Syntactic attachment disambiguation is one of the best-studied phenomena in sentence comprehension. Bottom-up disambiguating cues vary widely, however, and the relationship between specific cue properties and disambiguation efficacy has been less well studied. Here we investigate the relationship between the redundancy of disambiguating cues and contextual expectation for a given attachment. In both attachment preferences and syntactic adaptation, we find effects of cue redundancy. When disambiguating cues are highly redundant, comprehenders correctly interpret even violations of strong contextual expectations and rapidly adapt to these violations. When disambiguating cues are less redundant, however, comprehenders frequently misinterpret syntactic attachment, and show no signs of adaptation.

In (1a—b), a sentence-final RC might locally modify the preceding noun (company), or might unexpectedly be an extraposed modifier of executives. Changing the premodifier of executives from the to only those, however (1c—d), sets up a strong expectation for a postmodifier.

But disambiguating input may vary in redundancy. Whereas in (1) animacy, number marking, and RC semantics all indicate correct attachment, in (2) RC semantics is neutral. In many formal expectation-based models, surface input to syntactic comprehension is taken to be veridical and a single cue should be enough to completely rule out the incorrect attachment (Hale, 2001; Jurafsky, 1996). In some models, however, surface input itself can be overridden by strong contextual expectations (Levy et al., 2009). In such models, the low-redundancy disambiguations of (2) should be less effective, since fewer cues are available and these cues are carried by short, high-frequency words. Thus interpretation should be less accurate for low-redundancy than for high-redundancy disambiguations.

We verified two key predictions of such input-uncertainty models by analyzing data (some of which are from Levy et al., 2011) from one high-redundancy and one low-redundancy self-paced reading experiment. First, comprehenders should be least accurate at answering questions when (a) the questions pertain to what the RC modifies, (b) the correct modification violates contextual expectations, and (c) disambiguating input is low-redundancy. We find this to be the case (Table 1); the extraposition-expectation interaction is significant ($p<0.001$) only for RC-related QA accuracy in the low-redundancy experiment.

Second, since syntactic adaptation is error-driven (Bock, 1986; Bock & Griffin, 2000; Fine et al., 2010; Jaeger & Snider, 2008; Pickering & Ferreira, 2008), we expect to see the strongest facilitatory adaptation in the two expectation-violation conditions. In the low-redundancy conditions, however, if—as suggested by question-answering accuracy—comprehenders did not reliably infer the unexpected syntactic analysis, then there would be no clear error to learn from. Hence we predict stronger facilitatory learning in the high-redundancy experiment. This is exactly what we see (Figure 1, three-way order-extraposition-expectation interaction $t=1.934$ in a mixed linear model with three-way random interactions by participants and items); in the low-redundancy experiment, we see only a general speeding effect (Figure 2; no trace of a three-way interaction).
1. **HIGH-REDUNDANCY:**
   a. The chairman consulted the executives about the company which was acquired recently by a rival firm.
   b. The chairman consulted the executives about the company who were highly skilled and experienced in the industry.
   c. The chairman consulted only those executives about the company which was acquired recently by a rival firm.
   d. The chairman consulted only those executives about the company who were highly skilled and experienced in the industry.

2. **LOW-REDUNDANCY:**
   a. The chairman consulted the executives about the company which was making lots of money.
   b. The chairman consulted the executives about the company who were making lots of money.
   c. The chairman consulted only those executives about the company which was making lots of money.
   d. The chairman consulted only those executives about the company who were making lots of money.

<table>
<thead>
<tr>
<th></th>
<th>High-redundancy</th>
<th>Low-redundancy</th>
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<tbody>
<tr>
<td></td>
<td>RC Extrapolated</td>
<td>Unextrapolated</td>
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<td><strong>RC-related</strong></td>
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<td></td>
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<td>0.84</td>
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</tbody>
</table>

Table 1: Question-answering accuracy

![High-redundancy RT adaptation](image1)

![Low-redundancy RT adaptation](image2)

Figure 1: High-redundancy RT adaptation

Figure 2: Low-redundancy RT adaptation

References: