

# PROSODIC INFLUENCE ON SYNTACTIC JUDGMENTS

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## 1. Introduction

It appears that there is a rebellion in the making, against the intuitive judgments of syntacticians as a privileged database for the development of syntactic theory. Such intuitions may be deemed inadequate because they are not sufficiently representative of the language community at large. The judgments are generally few and not statistically validated, and they are made by sophisticated people who are not at all typical users of the language. Linguists are attuned to subtle syntactic distinctions, about which they have theories. However, our concern in this paper is with the opposite problem: that even the most sophisticated judges may occasionally miss a theoretically significant fact about well-formedness.

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In the 1970's it was observed that in order to make a judgment of syntactic well-formedness one must sometimes be creative. It was noted that some sentences, such as (1), are perfectly acceptable in a suitable discourse context, and completely unacceptable otherwise (e.g., as the initial sentence of a conversation; see Morgan 1973).

(1) Kissinger thinks bananas.

Context: What did Nixon have for breakfast today?

Given the context, almost everyone judges sentence (1) to be well-formed. But not everyone is good at thinking up such a context when none is provided. That is not a part of normal language use. Hence out-of-context judgments are more variable, since they depend on the happenstance of what might or might not spring to the mind of the person making the judgment. (See Schütze 1996 section 5.3.1.) Our thesis is that *prosodic* creativity is also sometimes required in judging syntactic well-formedness when sentences are presented visually, i.e., when no prosodic contour is supplied.

Consider sentence (2), which is modeled on Gapping examples from Hankamer 1973. If (2) is read with a nondescript sort of prosody – the more or less steady fundamental frequency declination characteristic of unemphatic declarative sentences in English – it is likely to be understood as in (2a) rather than (2b).

(2) Jane took the children to the circus, and her grandparents to the ballgame.

(a) ... and Jane took her grandparents to the ballgame.

(b) ... and Jane's grandparents took the children to the ballgame.

If construed as (2a), "her grandparents" in (2) is the object of the second clause, in which the subject and verb have been elided; this is *clause-peripheral* gapping. If construed as (2b), "her grandparents" in (2) is the subject of the second clause, in which the verb and the object have been elided; this is *clause-internal* gapping. It demands a very distinctive prosodic contour, which readers are unlikely to assign to the word string (2) in the absence of any specific indication to do so. It requires paired contrastive accents on *Jane* and *her grandparents*, and on *circus* and *ballgame*, defocusing of *the children*, and a significant pause between the NP and the PP in the second clause. (See Carlson 2001 for relevant experimental data.)

In a language with overt case marking, a sentence like (2) would not be syntactically ambiguous. The (2b) analysis could be forced by nominative case marking on the "grandparents" noun phrase. Case marking is not robust in English, but for English speakers who still command a reliable nominative/accusative distinction, the sentence (3a) can only be understood as peripheral gapping with "us grandparents" as object, and (3b) can only be understood as clause-internal gapping with "we grandparents" as subject.

(3) (a) Jane took the children to the circus, and us grandparents to the ballgame.

(b) Jane took the children to the circus, and we grandparents to the ballgame.

If these sentences are presented in written form, (3a) is very likely to be accepted as well-formed but (3b) may receive more mixed reactions. Readers are most likely to begin reading (3b) with the default prosody, and they may then be inclined to continue that prosodic contour through the second clause, despite the nominative "we". If so, they might very well arrive at the peripheral-gap analysis and judge "we" to be morphosyntactically incorrect on that basis. It might occur to some readers to try out another way of reading the sentence, but it also might not. The standard

orthography does not mark the prosodic features required for Gapping; they are not in the stimulus, but must be supplied by the reader – if the reader thinks to do so. Thus, grammaticality judgements on written sentences may make it appear that clause-internal gapping is syntactically unacceptable, even if in fact the only problem is a prosodic 'garden path' in reading such sentences. The way to find out is to present them auditorily, spoken with the highly marked prosody appropriate for clause-internal gapping, so that their syntactic status can be judged without interference from prosodic problems. The outcome of such a test might still be mixed, of course, if indeed not everyone accepts (this kind of) non-peripheral gapping, but at least it would be a veridical outcome, a proper basis for building a theory of the syntactic constraints on ellipsis.

The general hypothesis that we will defend here is that any construction which requires a non-default prosody is vulnerable to misjudgments of syntactic well-formedness when it is read, not heard.<sup>1</sup> It might be thought that reading – especially silent reading – is immune to prosodic influences, but recent psycholinguistic findings suggest that this is not so. Sentence parsing data for languages as diverse as Japanese and Croatian are explicable in terms of the *Implicit Prosody Hypothesis* (Fodor 2002a, Fodor 2002b): *In silent reading, a default prosodic contour is projected onto the stimulus. Other things being equal, the parser favors the syntactic analysis*

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<sup>1</sup> There is a fine line between cases in which a prosodic contour helps a listener arrive at the intended syntactic analysis, and cases in which a particular prosodic contour is obligatory for the syntactic construction in question. The examples we discuss in this paper are of the latter kind, we believe. But as the syntax-phonology interface continues to be explored, this is a distinction that deserves considerably more attention.

*associated with the most natural (default) prosodic contour for the construction.* In other words, prosody is always present in the processing of language, whether by ear or by eye. And because prosodic structure and syntactic structure are tightly related (Selkirk 2000), prosody needs to be under the control of the linguist who solicits syntactic judgments, not left to the imagination of those who are giving the judgments. At least this is so for any construction that requires a *non-default* prosodic contour which readers may not be inclined to assign to it.

We illustrate the importance of this methodological moral by considering a variety of complex Wh-constructions in Japanese. In previous work we have argued that disagreements that have arisen concerning the syntactic well-formedness of some of these constructions can be laid at the door of the non-default prosodic contours that they need to be assigned.

## 2. Japanese Wh-constructions: syntactic and semantic issues

The constructions of interest are shown schematically in (4) and (5). For syntactic/semantic theory, the issues they raise are: (i) whether Subjacency blocks operations establishing LF scope in Japanese; (ii) whether (overt) long-distance scrambling of a Wh-phrase in Japanese permits scope reconstruction at LF. For many years there was no consensus on these matters in the literature.

(4) Wh-in-situ: [ ---- [----- Wh-XP ----- COMP<sub>Subord</sub> ] ---- COMP<sub>Matrix</sub> ]

(5) Long-distance scrambling: [ Wh-XP<sub>i</sub> ----- [----- t<sub>i</sub> ----- COMP<sub>Subord</sub> ] ---- COMP<sub>Matrix</sub> ]

Consider first the situation in (4), in which a Wh-phrase in a subordinate clause has not moved overtly. This Wh-phrase could have matrix scope if appropriate covert operations are permitted: either movement of a Wh-phrase to its scope position at LF, with or without

movement of an empty operator at S-structure, or operator-variable binding of a Wh-in-situ by an appropriate COMP. If Subjacency were applicable to such scope-determining operations, it would prevent matrix scope when the subordinate clause is a Wh-island, e.g., when the subordinate clause complementizer is *-kadooka* ('whether') or *-ka* ('whether'). The scope of a Wh-XP in Japanese must be marked by a clause-final COMP<sub>WH</sub> (*-ka* or *-no*).<sup>2</sup> Thus, if the matrix clause complementizer were *-no* (scope-marker), and the subordinate clause complementizer were *-kadooka*, the sentence would be ungrammatical if Subjacency applies to covert operations in Japanese: subordinate scope would be impossible for lack of a subordinate scope-marker, and matrix scope would be impossible because of Subjacency.

The applicability of Subjacency to Wh-in-situ constructions has significant theoretical ramifications (see discussion in Kuno 1973, Huang 1982, Pesetsky 1987, among others). It has been widely, though not universally, maintained that Subjacency is not applicable to covert (LF) operations. Thus it would clarify the universal status of locality principles in syntax if this were also the case in Japanese. This is why it is important to determine whether sentences of this form

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<sup>2</sup> The ambiguity of some complementizers will be important to the discussion below. For clarity, we note here that both *-ka* and *-no* are ambiguous. *-ka* can function as a Wh-scope marker, COMP<sub>WH</sub>, in any clause, or as COMP<sub>WHETHER</sub> in subordinate clauses, and as a yes/no question marker Q in matrix clauses. *-no* can be an interrogative complementizer only in matrix clauses, where it can function either as COMP<sub>WH</sub> or as Q. For most speakers, *-kadooka* is unambiguously COMP<sub>WHETHER</sub>, though a few speakers can also interpret *-kadooka* as a Wh-scope marker (COMP<sub>WH</sub>) in a subordinate clause.

(i.e., structure (4) where the subordinate complementizer is not a Wh- scope marker) are or are not grammatical. We will argue that they are, and that contrary judgments are due to failure to assign the necessary prosodic contour.

Example (5) raises a different theoretical issue, concerning the relation between surface position and scope at LF. Note first that the long-distance scrambling in (5) is widely agreed to be grammatical, even when the COMP<sub>Subord</sub> is *-kadooka* ('whether') or *-ka* ('whether'). Thus, Subjacency does not block scrambling (overt movement) from out of a Wh-complement in Japanese (Saito 1985).<sup>3</sup> What needs to be resolved is the possible LF scope interpretations of a Wh-XP that has been scrambled into a higher clause. Does it have matrix scope, or subordinate scope, or is it ambiguous between the two? When a Wh-XP has undergone overt Wh-movement into a higher clause in a language like English, matrix scope is the only possible interpretation. But unlike overt Wh-movement, long-distance scrambling in Japanese generally forces a "radically" reconstructed interpretation, i.e., a long-distance scrambled item is interpreted as if it had never been moved. (Saito 1989 describes this as scrambling having been "undone" at LF; Ueyama 1998 argues that long-distance scrambling applies at PF.) If this holds for the scrambling of a Wh-phrase, then subordinate scope should be acceptable in the configuration (5). However, there has been disagreement on this point. We will maintain that subordinate scope is indeed syntactically and semantically acceptable, and judgments to the contrary are most likely

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<sup>3</sup> Saito argued, however, that Subjacency does block overt scrambling out of a complex NP, and out of an adjunct. This discrepancy, which Saito did not resolve, remains an open issue to be investigated.

due to a clash between the prosody that is required for the subordinate scope interpretation and the default prosody that a reader might assign.

Thus, our general claim is that syntactic and semantic principles permit both interpretations for both constructions (4) and (5) (given appropriate complementizers), but that they must meet additional conditions on their PFs in order to be fully acceptable (see Deguchi and Kitagawa 2002 for details). We discuss the Subjacency issue (relevant to construction (4)) in section 3.1, and the reconstruction issue (relevant to construction (5)) in section 3.2.

### 3. The prosody of Wh-constructions in Japanese

Japanese Wh-questions have a characteristic prosodic contour, called *Emphatic Prosody* (EPD) by Deguchi and Kitagawa 2002. The Wh-XP is prosodically focused, and everything else in the clause which is its scope is de-focused. That is, there is an emphatic accent on the Wh-item, and then post-focal ‘eradication’ (compression of pitch and amplitude range, virtually suppressing lexical and phrasal pitch accents) up to the end of the Wh-scope.<sup>4</sup> Importantly, this means that

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<sup>4</sup> In this paper we retain the term "eradication" used in our earlier papers, but we would emphasize that it is not intended to imply total erasure of lexical accents. Rather, there is a post-focal reduction of the phonetic realization of accents, probably as a secondary effect of the general compression of the pitch range and amplitude in the post-focal domain. See Ishihara 2003 and Kitagawa To appear, where we substitute the term *post-focal reduction*. Also, we note that the utterance-final rise that is characteristic of a matrix question overrules eradication on the sentence-final matrix COMP<sub>WH</sub>. The prosodic descriptions given here should be construed as referring to standard (Tokyo) Japanese; there is apparently some regional variability.

there is a correlation between the extent of the prosodic eradication and the extent of the syntactic/semantic scope of the Wh-phrase. Subordinate Wh-scope (= indirect Wh-question) is associated with what Deguchi and Kitagawa called Short-EPD, i.e., EPD which ends at the COMP<sub>WH</sub> of the subordinate clause. Matrix Wh-scope (= direct Wh-question) is associated with what Deguchi and Kitagawa called Long-EPD, i.e., EPD which extends to the matrix COMP<sub>WH</sub> at the end of the utterance. (See Ishihara 2002 for a similar observation; and see Hirotsu 2003 for discussion of the role of prosodic boundaries in demarcating the Wh-scope domain.) This is the case for all Wh-constructions, regardless of whether the Wh-phrase is moved or in situ, and whether or not it is inside a potential island.

### 3.1 Wh-in-situ

First we illustrate Deguchi and Kitagawa's observation for Wh-in-situ. In (6) and (7) we show a pair of examples which differ with respect to Wh scope, as determined by their selection of complementizers. In both examples the Wh-phrase *dare-ni* ('who-DAT') is in situ and there is no Wh-island, so there is no issue of a Subjacency violation. What is of interest here is the relation between Wh-scope and the prosodic contour. (In all examples below, bold capitals denote an emphatic accent; shading indicates the domain of eradication, accent marks indicate lexical accents that are unreduced, and ↑ indicates a final interrogative rise.)

#### (6) Short-EPD

Keesatu-wa [Mary-ga ano-ban **DA**re-ni denwasita-ka] ímademo sirabeteteiru.

Police-TOP Mary-NOM that-night who-DAT called-COMP<sub>WH</sub> even.now investigating

'The police are still investigating who Mary called that night.'

## (7) Long-EPD

Keesatu-wa [Mary-ga ano-ban **DAre-ni denwasita-to** imademo kangaeteiru-no↑?

Police-TOP Mary-NOM that-night who-DAT called-COMP<sub>THAT</sub> even.now think-COMP<sub>WH</sub>

'Who do the police still think that Mary called that night?'

When we gather acceptability judgments on these sentences we present them in spoken form with either the Short-EPD or the Long-EPD prosodic pattern. With the contours shown here the sentences are judged acceptable. If the two contours are exchanged, the sentences are judged to be extremely unnatural.<sup>5</sup> (See section 4 for some related experimental data.)

Now let us consider examples that are similar to (6) and (7) but have a different selection of complementizers. In (8) and (9) the Wh-phrase is in situ inside a Wh-complement clause. The word strings are identical here, so (8) and (9) are lexically and structurally identical; only the prosodic contour differs between them. Observe that in both cases the complementizers (subordinate *-kadooka*, matrix *-no*) are compatible only with matrix scope. We thus predict that (8) with Short-EPD will be judged unacceptable, while (9) with Long-EPD will be judged acceptable. And this is indeed what informants' judgments reveal when sentences are presented auditorily, with prosodic properties controlled. (We use # below to denote a sentence that is unacceptable with the indicated prosody.)

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<sup>5</sup>Though this is generally true, Satoshi Tomioka notes (p.c.) that certain expressive modes (e.g., a strong expression of surprise) can disturb the prosody-scope correlation for Long-EPD. This phenomenon needs further investigation. See also Hirotani 2003 for psycholinguistic data on the perception of Long-EPD utterances.

## (8) Short-EPD

#Keesatu-wa [Mary-ga ano-ban **DA**re-ni denwasita-kadooka] imademo sirabeteteiru-no?

Police-TOP Mary-NOM that-night who-DAT called-COMP<sub>WH</sub> even.now investigating-Q

(a) 'Who<sub>1</sub> is such that the police are still investigating [whether Mary called him/her<sub>1</sub> that night]?'  
 night]?'

(b) 'Are the police still investigating [whether Mary called who that night ]?'

## (9) Long-EPD

Keesatu-wa [Mary-ga ano-ban **DA**re-ni denwasita-kadooka] imademo sirabeteteiru-no↑?

Police-TOP Mary-NOM that-night who-DAT called-COMP<sub>WHETHER</sub> even.now investigating-COMP<sub>WH</sub>

'Who<sub>1</sub> is such that the police are still investigating [whether Mary called him/her<sub>1</sub> that night]?'  
 night]?'

Pronounced with Long-EPD, (9) is acceptable and has matrix scope interpretation of the Wh-phrase. Sentence (8) with Short-EPD is not acceptable. It may be rejected on one of two grounds, as indicated in (a) and (b). Either a hearer attempts to interpret (8) with matrix Wh-scope as in translation (8a), and would then judge the prosody to be inappropriate; or (8) is interpreted with subordinate Wh-scope as in translation (8b), in line with the prosody, and the subordinate complementizer *-kadooka* ('whether') would be judged ungrammatical since it cannot be a Wh-scope marker. As noted, however, there are some speakers who are able to interpret *-kadooka* as a Wh-scope-marker, and for them (8) is acceptable with subordinate scope, as expected.

The fact that (9) is acceptable shows that matrix Wh-scope is available when the sentence is pronounced with Long-EPD. Thus it is evident that Subjacency does not block scope extraction from a *-kadooka* clause. The unacceptability of (8) therefore cannot be due to

Subjacency. Only an approach that incorporates prosody can account for the contrast between the two examples.

The confusion about the applicability of Subjacency in Japanese is thus resolved. When appropriate prosody is supplied, grammaticality judgments show no effect of Subjacency on the interpretation of Wh-in-situ.<sup>6</sup> The variable judgments reported in the literature are explicable on the assumption that when no prosody is explicitly provided, readers project their own prosodic contour. A reader of (8)/(9) who happened to project Long-EPD would find the sentence acceptable on the matrix scope reading represented in (9). A reader who happened to project Short-EPD would in effect be judging (8), and would be likely to find it unacceptable on the matrix scope reading (and also the subordinate scope reading). This judgment could create the impression that Subjacency is at work. As we discuss below, there are reasons why readers might be more inclined to project Short-EPD than Long-EPD for Wh-in-situ examples. If this is so (i.e., if Short-EPD is the default prosody for this construction), it would encourage the misreading of this word string as (8) rather than as (9), and so would tilt readers toward a negative judgment.<sup>7</sup>

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<sup>6</sup> See Deguchi and Kitagawa 2002 for evidence that Long-EPD is not an exceptional prosody which permits scope extraction out of Wh-islands by overriding Subjacency.

<sup>7</sup> In Kitagawa and Fodor (2003) we noted two additional factors that could inhibit acceptance of matrix scope for Wh-in-situ: semantic/pragmatic complexity (the elaborate discourse presuppositions that must be satisfied); and processing load (added cost of computing the extended dependency between the embedded Wh-phrase and a scope marker in the matrix clause). It seems quite likely that these conspire with the default prosody to create difficulty with

### 3.2 Long-distance-scrambled Wh

The other data disagreement which needs to be resolved with respect to Japanese Wh-constructions concerns the scope interpretation of a Wh-XP that has undergone long-distance scrambling out of a subordinate clause. This was schematized in (5), repeated here, and is exemplified in (10).

(5) Long-distance scrambling : [ Wh-XP<sub>i</sub> ----- [----- t<sub>i</sub> ----- COMP<sub>Subord</sub> ] ----- COMP<sub>Matrix</sub> ]

(10) Nani<sub>i</sub>-o John-wa [ Mary-ga t<sub>i</sub> tabeta-ka ] siritagatteiru-no?  
 what-ACC John -TOP Mary -NOM ate-COMP<sub>WHETHER/WH</sub> wants.to.know-COMP<sub>WH/-Q</sub>

(a) 'Does John want to know what Mary ate?'

(b) '\*What does John want to know whether Mary ate?'

(i.e., 'What<sub>i</sub> is such that John wants to know whether Mary ate it<sub>i</sub>?')

As noted earlier, there is no evidence of any Subjacency restriction on overt long-distance scrambling in this construction: a Wh-phrase can be freely scrambled even out of a Wh-island. But there has been disagreement in the literature concerning the LF scope of a long-distance-scrambled Wh-XP. If scrambling of a Wh-XP is subject to obligatory (or "radical") reconstruction at LF, the scrambled Wh-phrase in (10) would have to be interpreted in its underlying position, i.e., with the same scope possibilities as for an in-situ Wh-phrase. We

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the matrix scope reading. However, we will not discuss those factors here, because they cannot account for judgments on the Wh-scrambling examples that we examine in the next section.

observed above that Wh-in-situ can be interpreted with either subordinate-clause scope or matrix-clause scope, though with a preference for the former in reading, when prosody is not pinned down. However, Takahashi 1993 claimed to the contrary that only matrix Wh-scope (i.e., interpretation (10b)) is acceptable in this construction.

Unacceptability of the subordinate scope interpretation (10a) does not follow from Subjacency or from any other familiar syntactic constraint. In order to account for it, Takahashi was driven to assume that sentences like (10) are derived not by long-distance scrambling but by overt Wh-movement, which (unlike scrambling) would not be "undone" (i.e., would not be radically reconstructed) at LF. Though a clever notion, this does not mesh well with other observations about scrambling in Japanese and also in Korean (e.g., Kim 2000). That it is not the right approach is underscored by the observation (Deguchi and Kitagawa 2002) that when Short-EPD is overtly supplied in spoken sentences, many speakers accept subordinate scope in examples like (10). That is, (10a) is acceptable with Short-EPD, though not with Long-EPD – though informants often sense a lingering awkwardness in (10a), for which we offer an explanation below. The mixed opinions on (10a) thus fall into place on an account that respects prosodic as well as syntactic constraints. The correlation of prosody and scope in informants' judgments of spoken sentences is exactly as in the other examples noted above: Short-EPD renders subordinate scope acceptable and blocks matrix scope, while with Long-EPD matrix scope is acceptable and subordinate scope is not.

Note, however, that to explain why it is (10a) rather than (10b) that raises disagreement when prosody is not specified, the prosodic account would have to assume that Long-EPD is the prosody that readers naturally project onto the word string. However, we saw above that readers must prefer Short-EPD if prosody is to provide an explanation for the mixed judgments on Wh-

in-situ. Apparently the phonological default flips between Wh-in-situ constructions and Wh-scrambled constructions. In the next section we consider why this would be so.

### 3.3 Which prosody is the default?

Many, perhaps most, judgments of syntactic well-formedness reported in the literature are made on written examples. No doubt this is largely for reasons of convenience, but perhaps also the intention is to exclude phonological factors from the judgment so that it can be a pure reflection of syntactic structure. However, if the *Implicit Prosody Hypothesis* (section 1 above) is correct, this is an unrealistic goal. Phonological factors cannot be excluded, because default prosody intrudes when no prosody is specified in the input. Thus judgments on visually presented sentences are not prosody-free judgments, but are judged as if spoken with default prosody. To provide a full explanation of why certain scope interpretations of Japanese Wh-constructions tend to be disfavored in reading, we need prosodic theory to make predictions as to which prosody is the default for which construction. In particular, the observed preference for subordinate scope for Wh-in-situ would be explained if readers tend to assign Short-EPD rather than Long-EPD to Wh-in-situ constructions; and the observed preference for matrix clause scope for long-distance scrambled Wh would be explained if readers tend to assign Long-EPD in preference to Short-EPD to scrambled Wh constructions. Though it may have the flavor of a contradiction, this is in fact exactly what would be expected. Our proposal is that competition among various constraints at the PF interface yield a different prosodic default for scrambled Wh than for Wh-in-situ.

In our previous work we have argued that Short-EPD is phonologically more natural than Long-EPD because the latter creates a long string of rhythmically and tonally undifferentiated material, which is generally dispreferred in natural language (see Selkirk 1984; Kubozono 1993).

This implies that even where a grammar insists on prosodic eradication, the shorter it can be, the better it is. In support of this, Kitagawa and Fodor 2003 presented examples indicating that a sentence becomes progressively less natural as the extent of EPD is increased by adding extra material even within a single-clause construction. Comparable sentences but without Wh and hence without EPD do not degrade in the same manner; thus the effect is apparently prosodic. A similar distaste for lengthy stretches of deprosodified material can be observed in English Right Dislocation constructions. The dislocated phrase requires prosodic eradication yet disfavors eradication that extends over more than a few words. This creates a clash which makes an example such as *I really hated it, that fish that Mary tried to persuade me to eat at the French restaurant last night* stylistically awkward.

A different sort of clash occurs when a long-distance-scrambled Wh is to be pronounced with Short -EPD in order to give it subordinate clause scope, as in (10a) (repeated below as (11a) with its prosody indicated). Though Short-EPD is generally preferred, in the scrambled construction it traps an element of the matrix clause (*John-wa*; 'John-TOP' in (10)) between the scrambled XP and the rest of the subordinate clause.<sup>8</sup> Prosodic eradication proceeds from the

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<sup>8</sup> If the XP were scrambled to a position between any overt matrix items and the first overt element of the subordinate clause, no matrix item would be trapped. The resulting sentence would be ambiguous between local scrambling within the subordinate clause, and long-distance scrambling into the matrix clause, so it would provide no overt evidence that the scrambled phrase is located in the matrix clause in the surface form. In that case the example would not be useful for studying the prosodic and/or semantic effects of long-distance scrambling. Thus: any

focused Wh phrase through to the end of the clause which is its scope. In the case of Short-EPD, this will be from the surface position of the Wh-XP to the end of the subordinate clause. Thus, the matrix topic *John-wa* in (10) will have its accent eradicated even though it is not in the intended syntactic/semantic scope of the Wh-XP. This is represented in (11a).

(11) a. **N**Ani<sub>i</sub>-o John-wa [ Mary-ga t<sub>i</sub> tabeta-ka ] siritagátteiru-no↑

what-ACC John-TOP Mary-NOM ate-COMP<sub>WH</sub> want.to.know-Q

'Does John want to know what Mary ate?'

b. **N**Ani<sub>i</sub>-o John-wa [ Mary-ga t<sub>i</sub> tabeta-ka ] siritagatteiru-no↑

what-ACC John-TOP Mary-NOM ate-COMP<sub>WHETHER</sub> want.to.know-COMP<sub>WH</sub>

'\*What does John want to know whether Mary ate?'

(i.e., 'What<sub>i</sub> is such that John wants to know whether Mary ate it<sub>i</sub>?')

Short-EPD as in (11a) is dispreferred. There is a mismatch between the inclusion of *John-wa* within the EPD domain, and the ending of the EPD at the subordinate COMP. This offends a very general preference for congruence between syntactic and prosodic structure, which encourages perceivers to assume a simple transparent relationship between prosody and syntax wherever possible. Thus we expect a preference for material in the prosodic eradication domain of a Japanese Wh construction to be construed as being in the syntactic scope domain also. In the

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sentence that could be used to obtain informants' judgments on the acceptability of subordinate clause scope for a long-distance scrambled Wh would necessarily exhibit the entrapment which we argue favors Long-EPD and hence matrix scope.

present case this preference for congruence can be satisfied only if the prosody assigned is Long-EPD, which extends through both clauses, as in (11b). If (10) were presented in writing, a reader assigning *implicit* prosody, and having necessarily eradicated the accent in *John-wa*, would be likely to continue the eradication through the rest of the clause that includes *John-wa*. The result would be (11b) with Long-EPD, favoring a matrix scope interpretation. The advantage of Long-EPD over Short-EPD with respect to congruence for long-distance scrambled Wh might outweigh the fact that long expanses of EPD are generally dispreferred.<sup>9</sup>

In support of this account of Long-EPD as the preferred prosody for a scrambled-Wh construction, we note that even for spoken sentences with overt prosody, hearers (and even speakers!) sometimes complain that they can accept the subordinate scope interpretation only by somehow disregarding or 'marginalizing' the intervening matrix constituent. This is interesting. It can explain why subordinate scope is not always felt to be fully acceptable even with overt Short-EPD, and it is exactly as could be expected given that the intrusion of this matrix constituent in the subordinate clause eradication domain is what disfavors the otherwise preferred Short-EPD.

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<sup>9</sup> We noted above that semantic and processing factors may reinforce the prosodic default in the case of Wh-in-situ. However, those factors would favor subordinate scope for scrambled Wh as well as for Wh-in-situ, as explained in Kitagawa and Fodor 2003. Thus, only the prosodic explanation makes the correct prediction for both contexts: a preference for subordinate scope for Wh-in-situ and a preference for matrix scope for long-distance scrambled Wh.

The general conclusion is clear: When overt prosody is present, listeners can be expected to favor the syntactic structure congruent with the prosody and judge the sentence accordingly. When no overt prosody is in the input, as in reading, perceivers make their judgments on the basis of whatever prosodic contour they have projected. This is a function of various principles, some concerning the prosody-syntax interface, others motivated by purely phonological concerns (e.g., rhythmicity) which in principle should be irrelevant to syntax. However, a reader may proceed as if the mentally projected prosody had been part of the input, and then judge the syntactic well-formedness of the sentence on that basis. Though some astute informants may seek out alternative analyses, there is no compelling reason for them to do so, especially as the request for an acceptability judgment implies – contrary to the expectation in normal sentence processing for comprehension – that failure to find an acceptable analysis is a legitimate possibility. Therefore, any sentence (or interpretation of an ambiguous sentence) whose required prosodic contour does not conform to general prosodic patterns in the language is in danger of being judged ungrammatical in reading, though perceived as grammatical if spoken with appropriate prosody.

#### **4. Judgments for written and spoken sentences**

##### **4.1 Previous research**

When we began this work on Wh-scope interpretation in Japanese, we took it for granted that the relevance of prosody to acceptability, for some constructions at least, would be a familiar point and that the recent wave of psycholinguistic experiments on grammaticality judgments would have produced plenty of data in support of it. But we scoured the literature, most notably the volumes by Schütze 1996 and Cowart 1997, and found very few reports of grammaticality judgments on spoken sentences. Comments on using speech input for grammaticality judgments

mostly concern differences in register between spoken and written language. Cowart also notes some practical disadvantages of spoken input.<sup>10</sup> Schütze cites a study by Vetter, Volovecky and Howell 1979, which compared written presentation and auditory presentation, the latter with normal or monotone intonation. The sentence materials were diverse and the results concerning prosody were mixed; normal intonation had an effect in some cases only. The details may repay further investigation, but the sentence materials were not designed in a way that could shed light on our hypothesis that auditory presentation should aid judgments primarily for sentences needing non-default prosody.<sup>11</sup>

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<sup>10</sup> We set aside here studies whose primary focus is judgments by second language learners; see Murphy 1997 and references there. Murphy found for English and French sentences that subjects (both native and L2 speakers) were less accurate with auditory presentation than with visual presentation, especially with regard to rejecting Subjacency violations and other ungrammatical examples (cf. Hill's observation noted below).

<sup>11</sup> Schütze also mentions an early and perhaps not entirely serious exploration by Hill 1961 of ten example sentences, eight of them from Chomsky 1957, judged by ten informants. For instance, the sentence *I saw a fragile of* was accepted in written form by only three of the ten informants. In spoken form, with primary stress and sentence-final intonation on the word *of*, it was subsequently accepted by three of the seven who had previously rejected it. Some comments (e.g., "What's an of?") revealed that accepters had construed *of* as a noun. Hill concluded, as we have done, that "...intonation-pattern influences acceptance or rejection." However, his main concern, unlike ours, was over-acceptance of spoken examples. He warned that "If the intonation

The only other study we know of that tested identical sentence materials in written and spoken form is by Keller and Alexopoulou 2001 on Greek word order, accent placement, and focus. This is a substantial investigation of six different word orders in declarative sentences, each in five different question contexts establishing a discourse focus. In the spoken sentences, accent position was also systematically varied. The magnitude estimation method (see Bard, Robertson and Sorace 1996) was used to elicit judgments of "linguistic acceptability," a term which was intentionally not defined for the participants. The results and conclusions are of considerable interest but are too numerous to review here. It is worth noting, though, that Keller and Alexopoulou underscore the significant contribution of prosody to acceptability for sentences involving focus, even in a language with considerable freedom of word order such as Greek. They write: "English relies on accent placement and only rarely on syntax...for discourse purposes. On the other hand, the literature on free word order languages...has emphasized the role of word order... We found that, at least in Greek, word order...plays only a secondary role in marking Information Structure; word order preferences can be overridden by phonological constraints." Unfortunately for present purposes, no exact comparison can be made of the results

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is right, at least enough normal speakers will react to the sentence as grammatical though of unknown meaning, to prevent convergent rejection." Our experimental data (see below) also reveal some tendency to over-accept items that are ungrammatical but pronounced in a plausible-sounding fashion, but we show that this can be minimized by simultaneous visual and auditory presentation.

for the reading condition and the listening condition, because there were other differences of method between the two experiments.

## 4.2 Experimental findings: Japanese and English

### 4.2.1 Materials

Since the relevance of prosody to acceptability had not previously been broadly tested, we conducted an experiment on the two Japanese Wh constructions discussed above, with a related experiment on two constructions in English for purposes of comparison. In all four cases the target constructions were hypothesized to be fully acceptable only if assigned a non-default prosody (explicitly or implicitly). Our prediction was that they would be accepted more often when presented auditorily with appropriate prosody (the listening condition) than when presented visually without prosody (the reading condition).

The Japanese experiment was conducted by Kitagawa and Yuki Hirose. The target items were instances of constructions (4) and (5) above, with Wh-in-situ and long-distance scrambled Wh respectively. Each was disambiguated by its combination of matrix and subordinate complementizers toward what has been reported to be its less preferred scope interpretation: (a) subordinate Wh-in-situ with forced matrix scope as in (12) below; (b) Wh scrambled from the subordinate clause into the matrix clause, with forced subordinate scope as in (13).<sup>12</sup>

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<sup>12</sup> An extra declarative clause was added in the sentences of type (13), structurally intermediate between the lowest clause, in which the Wh-XP originated, and the highest clause, into which it was scrambled. The purpose of this was to prevent readers, at the point at which they encounter the *-ka*, from easily scanning the remainder of the sentence to see that no other possible scope

(12) Kimi-wa Kyooko-ga hontoowa [ dare-o aisiteita-to ] imademo omotteiru-no?  
 you-TOP Kyooko-NOM in.reality who-ACC love-COMP<sub>THAT</sub> even-now thinking-COMP<sub>WH</sub>  
 'Who do you still think that Kyoko in fact loves?'

(13) Nani<sub>1</sub>-o aitu-wa [ [ Tiekō-ga t<sub>1</sub> kakusiteiru-ka ] boku-ga sitteiru-to ]  
 what-ACC that.guy-TOP Tiekō -NOM hiding-COMP<sub>WH</sub> I-NOM know-COMP<sub>THAT</sub>  
 omotteiru-rasii-yo.  
 thinking-seems-AFFIRM

'That guy seems to think that I know what Chieko is hiding.'

In the listening test, the sentences were spoken with appropriate prosody: Long-EPD for Wh-in-situ examples like (12), and Short-EPD for fronted-Wh examples like (13). In the reading test prosody was not mentioned, so readers were free to assign either prosody (or none at all). Our hypothesis that Short-EPD is the default for Wh-in-situ examples, and Long-EPD the default for fronted-Wh examples, predicted that the experimental sentences would be rejected more often when presented in written form than when spoken with appropriate contours.

We conducted a comparable experiment in English in order to provide some benchmarks for the Japanese study. The English experiment was conducted by Fodor with Erika Troseth, Yukiko Koizumi and Eva Fernández. The target materials were of two types. One was t 'not-

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marker is present. If they had at that point detected the absence of a scope marker in the matrix clause, they would inevitably have adopted a subordinate scope reading, and that would have inactivated any possible preference for the Long-EPD/matrix scope reading.

*because*' sentences such as (14), with potentially ambiguous scope that was disambiguated by a negative polarity item in the *because*-clause, which would be ungrammatical unless that clause were within the scope of the negation.

(14) Marvin didn't leave the meeting early because he was mad at anyone.

The second type of target sentences consisted of a complex NP (a head noun modified by a PP) and a relative clause (RC) as in (15), which was potentially ambiguous between high attachment to the head noun or low attachment to the noun inside the PP, but was disambiguated by number agreement toward high attachment.

(15) Martha called the assistant of the surgeons who was monitoring the progress of the baby.

For both of these constructions, as in the Japanese experiment, the disambiguation was toward an interpretation which has been claimed to require a non-default prosody.

For the *not-because* construction, Frazier and Clifton 1996 obtained experimental results for written materials indicating that the preferred interpretation has narrow-scope negation, i.e., the *because*-clause is outside the scope of the negation. (Unlike (14), their sentences had no negative polarity item forcing the wide-scope negation reading.) That the dispreferred wide-scope-negation reading needs a special intonation contour is noted by Hirschberg and Avesani 2000. In their study, subjects read aloud contextually disambiguated examples, and the recordings were acoustically analyzed. The finding was that the intonation contours for the (preferred) narrow-scope-negation "usually exhibit major or minor prosodic phrase boundaries before the subordinate conjunction" and "usually were falling contours." These are typical features of multi-clause sentences without negation. By contrast, Hirschberg and Avesani noted

that the intonation contours for the (dispreferred) wide-scope-negation "rarely contain internal phrase boundaries" and "often end in a 'continuation rise'." This prosody – especially the sentence-final rise – is generally perceived to be highly marked for English. In our listening test this marked prosody was used. Thus, we predicted that the sentences would be perceived with wide-scope negation, which would license the negative polarity item, so that the sentences would be judged grammatical. If instead, readers assigned the default prosody, without these marked features, they might not spot the wide-scope-negation interpretation, and the negative polarity item would then seem to be ungrammatical.

For the RC construction in (15), experimental results by Cuetos and Mitchell 1988 have shown that the low-attachment reading is mildly preferred for ambiguous examples in English (though the opposite is true in Spanish). It has been suggested (Fodor 1998, Fodor 2002a,b) that this is for prosodic reasons. It has been shown (Maynell 1999; Lovric 2003) that a prosodic boundary before an RC promotes high attachment; but English (unlike Spanish) often has no prosodic break at the beginning of an RC. If English readers tend to assign a contour with no pre-RC break, that would encourage the low attachment analysis, so the verb in the RC in the experimental sentences would appear to have incorrect number agreement, and a judgment of ungrammaticality would ensue. In our listening test, we used the marked prosody with a prosodic break at the pre-RC position, to encourage high attachment.

The two English constructions tested in this experiment are useful because they differ considerably with respect to the degree of markedness of their less preferred prosodic contour: for (14) it is extreme; for (15) it is very slight. We chose these two constructions in the hope that they would allow us to bracket the sensitivity of the reading-versus-listening comparison, providing useful baselines for future research. We predicted considerably lower acceptance rates

in reading than in listening for the wide-scope interpretation of the *not-because* construction, but a much smaller difference, if any, for the high-attachment RC construction. The Japanese Wh constructions were expected to fall between these end-points.

#### 4.2.2 Method and presentation

In both experiments there were 12 of each of the two types of target sentence, and for each target type there were also 12 filler sentences (4 grammatical, 8 ungrammatical) for comparison with the targets; these 'related fillers' were superficially similar to the targets in structure but did not contain the critical ambiguity disambiguated to its non-preferred reading. In both experiments, the targets and their related fillers were presented in pseudo-random order among 40 assorted filler sentences (20 grammatical, 20 ungrammatical) with completely different structures.

One group of subjects saw all sentences on a computer screen, one whole sentence at a time, with a timed exposure (9 seconds per sentence in the Japanese study; 12 seconds per sentence in the English one), and read them silently. Another group heard sound files of the same sentences, spoken with appropriate prosody by an instructed native speaker. For the English materials, there were 12 seconds between the onsets of successive spoken sentences as for the written sentences (though none of the spoken sentences occupied the full 12 seconds). For the Japanese spoken materials, the presentation time was from 5 to 7 seconds, tailored to the length of the sentence. For English only, there was a third group of subjects who heard the sound files simultaneously with visual presentation, for 12 seconds per sentence. Subjects in both experiments, 13 in each presentation condition, were college students, native speakers of the language of the experimental materials. They made rapid grammaticality judgments by circling "YES" or "NO" ("HAI" or "IIE" in the Japanese experiment) on a written response sheet. They were then allowed to revise this initial judgment if they wished to. This revision opportunity was

afforded in order to prevent excessively thoughtful (slow) initial responses. In fact there were few revisions and we report only the initial judgments here.

### 4.2.3 Results

Acceptance rates (as percentages) are shown in Figures 1 - 5 below. What follows is a brief review of the experimental findings. We regard these results as preliminary, and plan to follow them up with more extensive studies, but we believe there are already outcomes of interest here, which we hope will encourage comparable studies on other constructions and in other languages.

**Key to Figures:** In all the figures below, the percentage acceptance rates for target sentences (of each type named) are represented by horizontal stripes. The grammatical filler sentences that are related to the targets are represented by vertical stripes, and the ungrammatical fillers related to the targets are represented by dots. The assorted (unrelated) fillers are shown separately at the right.

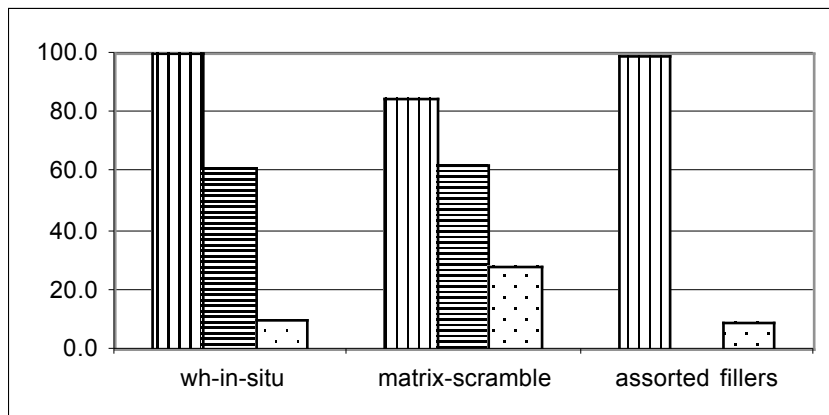


Figure 4.1 Japanese reading, percent acceptance

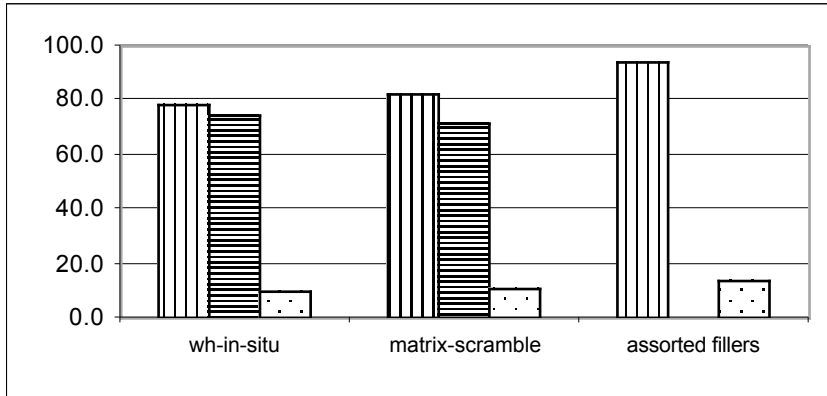


Figure 4.2 Japanese listening, percent acceptance

In the Japanese data we see, as predicted, that the target sentences were accepted more often in listening than in reading (see the central bars for wh-in-situ and for matrix-scramble, across the two presentation conditions). The difference is not large but it is statistically significant ( $p < .01$ ). Relatively speaking, the results are very clear: In the reading condition, the targets are intermediate in judged acceptability between their matched grammatical fillers and matched ungrammatical fillers, but in the listening condition they draw significantly closer to the grammatical fillers, supporting the hypothesis that the grammar does indeed license them though only with a very particular prosody.

Aspects of the Japanese data that need to be checked in continuing research include the relatively poor rate of acceptance in reading for the matrix-scramble filler sentences<sup>13</sup>, and the

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<sup>13</sup> This result may dissolve in a larger-scale study. It was due here to only one of the four grammatical filler sentences related to the matrix-scramble experimental sentences. Unlike the other three, which were close to 100% acceptance, this sentence was accepted at an approximately 50% level. This one example had a matrix-scrambled/matrix-interpreted Wh

lowered acceptance of all grammatical fillers in the listening condition. The general reduction in discrimination of grammatical versus ungrammatical filler items in listening is observed also in the English study and its cause is considered below.

We turn now to the English data which show, as anticipated, that the benefit of spoken input depends on how marked the non-preferred prosody is.

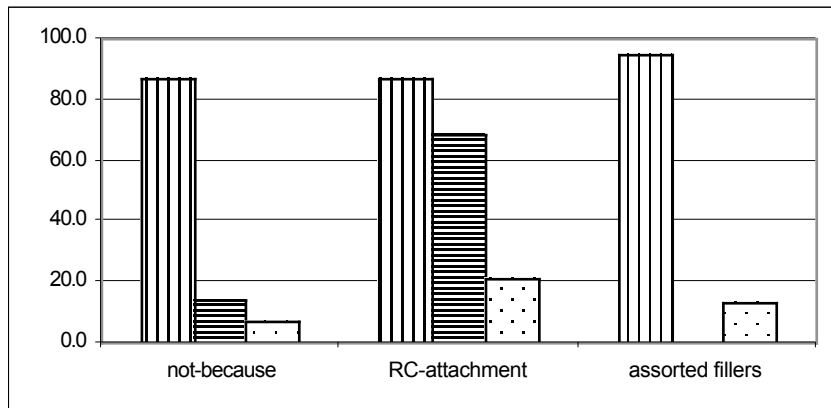


Figure 4.3 English reading, percent acceptance

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phrase in a construction with three clauses, in which there were two intervening non-Wh complementizers between the overt Wh phrase and its ultimate Wh scope marker. It is possible that in this multi-clause structure, the dispreference for very Long-EPD outweighed the preference for syntax-prosody congruence, creating an apparent ungrammaticality.

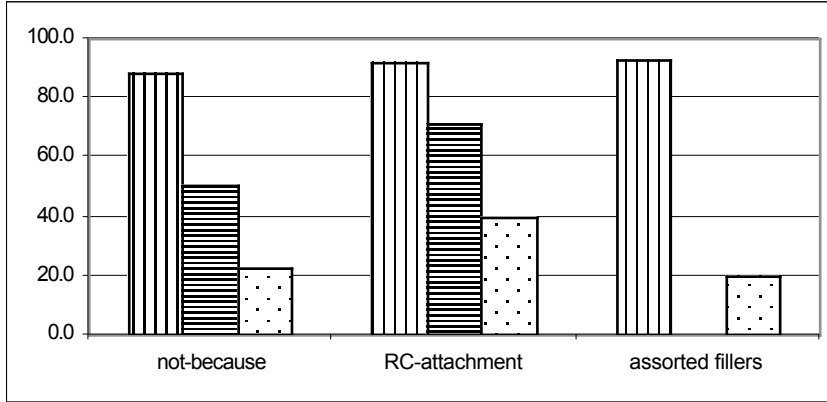


Figure 4.4 English listening, percent acceptance

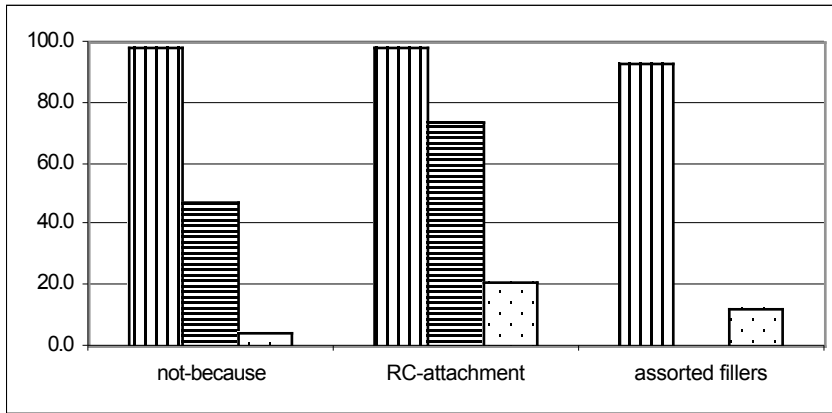


Figure 4.5 English simultaneous reading and listening, percent acceptance

For the *not-because* sentences, acceptance was extremely low in the reading condition, little better than for the matched ungrammatical fillers. In the listening condition there was a striking increase in acceptance for these sentences. It did not rise above fifty percent, even with the appropriate prosody as described by Hirschberg and Avesani. The reason for this was apparent in subjects' comments on the materials after the experiment: it was often remarked that some sentences were acceptable except for being incomplete. In particular, the continuation rise at the end of the *not-because* sentences apparently signaled that another clause should follow, to provide the real reason for the event in question (e.g., *Marvin didn't leave the meeting early*

*because he was mad at anyone; he left early because he had to pick up his children from school.*)<sup>14</sup> This sense of incompleteness clearly cannot be ascribed in the listening condition to failure to assign a suitable prosodic contour. So it can be regarded as a genuine syntactic/semantic verdict on these sentences. Thus this is another case in which auditory presentation affords a clearer view of the syntactic/semantic status of the sentences in question. It seems that *not-because* sentences with wide-scope negation stand in need of an appropriate following discourse context – just as some other sentence types (such as (1) above) stand in need of an appropriate preceding discourse context.

The RC-attachment sentences, on the other hand, showed essentially no benefit from auditory presentation. Acceptance in the reading condition was already quite high and it did not increase significantly in the listening condition. This could indicate that the prosodic explanation for the trend toward low RC-attachment in English is invalid. But equally, it might show only that this experimental protocol is not sufficiently discriminating to reveal the advantage of the appropriate prosody in this case where the difference is quite subtle. The familiar preference of approximately 60% for low RC-attachment with written input is for fully ambiguous examples.

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<sup>14</sup> We have found that that a suitable preceding context can obviate the need for the final rise, and with it the associated expectation of a continuation. For example, a final fundamental frequency fall on *at anyone* is quite natural in: *I have no idea what was going on that afternoon, but there's one thing I do know: Marvin did not leave the meeting early because he was mad at anyone.* However, it is still essential that there be no intonation phrase boundary between the *not* and the *because*-clause.

For sentences in which the ambiguity is subsequently disambiguated (e.g., by number agreement, as in the present experiment), subjects may be able to recover quite efficiently from this mild first-pass preference once the disambiguating information is encountered. (See Bader 1998 and Hirose 2003 for data on prosodic influences on garden-path recovery in German and Japanese respectively.) In short: The present results for relative clause attachment do not contradict standard findings, though they also do not definitively support a prosody-based preference for low RC attachment in English reading. If prosody is the source of this preference, this experimental paradigm is not the way to show it. This is an informative contrast with the case of the *not-because* sentences, for which intuitive judgments are sharper and for which the prosodic cues in spoken sentences had a significant effect in this experimental setting.

An unwelcome outcome of the English study is that greater acceptance of the target sentences in the listening condition is accompanied by greater acceptance of the related *ungrammatical* filler sentences. It is conceivable, therefore, that these findings are of no more interest than the discovery that inattentive subjects can be taken in by a plausible prosodic contour applied to an ungrammatical sentence as Hill (1961) suggested (see footnote above). However, it seems unlikely that this is all that underlies the considerable difference between reading and listening for the *not-because* sentences. A plausible alternative explanation is that listening imposes its own demands on perceivers, which may offset its advantages. Though auditory input provides informants with additional linguistically relevant information in the form of a prosodic contour, it also requires the hearer to perceive the words accurately and hold the sentence in working memory without the opportunity for either look-ahead or review. Our methodology provided no independent assessment of whether errors of perception were more frequent for auditory than for visual input. It seems likely that this was so (though the converse

might be the case for poor readers), since the distinction between grammatical and ungrammatical sentences often rested on a minor morphophonological contrast. In the English RC sentences the disambiguation turned on a singular versus plural verb, e.g., *walk* versus *walks*, which could have been mis-heard.

Though it may have a natural explanation, the 'Hill effect' is a potential disadvantage of auditory presentation for the purposes of obtaining reliable syntactic judgments, since it decreases the discrimination between grammatical and ungrammatical items. To the extent that it is due to persuasiveness of the prosodic contour, it cannot easily be factored out. But problems of auditory perceptibility and memory can be eliminated by presenting the sentence in written form while it is being heard. For the English sentences, the results for simultaneous visual and auditory presentation show that the mis-acceptance of ungrammatical sentences is substantially reduced, while the grammatical sentences are relatively unaffected or even improved. Thus, it appears that combined visual and auditory presentation optimizes both factors: perceptual accuracy and short-term memory are relieved of pressure, while the extra information in the auditory stimulus eliminates the need for prosodic creativity in reading sentences that require a non-default contour. Combined visual and auditory presentation will therefore be our next step in investigating the Japanese materials.

## **5. Conclusion**

These experimental findings, though modest as yet, support the general moral that we were tempted to draw on the basis of informal judgments of written and spoken sentences. That is: Acceptability judgments on written sentences are not purely syntax-driven; they are not free of prosody even though no prosody is present in the stimulus. This has a practical consequence for the conduct of syntactic research: More widespread use needs to be made of spoken sentences

for obtaining syntactic well-formedness judgments. The ideal mode of presentation, as we have seen, provides both written and auditory versions of the sentence (e.g., in a Powerpoint file), to minimize perceptual and memory errors while making sure that the sentence is being judged on the basis of the prosody intended. We are sympathetic to the fact that this methodological conclusion entails more work for syntacticians (Cowart 1997, p.64, warns that auditory presentation is "time-consuming to prepare and execute"), but it is essential nonetheless, at least for sentences whose prosody is suspected of being out of the ordinary in any way.

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