this early stage, a child has a highly incomplete lexicon, and consequently very tentative MSC’s and few or no morphophonemic rules: yet he knows what is and what is not a well-formed phonetic representation in his language. Thus a grammar which describes the SPC’s of a language as something deducible from the MSC’s and phonological rules of that language misrepresents an important aspect of man’s competence in his language.”

This last quote is prescient because Friederici and Wessels (1993); Jusczyk *et al.* (1993a,b, 1994) also show that children do in fact have knowledge of what is surface legal in their language at about 9 months (before they begin to speak). This is plausibly before they have learned the morphonology of the language (Hayes, 2004; Prince and Tesar, 2004). Interestingly, some phonological learning algorithms for learning rules succeed in part because the learners assume some phonotactic knowledge (Albright and Hayes, 2003).

2.4 Evidence for Surface Phonetic Constraints

Here is some evidence from Japanese for SPCs. This is probably oversimplifying because there have been many different proposals about what the underlying forms are and what rules apply for Japanese verbs. But this argument is probably close to what Shibatani has in mind.

<i>UR</i>	<i>present</i>	<i>pres. polite</i>	<i>negative</i>	<i>past</i>	
/mat/	mats-u	matʃ-imasu	mat-anai	mat-ta	‘wait’
/kak/	kak-u	kak-imasu	kak-anai	kai-ta	‘write’
/aruk/	aruk-u	aruk-imasu	aruk-anai	arui-ta	‘walk’
/job/	job-u	job-imasu	job-anai	jon-da	‘call’
/asob/	asob-u	asob-imasu	asob-anai	ason-da	‘play’
/isog/	isog-u	isog-imasu	isog-anai	isoi-da	‘hurry’
/hanas/	hanas-u	hanaf-imasu	hanas-anai	hanaf-ita	‘speak’
/nom/	nom-u	nom-imasu	nom-anai	non-da	‘drink’
/kaer/	kaer-u	kaer-imasu	kaer-anai	kaet-ta	‘return’
/gambar/	gambar-u	gambar-imasu	gambar-anai	gambat-ta	‘hang in there’
/tabe/	tabe-ru	tabe-masu	tabe-nai	tabe-ta	‘eat’
/mise/	mise-ru	mise-masu	mise-nai	mise-ta	‘show’
/mi/	mi-ru	mi-masu	mi-nai	mi-ta	‘see’
/deki/	deki-ru	deki-masu	deki-nai	deki-ta	‘can’

- ★ What generalizations can we make about allowable non-prevocalic (i.e., syllable-final) Cs in surface forms?

- ★ Assuming the URs above are correct, is there an MSC (morpheme structure constraint) against non-prevocalic Cs in Japanese?

(1) Here are some English loanwords:

pɛN	‘pen’
doɾɛsu	‘dress’
sukuriputo	‘script’

★ What happened here?

Shibatani argues that there was no basis for a V-insertion rule in Japanese before contact with English—but there was a basis for a *surface* constraint on non-prevocalic Cs.

2.5 Summary

1. There are good arguments for phonotactic generalizations being part of the competence of a native speaker.
2. There are also good arguments for phonological processes also part of the competence of a native speaker (see first half of this class).
3. To what extent do our theories capture both kinds of generalizations?

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