Opacity and Transparency in Spanish Plurals: A Sympathetic Approach

Seiichiro KIKUCHI
Tohoku University / JSPS Research Fellow

Keywords: Sympathy, opacity, transparency, Output-Output correspondence

1. Introduction: opacity and transparency in Spanish plurals

Harris (1983) discusses two rules of Spanish phonology, which interact differently with plural suffixation. One of these rules is a depalatalisation rule that changes palatal consonants into non-palatals in a coda position as in (1a). In plurals, the depalatalisation rule opaquely applies to the stem-final palatals, although they are in an onset position, as in (1b).

(1) a. don.ce[ʎ]a "lass" don.ce[l] "lad"
des.de.[ɲ]ar "to disdain" des.dé[n] "disdain"
b. don.ce[l] "lad" don.ce.[l]-es "lads"
des.dé[n] "disdain" des.de.[n]-es "disdains"

The other rule, which Harris (1983) discusses, is a debuccalisation rule, which changes /s/ to [h] in coda as in (2a). In plurals, the rule of debuccalisation applies transparently to the stem-final /s/, as in (2b). In other words, /s/ is not debuccalised, when it is in an onset position.

(2) a. tos to[h] "cough"
deseo de.[s]e.o "desire"
b. tos to[h] "cough"
tos-es to.[s]-e[h] "coughs"

In rule-based theories, the opaque depalatalisation and the transparent debuccalisation has been accounted for by the following rule ordering: (i) syllabification; (ii) depalatalisation; (iii) plural suffixation; (iv) resyllabification; and (v) debuccalisation. This is demonstrated in the derivations in (3).

(3) UR /donceʎ-es/ /tos-es/
Syllabification don.ceʎ tos
Depalatalisation don.cel
Plural suffixation don.celes toses
Resyllabification don.ce.les to.ses
Debuccalisation to.seh

As shown in (3), the rule-based analysis crucially depends on the intermediate representation, in which a stem-final palatal is in a coda position. However, in the constraint-based Optimality Theory (OT; Prince and Smolensky 1993), which claims that there is no serial
derivation, there can be no intermediate representations. Therefore, the opacity and the transparency in (1) and (2) are problematic for OT.

The goal of this paper is to solve this opacity and transparency problem in Spanish plurals within the framework of Sympathy Theory (McCarthy 1998, Itô and Mester 1998a). I will show that Sympathy Theory can provide a unified account for the opacity and the transparency in Spanish plurals. I argue that the Spanish plural suffix has a lexical specification \( \text{selector} = \text{Anchor}_{io}(\text{Stem}, \sigma, \text{Final}) \) and that the difference between depalatalisation and debuccalisation arises from independently ranked sympathetic faithfulness constraints.

This paper is organised as follows. Section 2 presents a standard OT analysis of Spanish depalatalisation and debuccalisation and shows that the opacity and the transparency in plurals are problematic for the standard OT analysis. Section 3 provides a sympathetic analysis of the opacity and the transparency in Spanish plurals, and compares it with an Output-Output correspondence analysis. Finally, my conclusion is presented in Section 4.

2. A Standard OT approach to Spanish Plural Phonology
2.1. Preliminary analyses: Analyses of the singular cases

2.1.1. Depalatalisation

In Spanish, coda palatals are changed into non-palatals (1). This alternation is accounted for by assuming that Spanish has a coda condition against palatal segments. According to Beckman (1998), the coda condition against palataes is explained by the constraint ranking in (4).

\[
\text{(4) Ident-Ons}_{io}[\text{ant}] \gg *[\text{ant}] \gg \text{Ident}_{io}[\text{ant}]
\]

The positional faithfulness constraint Ident-Ons\(_{io}\)[ant] requires that onset segments in the output and their correspondents in the input are identical with respect to the feature [ant]. The constraint *[ant] prohibits palatal segments. Ident\(_{io}\)[ant] requires that correspondent segments are identical with respect to the feature [ant]. Given that the positional faithfulness constraint outranks the markedness constraint and the general faithfulness constraint as in (4), palatas can appear only in an onset position. This is demonstrated in tableaux (5) and (6).

<table>
<thead>
<tr>
<th>/donce(\alpha/)</th>
<th>Ident-Ons(_{io})</th>
<th>*[ant]</th>
<th>Ident(_{io})</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. don.ce(\alpha)</td>
<td>*!</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. don.cele</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(6) No depalatalisation in onset position

<table>
<thead>
<tr>
<th>/donce(\epsilon\alpha/)</th>
<th>Ident-Ons(_{io})</th>
<th>*[ant]</th>
<th>Ident(_{io})</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. don.ce(\epsilon\alpha)</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. don.cele.(\epsilon\alpha)</td>
<td>*!</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

In (5), the palatal segment is parsed as a coda and is depalatalised because *[ant] dominates Ident[ant]\(_{io}\). On the contrary, as shown in (6), the palatal segment that is parsed as an onset
appears intact in the surface, because the depalatalisation of the onset palatal incurs a fatal violation of \( \text{Ident-Ons[ant]}_{\text{IO}} \), which is ranked higher than \(*[-\text{ant}]\).

2.1.2. Debuccalisation

The debuccalisation process in (2) shows that Spanish does not allow /s/ to appear in a coda position. As the depalatalisation process discussed above, this is an effect of a coda condition that yields from the constraint ranking (7).

(7) \( \text{Ident-Ons[place]}_{\text{IO}} \gg *s \gg *h \gg \text{Ident[place]}_{\text{IO}} \)

Ident-Ons[place]_{IO} requires that onset segments in the output and their input correspondents have an identical value for the [place] feature. Ident[place]_{IO} says that correspondent segments must be identical with respect to the place feature. The segmental markedness constraints *s and *h penalise [s] and [h], respectively. The evaluations by the ranking (7) are illustrated in tableaux in (8) and (9).

(8) Debuccalisation in coda position

<table>
<thead>
<tr>
<th>/tos/</th>
<th>Ident-Ons_{IO}</th>
<th>*s</th>
<th>*h</th>
<th>Ident_{IO}</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. tos</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. toh</td>
<td>!</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(9) No debuccalisation in onset position

<table>
<thead>
<tr>
<th>/deseo/</th>
<th>Ident-Ons_{IO}</th>
<th>*s</th>
<th>*h</th>
<th>Ident_{IO}</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. de.se.o</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. de.he.o</td>
<td>*</td>
<td>!</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

In (8), the coda [s] is changed into [h] at the expense of IO faithfulness because *s outranks Ident[place]_{IO}. Contrarily, as shown in (9), debuccalisation of the onset [s] is not allowed because it incurs a violation of the higher-ranked Ident-Ons[place]_{IO}. Therefore, the underlying /s/ appears intact in the surface.

2.2. Problems in Spanish plural analysis

Although the constraint rankings proposed in the preceding section correctly predict that depalatalisation and debuccalisation apply only to coda consonants, the opaque application of the depalatalisation to plurals cannot be accounted for by the ranking proposed in (4).

(10) Opaque depalatalisation: Problematic

<table>
<thead>
<tr>
<th>/don.ce.-es/</th>
<th>Ident-Ons_{IO}</th>
<th>*[-ant]</th>
<th>Ident_{IO}</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. don.ce.-es</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. don.ce.-les</td>
<td>*</td>
<td>!</td>
<td>*</td>
</tr>
</tbody>
</table>

In (10), the stem-final consonant is parsed as an onset, because the plural suffix /-es/ is vowel-initial. Given the stem-final palatal parsed as an onset, its [-ant] specification is preserved by virtue of the high-ranked Ident-Ons[ant]_{IO}. Therefore, the candidate with the stem-final palatal (10a) is incorrectly selected as optimal.
Unlike the case of the opaque depalatalisation, the transparent debuccalisation in plurals is correctly accounted for by the ranking (7).

(11) Transparent debuccalisation: Unproblematic

<table>
<thead>
<tr>
<th></th>
<th>Ident-Ons_{io}</th>
<th>*s</th>
<th>*h</th>
<th>Ident_{io}</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. to. ses</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. to. seh</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c. to. hes</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>d. to. heh</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

In (11), the stem-final /s/ is parsed as an onset. As a result, the candidates with the onset stem-final [h] (11c, d) are ruled out by the high-ranked Ident-Ons[place]_{io}. Between the remaining candidates, (11b) fares better than (11a) with respect to the constraint *s, and is selected as the optimal candidate.

The problem of the opaque depalatalisation would be accounted for if we assume that the stem-final palatal is parsed as a coda in plurals, while the stem-final /s/ is parsed as an onset. However, we cannot assume any condition that requires only the stem-final palatal to be parsed as a coda. Therefore, the standard OT approach cannot provide a unified account for the opacity and the transparency in Spanish plurals. In section 3, I propose a Sympathy Theoretic (McCarthy 1998) account for them.

3. A Sympathetic Approach to Spanish Plural Phonology

3.1. Sympathy Theory (McCarthy 1998, Itô and Mester 1998a)

Sympathy Theory (henceforth, ST) is originally proposed by McCarthy (1998) to resolve opacity problems in OT and is extended further by Itô and Mester (1998a). According to McCarthy (1998), sympathy is a type of faithfulness. It is a faithfulness relation between output candidates and a designated failed candidate, and, like any other kind of faithfulness, it is demanded by ranked, violable constraints. The object of sympathy (indicated by $\#$) is the most harmonic member of the set of candidates that obey a designated IO faithfulness constraint (called the $\#$-selector). The $\#$-ed candidate is selected as follows.

(12) Selection of the $\#$-ed candidate (McCarthy 1998)

Each IO faithfulness constraint $F_i$ sorts the candidate set $C$ into two non-overlapping subsets: $C_{<F_i}$, which violate $F_i$, and $C_{\geq F_i}$, which obey $F_i$. If $C$ is sufficiently rich, as it usually is, then $C_{<F_i}$ will be non-empty. Therefore $C_{<F_i}$ has some most harmonic member, which can be called $H_{F_i}$. This is the $\#$-ed candidate selected by $F_i$.

In the original version of ST (McCarthy 1998), it is assumed that only faithfulness constraints can serve as the $\#$-selector. On the contrary, Itô and Mester (1998a) proposes that the markedness constraints on structural alignment also serve as the $\#$-selector.

Itô and Mester (1998a) make another important proposal that the specific morpheme can be specified the $\#$-selector as the lexical requirement. For example, in Itô and Mester (1998a) it is argued that German truncation affix /-i/ is specified with the lexical requirement
selector = All-σ-L. This means that All-σ-L is the constraint that determines the ✶-ed candidate for forms with the suffix /-i/. With lexically specified ✶-selector, a specific morpheme can induce a sympathetic correspondence.

3.2. Application of sympathy to Spanish plural phonology

3.2.1. The proposal

In this paper, I propose that the plural suffix in Spanish has the lexical specification ✶-selector = Anchor₁₀(Stem, σ, Final). That is, Anchor₁₀(Stem, σ, Final) serves as the ✶-selector for forms with the plural suffix. Anchor₁₀(Stem, σ, Final) is defined as follows:

(13) Anchor₁₀(Stem, σ, Final): If the stem-final segment is preserved in the output, then it must be final in a syllable.

This constraint requires the right edge of input stem to coincide with the right edge of output syllable.

3.2.2. Opaque depalatalisation

Given the ✶-selector as (13), the opaque depalatalisation in plurals yields from the following ranking:

(14) Onset, ✶Ident[ant]₁₀Anchor ≫ Ident-Ons[ant]₁₀ ≫ *[ -ant] ≫ Ident[ant]₁₀

The sympathetic faithfulness constraint ✶Ident[ant]₁₀Anchor requires that segments in the output candidates are identical to their correspondents in the ✶-ed candidate with respect to the feature [ant]. A syllable well-formedness constraint, Onset, prohibits syllables without onset. Given these two constraints undominated in the hierarchy, the opaque depalatalisation is correctly accounted for, as in (15).

(15) /doncelesai/        Onset  ✶Ident₁₀Anchor  Ident-Ons₁₀  *[ -ant]  Ident₁₀  Anchor₁₀
    a. donce.lesai        *!   *        *        *        *  *
    b. donce.lesi         *        *   *        *        *
    c. donce.ə.esi       *!  *    *        *        *  ✓
    d. donceu.ə.esi      *!  *    *        *        *  ✓

Here, (15d) is the most harmonic member of the set of candidates that obey Anchor₁₀(Stem, σ, Final) and is selected as the ✶-ed candidate. Given (15d) as the ✶-ed candidate, the output is demanded to have a non-palatal stem-final consonant because the (15d) has a depalatalised stem-final consonant and ✶Ident[ant]₁₀Anchor outranks Ident-Ons[ant]₁₀. Thus, (15b) that has the depalatalised stem-final consonant in onset is selected as the optimal candidate. The ✶-ed candidate itself is never selected as the optimal one, because it fatally violates the highest ranked Onset.

3.2.3. Transparent debuccalisation

As discussed in section 1, the debuccalisation applies transparently to plurals. This transparent interaction is accounted for by the following constraint ranking.
Onset, Ident-Ons[place] IO $\gg$ *s $\gg$ *h $\gg$ Ident[place] IO, $\bowtie$Ident[place] Anchor

$\bowtie$Ident[place] Anchor requires that segments in the output candidate are identical to their correspondents in the *-ed candidate with respect to the [place] feature. The ranking (16) accounts for the transparent debuccalisation, as shown in (17).

In (17), the set of candidates that obey Anchor IO (Stem, σ, Final) includes (17d, e). Of these candidates, (17e) is the most harmonic member and is designated as the *-ed candidate. Unlike the case of depalatalisation, the *-ed candidate has no active influence on the outputs, because the relevant sympathetic faithfulness constraint $\bowtie$Ident[place] Anchor is dominated by Ident-Ons[place] IO. Therefore, the candidate (17c) that has [h] in the onset is ruled out by the higher-ranked Ident-Ons[place] IO. Of the candidates that do not violate both Onset and Ident-Ons[place] IO, (17b) that has [h] only in the coda is evaluated as the optimal one, since (17a) violates *s two times, while (17b) violates it only once.

In this sympathetic analysis, the difference between the opaque depalatalisation and the transparent debuccalisation is accounted for as the difference in the ranking of the sympathetic faithfulness constraints with respect to the IO faithfulness constraints: in the opaque depalatalisation the sympathetic faithfulness constraint $\bowtie$Ident[ant] Anchor dominates the IO faithfulness constraints, while in the transparent debuccalisation the sympathetic constraint $\bowtie$Ident[place] Anchor is dominated by the IO faithfulness constraints.

### 3.3. An Output-Output correspondence approach

As an alternative to the sympathetic approach to the opacity and the transparency in (1) and (2), we must consider an approach based on Output-Output (OO) correspondence (Benua 1997). In the OO analysis, the plural suffix is assumed to trigger an OO correspondence relation. Words in a singular-plural paradigm are evaluated recursively by the same constraint ranking. In recursive evaluation, the evaluation of singulars is ranked higher than that of plurals. Tableaux (18) and (19) illustrate the OO analysis of the opaque depalatalisation and the transparent debuccalisation, respectively.
(18) OO correspondence analysis of the opaque depalatalisation

**Constraint ranking:** \(\text{Ident}_{\text{ant}}[\text{OO}] \Rightarrow \text{Ident-Ons}_{\text{ant}}[\text{IO}] \Rightarrow *[-\text{ant}] \Rightarrow \text{Ident}_{\text{ant}}[\text{IO}]\)

<table>
<thead>
<tr>
<th>/donce$/</th>
<th>Ident_[\text{ant}][\text{IO}]</th>
<th>Ident-Ons_[\text{ant}][\text{IO}]</th>
<th>*[-\text{ant}]</th>
<th>Ident_[\text{ant}][\text{IO}]</th>
</tr>
</thead>
</table>
| a. don.
| * |
| b. don.
| *! |
| c. don. |

<table>
<thead>
<tr>
<th>/donce$-es/</th>
<th>Ident_[\text{ant}][\text{IO}]</th>
<th>Ident-Ons_[\text{ant}][\text{IO}]</th>
<th>*[-\text{ant}]</th>
<th>Ident_[\text{ant}][\text{IO}]</th>
</tr>
</thead>
</table>
| a. don.
| * |
| b. don.
| *! |
| c. don. |

(19) OO correspondence analysis of the transparent debuccalisation

**Constraint ranking:** \(\text{Ident-Ons}_{\text{place}}[\text{IO}] \Rightarrow *s \Rightarrow *h \Rightarrow \text{Ident}_{\text{place}}[\text{IO}], \text{Ident}_{\text{place}}[\text{IOO}]\)

<table>
<thead>
<tr>
<th>/tos/</th>
<th>Ident-Ons[place] _{\text{IO}}</th>
<th>*s</th>
<th>*h</th>
<th>Ident-[place] _{\text{IOO}}</th>
<th>(\Rightarrow)</th>
<th>/tos-es/</th>
<th>Ident-Ons[place] _{\text{IO}}</th>
<th>*s</th>
<th>*h</th>
<th>Ident-[place] _{\text{IOO}}</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. toh</td>
<td>*</td>
<td>*</td>
<td>a. toh</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td>a. toh</td>
<td>*!</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>b. tos</td>
<td>*!</td>
<td>*</td>
<td>b. tos</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td>b. tos</td>
<td>*!</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>c. toh</td>
<td>*</td>
<td>*</td>
<td>c. toh</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td>c. toh</td>
<td>*!</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

(18) and (19) show that OO approach can account for the opacity and the transparency in Spanish plurals, if we imagine that, instead of the sympathetic constraints, the OO faithfulness constraints are ranked where the sympathetic faithfulness constraints is in our sympathetic analysis. However, at the explanatory level, there is a serious problem with this approach. Since the object of the evaluation in OO approach is phonological paradigm, the evaluation of a plural form must refer to the output representation of a singular form. However, if we consider the fact that it is not always the case that a singular form is contained in the utterance where its plural form appears, the output form of the singulars must be evaluated separately from that of the plurals, and it must be stored somewhere in the brain. Consequently, serial derivations are required in OO approach, and it contradicts the OT claim that grammar is parallel and there is no serial derivation.

Contrary to OO approach, the evaluation of the plural is strictly parallel in the sympathetic approach, because the \*ed candidate is a member of the output candidates, although it is a form that never appear in the language. For this reason, I conclude that the sympathetic analysis to Spanish plurals is preferable to the OO analysis.

4. Conclusion

In this paper, I have discussed the opaque depalatalisation and the transparent debuccalisation in Spanish plurals. It was shown that Sympathy Theory can provide a unified account for them. In particular, assuming that the Spanish plural suffix has a lexical specification \*selector = Anchor[Stem, σ, Final], the difference between the opaque depalatalisation and the transparent debuccalisation is accounted for by the different rankings of the sympathetic faithfulness constraints. I suggested that OO correspondence approach, an alternative to the sympathetic approach, is rejected because of its serial nature. By contrast, in the sympathetic approach, candidates can be evaluated in a strictly parallel fashion because the \*ed candidate is a member of the output candidates.
Notes

1 This paper is a part of my paper read at Phonology Forum 1998, held at Kobe University on September 3-5, 1998. I am grateful to the participants, in particular, Alan Prince, Armin Mester, Junko Itô, Philip Spaelti, Mafuyu Kitahara and Motoko Katayama, for their comments, suggestions and encouragement. My deepest gratitude goes especially to Hideyuki Hirano for his extremely valuable comments and insights. Also, I would like to thank Iggy Roca for his helpful comments. This work is supported by JSPS Research Fellowships for Young Scientists and Grant-in-Aid for JSPS Fellows.

2 *h must outranks Ident[place]IO because Spanish does not have [h] in the segmental inventory.

3 See Baković (1997) for the comprehensive OO correspondence analysis of Spanish depalatalisation and debuccalisation.

References


