Relative Clause Attachment in Canadian French: Prosodic Boundary or F0 Matching?

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RELATIVE CLAUSE LENGTH

N1-of-N2-RC: LONG RCs ARE MORE LIKELY TO ATTACH HIGH THAN SHORT RCs

- Predicted on basis of Implicit Prosody Hypothesis (Fodor, 1998)
- Confirmed for French by Pynte & Colonna (2000)
- Confirmed in all languages tested to date:

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Brazilian Portuguese	(Lourenço-Gomes, 2002)
Croatian	(Lovric & Fodor, 2000)
Dutch	(Wijnen, 2001)
English	(Fernández & Bradley, 1999)
German	(Walter et al., 1999)
Japanese	(Kamide et al., 1998)
Spanish	(Fernández, 2000)

PROSODIC EXPLANATION

- Prosodic contour biases syntactic disambiguation in listening.
- Projected prosody does so in silent reading.
- Supported by data from across constructions and across languages. See Lovric (forthcoming) for a survey.

But which aspect of prosody is responsible for RC-length effect?

Prior data: English, European French, fundamental frequency (F0)
(Quinn et al., 2000)

High attachment: F0 **rise** from N2 to start of RC (only for long RCs)
Low attachment: F0 **fall** (for all short RCs)

(These diagrams are only approximate!)

Preferred **HIGH**   Preferred **LOW**
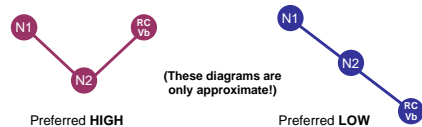
CONCLUSION: The prosodic influence on attachment height…
- is **not** the relative prominence of the two nouns (though see Schafer et al., 1996, on focal accents);
- concerns the relation between the nouns and the RC.

BUT A QUESTION REMAINS:
- Is it **F0** per se that matters (a melodic explanation)?
- Or do these F0 contours reflect **prosodic structure**?

THESE FACTORS CONFOUNDED BY QUINN ET AL.
- High F0 on Long RC-Verb probably caused by pre-RC prosodic boundary. Quinn's preliminary duration measures support this interpretation.
- Low F0 on Short-RC Verb was induced by sentence-final boundary tone.

CURRENT STUDY DESIGNED TO DISTINGUISH THESE FACTORS
- We induce high F0 by <u>other</u> means, holding boundaries constant. (See center panel.)

TWO HYPOTHESES:

F0 MATCHING: High F0 at RC-Verb might favor high attachment due to match with higher F0 at N1.

PROSODIC BOUNDARY: High F0 may reflect F0 reset, and a pre-RC prosodic boundary signals a discontinuity in the syntactic tree (Maynell, 1999).

THE EXPLANATORY ISSUE:
Why is Long RC more inclined to attach high than Short RC?

F0 MATCHING: Because Long RC is more likely to start with high F0.

PROSODIC BOUNDARY: Because Long RC is more likely to be preceded by a prosodic discontinuity (Selkirk, 2000).

THE CURRENT STUDY: PROSODIC BOUNDARY OR F0 MATCHING?

TACTIC: RAISE THE F0 OF THE RC-VERB…
BY INDUCING A CONTINUATION RISE IN SILENT READING, IN CANADIAN FRENCH.

French offers a clear test: The continuation rise is strongly realized and (more or less) obligatory.
- A high boundary tone occurs at the end of a non-final subordinate clause.
- The verb is the final word in a Short RC, so it realizes this final boundary tone.

[… N1-de-N2 RC[… Verb]].   [Adverb … N1-de-N2 RC[… Verb]], followed by main clause

MAIN CLAUSE   F0   ADVERBIAL CLAUSE   F0

EXPERIMENT: MAIN vs ADVERBIAL CLAUSE IN CANADIAN FRENCH

Method: Questionnaire, sentences followed by comprehension questions to determine preferred disambiguation.
Subjects: N = 48 (12 x 4) native speakers of Canadian French.
Materials: Similar to Quinn et al., but with additional clause. 24 basic sentences x 4 versions.

N1-de-N2-RC in Main / Adverbial Clause ´ Short / Long RC

N1-de-N2-RC in MAIN CLAUSE: Il aime la sœur de l'Anglaise qui arrive (à l'agence de voyages). Il n'est pas content.
He loves the sister of the Englishwoman who is arriving (at the travel agency). He is not happy.

Qui arrive?	la sœur	l'Anglaise
Who is arriving?	the sister	the Englishwoman

N1-de-N2-RC in ADVERBIAL CLAUSE: Quoiqu'il aime la sœur de l'Anglaise qui arrive (à l'agence de voyages), il n'est pas content.
Although he loves the sister of the Englishwoman who is arriving (at the travel agency), he is not happy.

Qui arrive?	la sœur	l'Anglaise
Who is arriving?	the sister	the Englishwoman

QUESTION: Does RC-attachment preference shift from low to high, when the ambiguity is shifted from main clause (falling final boundary tone) to adverbial clause (rising final boundary tone)?

F0 MATCHING predicts YES, for short RCs only
PROSODIC BOUNDARY predicts NO

PRE-TEST FOR SHORT RC F0 CONTOUR

Method: Elicited production
Subjects: N = 8 native speakers of Canadian French
Materials: Similar to those of Quinn et al. and current study

N1-de-N2-RC in Main / Adverbial Clause × Attachment High / Low

Acoustic Analysis: F0 measurements in stress-bearing syllables of N1, N2 and RC verb

- Data confirm continuation rise in Adverbial clause in Canadian French.
- Absolutely no effect of high / low attachment, nor any interaction. (Figure collapses over Attachment.)
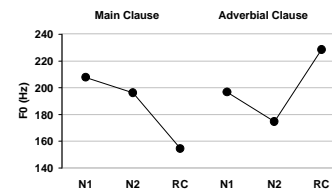
RESULTS

Interaction Term, $F_1 < 1$, $F_2 < 1$

Main Effect of RC Length (45.6 vs 58.3)
F_1 (1,44) = 25.60, p < .001; F_2 (1,20) = 27.20, p < .001

Main Effect of Clause Type (52.7 vs 51.2)
$F_1 < 1$, $F_2 < 1$

- Adverbial clause does *not* differ at all from main clause: Short RC (boundary tone on RC verb) still attaches lower than Long RC (boundary tone much later than RC verb)
- Replicates standard main clause RC length effect

F0 MATCHING is disconfirmed.
Data are consistent with the PROSODIC BOUNDARY explanation.
(Assumption: Probability of boundary before Short / Long RC is unaffected by Clause Type.)
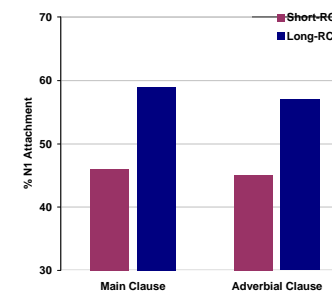
CONCLUSION

The F0 pattern in Quinn et al.'s data is most likely a consequence of prosodic boundary distribution, and it is prosodic boundaries that (directly) influence attachment preferences.

SUMMING UP

- One detail of the (implicit) prosodic explanation of RC-length effects on RC-attachment has been refined here.
- Default PROSODIC PHRASING, which is known to be length-dependent, is the likely cause of the length effect.

FUTURE DIRECTIONS

Our working hypothesis is that implicit prosody is the explanation of all differences in attachment preference in silent reading – across languages and across phrase lengths.

The Implicit Prosody Hypothesis also offers explanations for:

- The effect of null / overt preposition in Croatian (Lovric, 2002, forthcoming).
- New findings by Hemforth et al. (submitted):
  - ? More high attachment in object position than subject position (German, Spanish, English).
  - ? Marginally greater RC-length effect in object than subject position (German, Spanish, English).
  - ? No RC-length effect for extraposed RCs in German.

Further evidence concerning the prosodic hypothesis is always welcome!

WITHIN THE PROSODIC APPROACH:
Our current research aims to elucidate the <u>specific</u> prosodic causes of syntactic preferences (see also Bradley et al., this conference).

The current study is a small beginning. More research is needed!

Need to check additional languages:

- Is F0-MATCHING ever resorted to when disambiguation by PROSODIC BOUNDARIES is disallowed by the grammar?
- Are PROSODIC BOUNDARIES more relevant than F0 MATCHING in languages with prosodic characteristics different from Canadian French?

ALTERNATIVE EXPLANATIONS

TIMING OF STRUCTURAL DECISIONS
(Pynte, 1998; Pynte & Colonna, 2000)
- While long-RC is being processed, there's time for N1-of-N2 to be built.
  When short-RC is processed and ready to attach, no N1-of-N2 complex exists.
- Doesn't explain cross-language differences: Why do English, Swedish, etc. have overall lower attachment than French, German, Spanish, etc.?
- The data from our experiment do not confirm or disconfirm this approach.

INFORMATION LOAD
(Hemforth & Konieczny, 2002; Hemforth et al., submitted)
- The longer the RC, the more work it must do in the information structure of the sentence.
  So long-RC must modify an NP central to (or focused in) the message.
- The data from our experiment are compatible with only some versions of this approach.
  The main clause is evidently not privileged. Hence "centrality" must be assessed relative to each clause, not to the whole message.

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ABSTRACT

An effect of relative clause (RC) length on preferred RC-attachment in complex NPs (N1-of-N2-RC) has been established for Brazilian Portuguese, Croatian, English, French, Japanese and Spanish (German data are mixed). Proposed explanations invoke timing of structural decisions (Pynte & Colonna, 2000), information load (Hemforth & Konieczny, 2002), and implicit prosody (Quinn et al., 2000). Our study investigates one aspect of the prosodic explanation.

In number-disambiguated sentences of American English and European French, Quinn et al. measured F0 for the prominent vowels of N1, N2 and the RC-verb. Declining F0 was observed in all cases except Long-RC with forced-high attachment in English, and both forced-high and forced-low Long-RCs in European French. In these, F0 fell from N1 to N2, then rose to the RC. Quinn et al. related these contours to ambiguity resolution preferences favoring high attachment in European French not English, for Long-RCs only. However, it was left unresolved whether the fall-rise contour characteristic of high attachment indicated (A) F0-matching of the RC to the modified noun, or (B) F0-reset due to a pre-RC prosodic boundary. This is relevant to predictions this theory should make for other languages.

Our study of Canadian French located the complex NP plus RC in final position either in a main clause (with sentence-final fall) as in Quinn et al.'s study, or in an initial adverbial clause (with clause-final continuation rise). The purpose was to induce higher F0 at the RC-verb in the latter case for Short-RCs, whose verb was clause-final. A preliminary reading-aloud experiment confirmed that Canadian French Short-RCs show a sharp F0 contrast between sentence-final fall and continuation rise, regardless of whether attachment is forced high or low.

Hypothesis (A) therefore predicts a high-attachment preference for Short-RCs as well as Long-RCs in Adverbial-clause contexts, but Quinn et al.'s data pattern in Main-clause contexts (high attachment of Long-RCs only). Hypothesis (B) predicts Quinn et al.'s pattern in both contexts, assuming a comparable incidence of pre-RC prosodic boundaries. An ambiguity-resolution questionnaire (N=48) with factors Short/Long RC x Main/Adverbial context showed the usual RC-length effect (p<.001) but absolutely no effect of context or any interaction (all F's < 1). While compatible with the prosodic boundary hypothesis, these data exclude the F0-matching hypothesis. For non-prosodic accounts of RC-length effects: the decision-timing explanation is not excluded, but the insensitivity to main/subordinate clause position demonstrated here offers an empirical constraint on further development of the information-load explanation.

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