Prune early or prune late? Surprisal will cost you either way
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According to locality-based accounts (e.g., Gibson, 1998, 2000), predictions incur memory costs. Surprisal (Hale, 2001; Levy, 2008) provides the alternative, or complementary, view that cost is incurred by pruning (i.e., discarding irrelevant interpretations) as in anti-locality effects in German (e.g., Konieczny, 2000). For example, consider the verb-final constructions in (1ab).

The ditransitive verb V1 is read more quickly when preceded by the dative noun (an indirect object) and accusative noun (a direct object) in (1a) compared to when it is only preceded by an accusative noun (modified by a genitive noun in (1b) as in “designer’s unique earring”). V1 is predicted to be slow in (1b) due to pruning (to discard transitive constructions); whereas V1 is fast in (1a) as pruning took place earlier at the two object NPs, which make clear in advance that a transitive verb is not a possible continuation. However, the German results only support half of surprisal’s predictions. Pruning should be costly not only at V1 in (1b), but also at the object NPs in (1a). We report an eye-tracking reading experiment (32 participants) confirming the tradeoff: early pruning in (1a) leads to slowdowns at the object NPs and speedups at the verb.

We manipulated case markers at two points in Japanese sentences in a 2 x 2 design. Case1 (dative or genitive) marked N1 “designer”. Case2 (accusative or nominative) marked N2 “earring”. When Case1 is dative, N1 is the indirect object of an upcoming verb; when Case1 is genitive, N1 modifies N2 (“designer’s unique earring”). When Case2 is accusative, N2 is the direct object of V1 (“ordered”); when Case2 is nominative N2 is the object of V2 (“want”).

Results I (preverbal). There were no differences at the subject or N1 in first pass measures. At the adjective “unique”, there was a main effect of Case1 in first pass reading times (dative slower than genitive: mixed models, p<.05) suggesting that the dative led to more pruning.

Results II (preverbal). At N2, accusative was slower than nominative in regression path (p<.05). This result was unexpected and further analyses are being conducted to investigate it.

Results III (verb). There was an interaction at the verb V1 in right-bounded times (p<.01; also in regression path times, p<.01; second pass times, p<.05; total times, p<.05). The sequence dative-accusative (i.e., Case1 dative; Case2 accusative) was faster than dative-nominative (p<.05); whereas genitive-accusative and genitive-nominative did not differ (p>.1). The results are compatible with the interpretation that the dative was more felicitous followed by an accusative (i.e., a ditransitive construction; Kamide et al., 2003, for related results) rather than a nominative; in contrast, the genitive only required a noun to come next without restricting its case marker. This suggests that the slowdown in Results I was in order to prune alternatives other than ditransitive constructions. This is confirmed by a replication of the German results as the ditransitive verb V1 was read more quickly when preceded by the dative-accusative sequence in (1a) than the genitive-accusative sequence in (1b) (in right-bounded times, p <.01).

Examples:

<table>
<thead>
<tr>
<th>Case1 – Case2</th>
<th>Subject</th>
<th>N1</th>
<th>Adjective</th>
<th>N2</th>
<th>V1 (ordered)</th>
<th>V2 (want-that)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a) dat-acc:</td>
<td>Subject</td>
<td>N1-dat</td>
<td>Adjective</td>
<td>N2-acc</td>
<td>V1</td>
<td>seem</td>
</tr>
<tr>
<td>1b) gen-acc:</td>
<td>Subject</td>
<td>N1-gen</td>
<td>Adjective</td>
<td>N2-acc</td>
<td>V1</td>
<td>seem</td>
</tr>
<tr>
<td>1c) dat-nom:</td>
<td>Subject</td>
<td>N1-dat</td>
<td>Adjective</td>
<td>N2-nom</td>
<td>V2</td>
<td>said</td>
</tr>
<tr>
<td>1d) gen-nom:</td>
<td>Subject</td>
<td>N1-gen</td>
<td>Adjective</td>
<td>N2-nom</td>
<td>V2</td>
<td>said</td>
</tr>
</tbody>
</table>

(1a/b) sono zyosikousei-wa dezainaa-ni/no koseitekina iyaringu-o tyuumonsita rassii
That school girl-TOP designer-DAT/GEN unique earring-ACC ordered seem

(1c/d) sono zyosikousei-wa dezainaa-ni/no koseitekina iyaringu-ga hosii-to itta
That school girl-TOP designer-DAT/GEN unique earring-NOM want-COMP said

“That school girl seems to have ordered the unique earring to/of the designer.”

“That school girl said that she want the unique earring to/of the designer.”