

# A Production Study of Preverbal Sentential and Manner Adverbs in English\*

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In the syntactic literature, potentially ambiguous adverbs in English such as *naturally* in the following sentence have often been presented (e.g., Jackendoff 1972) as an example where certain prosodic events (e.g., including heavy pausal breaks and certain distinct intonation patterns) are crucial to meaning, here distinguishing between sentential- (a) and manner-reading (b) of the adverbs.

- Mr. Nathaniel River's grandfather (,) naturally (,) recited the old poems,  
a. since of course he figured everyone wanted to hear him reciting.  
b. you could tell from his delivery that he had been a skilled reciter.

This claim, however, has often been presented in the previous syntactic works without explicit prosodic/phonetic evidence. In the production experiment reported here, I tested whether English speakers actually produce certain prosodic cues as a means of disambiguating the adverbs in question. The current study focused on examining three prosodic events as potential sources of the disambiguation in question: (i) the presence or absence of silent pauses around the adverbs, (ii) the types of prosodic boundaries after the adverbs, and (iii) the shapes of tonal contour of the adverbs. Implications of the current findings for the syntactic and prosodic representation of the adverbs are discussed.

**Keywords:** English adverbs, sentential-reading, manner-reading, ambiguity, disambiguation, intonation, pauses, prosody

## 1. Introduction

In English there exists a set of adverbs that are ambiguous between two meanings in pre-verbal position. The adverb *oddly*, as shown in (1), illustrates this type of adverbs. In one reading of the adverb, where (1a) is a preferable continuation of sentence (1), *oddly* is said to have a sentential (or parenthetical) interpretation: that is, 'the bride's best friend is judged to be odd to lead the

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dance, regardless of the way in which she danced'. In this reading of *oddly*, the adverb is often surrounded by commas in writing, though not obligatorily.

- (1) At the wedding reception, the bride's best friend (,) *oddly* (,) led the dance,  
 a. since the bride knew that her friend normally hates dancing in public.  
 b. by locking her knees and throwing her arms about.

In the other reading of the adverb, where (1b) is a good continuation of sentence (1), *oddly* is said to have a manner interpretation: that is, 'the way in which she danced was very awkward', regardless whether she usually likes or hates dancing.

A traditional syntactic approach to this particular type of English adverbs (e.g., Jackendoff 1972) has maintained that the ambiguity of sentence (1) is due to the sentence being structurally ambiguous. That is, because the adverb is adjacent to the main verb, it can be a VP adverb, hence the availability of the manner interpretation. At the same time, the adverb can also be located outside the VP, which gives the equally possible sentential interpretation.

A question that one can ask for this kind of explanation of the ambiguity is what exactly it is meant by the sentential-reading adverbs' being outside or adjacent to the VP. In fact, the exact way in which the adverbs are linked up with the sentence that embeds them is a long-standing problem for theories of adverbial representation. The major issue has to do with the fact that in spite of the availability of two distinct meanings, there seems to be only one syntactic position available for the adverb in (1), namely the position immediately before the main verb.

One particular traditional approach that many previous researchers have adopted is referred to as two-tier syntax approach. For instance, Emonds (1969), and Nespor and Vogel (1986) argued that the sentential-reading adverb in preverbal position and its host sentence form a discontinuous constituent. That is, they are in two different representational planes (i.e., tiers), and thus do not form a traditional tree structure.

The major argument for this type of unorthodox tree structures is that it is able to account for such prosodic events as the occurrence of silent pauses and the special intonation (often referred to as 'comma' intonation) for the sentential-reading adverbs. The comma intonation in sentential-reading adverbs contrasts with the lack of such intonation for the manner-reading adverbs. The argument is that if the sentential-reading adverbs are a normal adjunct to VP, why are they then to be associated with this special prosody that has been thought of as being typical of sentence boundaries, namely heavy pausal breaks and the special pitch contour? This was an issue for researchers who held the two-tier syntax approach, since for them intonation breaks can occur

only at major constituent boundaries such as sentences. The claim is that sentential-reading adverbs are not considered to combine with their hosts to form syntactic structures at all. Instead, they are base-generated in two different tiers, as tones and segments are in phonology, and the special comma intonation and pauses signal precisely that the sentential adverbs do not belong to the same syntactic representation in spite of their surface look.

One thing that needs to be verified in order for this two-tier syntax approach to receive empirical support is that the sentential-reading adverbs are indeed prosodically distinguishable from the manner-reading ones, and that it should be relatively easy to keep them apart by English users. Accordingly, the goal of this paper is to examine the prosodic characteristics of this type of adverbs. Previous prosodic literature mentions this only in passing, usually within the context of the production and perception of relatively longer parenthetical elements<sup>1</sup> in an utterance. The current paper, thus, examines whether there is empirical evidence against or in support of such supposed prosodic events. This paper focuses on investigating three acoustic events based on the claims from the syntactic literature: (i) the presence or absence of silent pauses around the adverbs, (ii) the types of prosodic boundary after the adverbs, and (iii) the shape of tonal contour of the adverbs.

### 1.1. Some Theoretical Assumptions

In this paper, I adopt the prosodic structures as proposed in Pierrehumbert (1980) and Beckman and Pierrehumbert (1986). In this model of English intonation, the Intonational Phrase (IP) minimally has a nuclear pitch accent, a phrase accent, and a boundary tone. A further distinction is made between full IPs and intermediate intonation phrases (ips). The difference between the two phrases is that the latter can have one or more pitch accents plus a phrase accent without the boundary tone, thus allowing us to distinguish between intonational boundaries of different strengths. That is, the IP subsumes the intermediate phrase in the prosodic hierarchy in that the former can have one or more intermediate phrase plus boundary tone. In addition, I will be making the assumption that IP or ip boundaries are optionally marked by the deliberate insertion of a longer or shorter period of silence. This deliberate silence (though optional) is what Nespor and Vogel (1986: 219) call 'grammar-related' pauses, and should be distinguished from those that depend solely on performance factors and cannot therefore be said to be rule-governed.

<sup>1</sup> For example, the italicized relative clause in "The man, *who is an architect*, lives in Chicago" is an instance of what I call longer parenthetical elements.

## 2. Experiment

As stated above, the major aims of the current experiment are to investigate (i) whether the sentential/parenthetical reading of the adverbs induces silent pauses, while no such significant pauses are associated with manner reading of the adverbs, (ii) whether there is a systematic difference between the two types of adverbs in terms of the type of prosodic boundary involved, and finally (iii) whether English speakers produce a different intonational pattern in producing sentential adverbs from the one that they use in producing adverbs functioning as simple manner adverbs.

### 2.1. Method

#### 2.1.1. Participants

Five native speakers of English (4 female and 1 male) participated in the production study. They were all undergraduate students at a university in the U.S. and were naive with respect to the purposes of the experiment. Their participation in the experiment was to fulfill a part of the requirements for the introductory linguistic course that they were taking.

#### 2.1.2. Procedure

The experiment involved each participants' reading two lists of sentences in which the critical adverbs were embedded. The two reading lists differed from each other in the following way. In one list, a particular target adverb appeared with visual commas surrounding it (see (2)). Each sentence that contains a target adverb was followed by another sentence or phrase that was intended to reinforce the participants to produce the target adverbs with prosodies appropriate for the sentential reading (see (2a)). In the other list, the same adverb appeared without visual commas around it (see (3)). The sentence was also followed by a sentence or phrase that was intended to lead subjects to produce the adverbs at this time with prosodies suitable for the manner reading (see (3a)).

All target adverbs were preceded by an NP and immediately followed by a VP. Thus, for example, in a recording session participants read sentence (2), followed by the context sentence (2a) in one reading list, while they read an almost identical sentence (3) (except the absence of visual commas), followed by the context phrase (3a) in the other reading list.

- (2) (sentential-reading intended) The secretary in the finance department, cunningly, made several copies of the secret document, including a fake one,

- a. although everyone questioned the need for it until an industry spy stole the fake one.
- (3) (manner-reading intended) The secretary in the finance department cunningly made several copies of the secret document, including a fake one,
- a. by using official letterhead and the fake company seal.

The two written sentences with the appropriate contexts were assigned to two recording sessions for each participant so that the two contrasting members of a pair did not occur in the same reading session. That is, the speakers read a list of sentences containing the 'a' version on a day and were asked to return for second reading session to read the 'b' version of the sentences. The reason for separating the recording sessions by a few days was to minimize the possibility that the participants realize that there are some contrasting sentences in the reading lists and inadvertently pronounce unnatural versions in an attempt to emphasize potential differences between the two members of a pair.

The speakers were not told that there were special target words within the sentences. In each session, the participants read the sentences aloud to the microphone. They read them with normal speaking style. After completing reading the entire list, the participants were asked to re-read sentences that the experimenter and another phonetically-trained native speaker of English judged to have involved obvious reading mistakes such as the participants' not pronouncing an entire word or saying things that were not in fact existent in the written texts. The recordings were conducted in a sound-attenuated booth. The collected recordings were subsequently converted to WAV file format (16kHz sampling rate) for analysis.

### 2.1.3. Materials

Each reading list contained 8 target adverbs with visual commas and another 8 target adverbs without commas, both of which were followed by the context-providing sentences or phrases. The same 16 adverbs also appeared in non-medial position, i.e., 8 adverbs in sentence-initial position and the other 8 adverbs in sentence-final position, which were embedded in totally different sentences from the sentences that contained the adverbs in sentence-medial position. There were additional 20 filler adverbs in various positions, also embedded in different sentences. Thus, each list included total of 52 sentences (8 commas, 8 without commas, 8 sentence-initial position, 8 sentence-final position, and 20 fillers). The sentences in each list were pseudo-randomized for recording. The 16 target sentences together with suggested contexts are given in Appendix 1.

## 2.2. Results

### 2.2.1. Duration of Silent Pauses

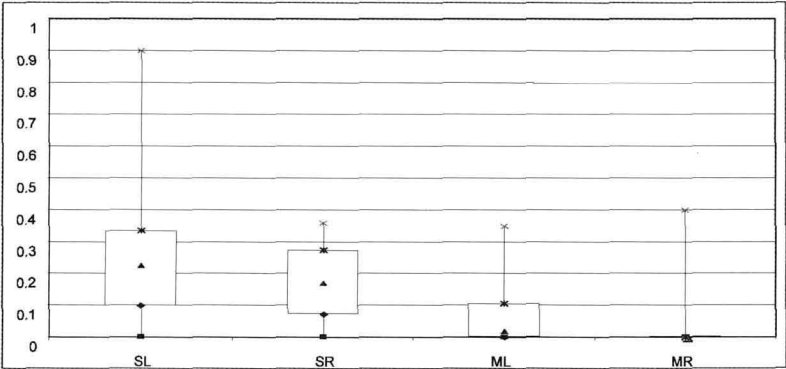
I report results from the pause duration measurement first. The pause duration included the silent interval in the waveform between the cessation of the word located right before the target adverb and the onset of the word that immediately follows the adverb, where the amplitude was indistinguishable from the background noise. Two things complicated the appropriate measurement and thus detection of the presence of pauses. First, in some cases, the pause duration included the closure of the stop consonant of the word that immediately precedes and the word that immediately follows the adverb. Second, the duration of a certain stop closure varied quite a lot due to the intonational phrasing differences. To compensate for these factors, it was decided that a pause is deemed to be present if the silent portion is never shorter than a minimum duration taken to be equal to the average duration of an intervocalic stop produced by the speaker increased by four standard deviation (this criterion was adopted from Duez (1982)).<sup>2</sup>

Table 1 presents the measurement of the silent periods from one female speaker, who I and another (ToBI-trained) independent native speaker of English judged to be the best cooperative speaker among the five participants in this production experiment. Fig. 1 is the box plot representation of the same data. Together they show that the overall result is consistent with the claim from the syntactic literature about pause lengths as a function of the two intended readings of the adverbs. Specifically, the duration of silence around the adverbs intended to elicit a sentential-reading was on average longer than that of the silence around those intended to elicit a manner-reading. The difference in means between SL (pauses to the Left of the Sentential adverbs) and ML (pauses to the Left of the Manner adverbs) as well as between SR (pauses to the Right of the Sentential adverbs) and MR (pauses to the Right of the Manner adverbs) was all statistically significant (paired *t*-tests SL vs. ML:  $t(15) = 2.68, p < 0.05$ , SR vs. MR:  $t(15) = 4.66, p < 0.05$ ).

**Table 1.** Duration of pauses by an English-speaking female speaker (unit: sec.)

| Adverbs      | SL   | SR   | ML   | MR   | Adverbs       | SL   | SR   | ML   | MR   |
|--------------|------|------|------|------|---------------|------|------|------|------|
| foolishly    | 0.38 | 0.13 | 0.15 | 0.00 | oddly         | 0.18 | 0.15 | 0.12 | 0.00 |
| aggressively | 0.14 | 0.20 | 0.07 | 0.00 | maliciously   | 0.32 | 0.02 | 0.00 | 0.00 |
| naturally    | 0.27 | 0.08 | 0.33 | 0.00 | tactfully     | 0.06 | 0.00 | 0.00 | 0.00 |
| rudely       | 0.90 | 0.19 | 0.04 | 0.00 | intelligently | 0.40 | 0.01 | 0.00 | 0.00 |
| obnoxiously  | 0.13 | 0.34 | 0.07 | 0.00 | graciously    | 0.10 | 0.05 | 0.35 | 0.00 |
| politely     | 0.29 | 0.14 | 0.00 | 0.00 | craftily      | 0.00 | 0.33 | 0.00 | 0.00 |
| carelessly   | 0.29 | 0.28 | 0.10 | 0.00 | stupidly      | 0.00 | 0.27 | 0.00 | 0.00 |
| cunningly    | 0.39 | 0.23 | 0.00 | 0.00 | cautiously    | 0.09 | 0.36 | 0.00 | 0.00 |

<sup>2</sup> I thank Zsuzsanna Fagyal for suggesting to me this criterion for measuring silent pauses.



**Figure 1.** Duration of pauses by the same female speaker in Table 1 (unit: sec.).

Concerning the location of pauses, the finding is that silence occurred with almost equal likelihood at both edges of the sentential adverbs, although the mean duration of silence after the sentential-reading intended adverb was somewhat shorter than that of silence before the adverb. Whether there was a pause or not was determined in the following way. The average duration of the speaker's intervocalic stops was about 0.04sec with standard deviation (SD) value of about 0.015sec. If we increase the mean stop closure by four SDs, we get the value of about 0.10s ( $0.04\text{sec} + 0.06\text{sec} = 0.10\text{sec}$ ). Adopting this value as the threshold for the determination of the presence or the absence of pause, we can convert Table 1 to Table 2. Table 2 shows this conversion. As expected, silent pauses usually occurred at both edges of parenthetical adverbs and also the pauses occurred with almost equal likelihood in both edges of parenthetical adverbs. Significantly fewer pauses occurred when the speaker produced the adverbs intended to elicit a manner-reading. Paired t-test results are given in Table 3 to show this.

**Table 2.** Occurrences of pauses by an English-speaking female speaker

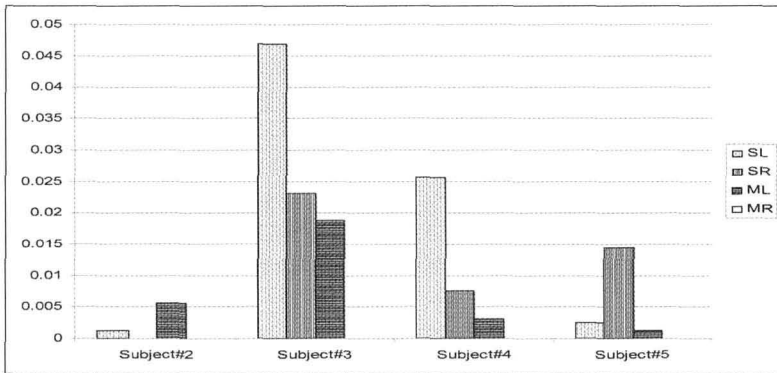
| SL    | SR    | ML   | MR   |
|-------|-------|------|------|
| 12/16 | 11/16 | 5/16 | 1/16 |

**Table 3.** Paired t-test comparing mean pause lengths

|           | mean diff. | SD   | t   | df | Sig. |
|-----------|------------|------|-----|----|------|
| SL vs. ML | 0.16 sec   | 0.25 | 2.6 | 15 | .017 |
| SR vs. MR | 0.14 sec   | 0.12 | 4.6 | 15 | .000 |

Despite these results from the female speaker that were more or less consistent with the expectations based on the traditional syntactic literature, it turned out that there were more variations among the other four speakers that made it

hard to claim that the results from the female speaker are what we would normally expect. Figure 2 shows pause duration measurements from the rest of the four speakers.



**Figure 2.** Duration of pauses by the rest of the four speakers (unit: sec., when no bar is present, it means the value is zero.).

Figure 2 indicates that, as was the case with the female speaker, it is generally the case that if there are silent intervals at all, the intervals seem to be generally longer for the sentential adverbs than for the manner adverbs (except for Subject #2). Also, the silence seems to be longer for the left edge of the sentential adverbs than for the right edge of them (except for Subject #5). Despite this, it seems to be safe to say that the four subjects seem to have opted not to insert pauses for the sentential adverbs. Since I did not measure the average duration of the four speakers' intervocalic stops, I do not have the threshold values for detecting the presence of the actual pauses. But, since the raw silent interval values are very short to begin with, it is quite unlikely that the subjects (especially subject #4 and #5, and not to mention subject #2 who did not 'pause' at all regardless of the presence and the absence of visual commas) used pauses as often as the female speaker above did.

### 2.2.2. Prosodic Boundary after the Adverbs

Here I report the duration of the final syllable of the adverbs.<sup>3</sup> Since every target adverb in this study ended with '-ly', the duration of this syllable was measured. The expectation was that a sentential adverb would be followed by a prosodic boundary larger than the prosodic boundary that a manner adverb would be followed by. This is based on the assumption that the sentential-reading adverbs are an adjunct to a syntactic constituent bigger than a simple word. Whichever intonational phrasal category these sentential adverbs are

<sup>3</sup> I thank an anonymous reviewer for suggesting this measurement to me.



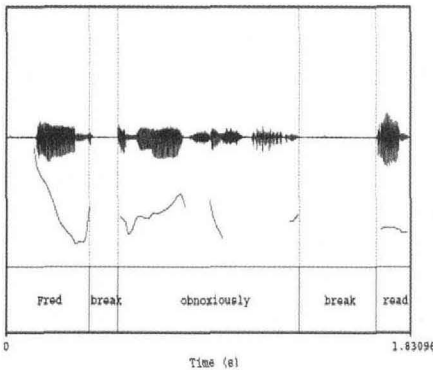
mapped onto, the duration would be much longer for this type of adverbs than for the manner adverbs due to the well-established phrase final lengthening effect. Mean durations of the adverb-final syllables are reported in Table 4. A series of t-test indicated that for the majority of the participants (except subject #2) the ‘-ly’ portion of the sentential adverbs was produced significantly longer than that of the manner adverbs.

**Table 4.** T-tests comparing mean duration of adverb-final syllable

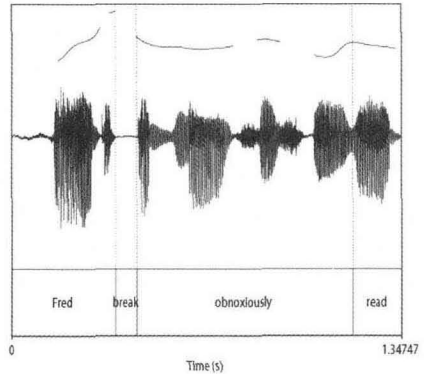
| subject # | Manner    | Sentential | t    | df | sig.       |
|-----------|-----------|------------|------|----|------------|
| 1         | 0.13 sec. | 0.28 sec.  | 4.88 | 14 | $p < 0.05$ |
| 2         | 0.03 sec. | 0.04 sec.  | 0.44 | 14 | $p > 0.5$  |
| 3         | 0.15 sec. | 0.35 sec.  | 5.02 | 14 | $p < 0.05$ |
| 4         | 0.17 sec. | 0.29 sec.  | 4.78 | 14 | $p < 0.05$ |
| 5         | 0.08 sec. | 0.14 sec.  | 4.20 | 14 | $p < 0.05$ |

### 2.2.3. Types of Tonal Contours of the Adverbs

Finally, here I report the pitch contour patterns used by the female speaker whose pause duration was reported in 2.2.1 above. Figures 3 and 4 are pictures of the pitch contour of part of a target sentence “Fred (,) obnoxiously (,) read the introduction for the speaker at his sister’s graduation”.



**Figure 3.** H\* on the stressed syllable of the adverb with major intonation breaks on both sides of the adverb (Sentential-reading).



**Figure 4.** L\* on the stressed syllable with a small break before the adverb (Manner-reading).

Table 5 gives the ToBI analysis of all of the sixteen pairs of target adverbs produced by this female speaker.<sup>4</sup>

<sup>4</sup> The analysis of tones and intonation breaks was done with the help of an English-speaking ToBI trained phonologist.

**Table 5.** A ToBI analysis of intonation of target adverbs from a female speaker

| S-reading intended           | M-reading intended       | S-reading intended          | M-reading intended        |
|------------------------------|--------------------------|-----------------------------|---------------------------|
| L-L% H* L-L%<br>foolishly    | L- L*+H<br>foolishly     | L-L% H* L-L%<br>oddly       | L- L* H-<br>oddly         |
| L-L% H* L-H%<br>aggressively | L- L*+H<br>aggressively  | L-H% L* H-H%<br>maliciously | L-L% L* H-<br>maliciously |
| L-L% H* L-L%<br>naturally    | L-L% L*+H<br>naturally   | L-L% H* L-L%<br>tactfully   | L* H-<br>tactfully        |
| L-L% H* L-L%<br>rudely       | L- L* H-<br>rudely       | L-L% H* L-<br>intelligently | L*+H<br>intelligently     |
| L- H* L-L%<br>obnoxiously    | H- L* H-<br>obnoxiously  | L-L% H* L-L%<br>graciously  | L-L% L*+H<br>graciously   |
| L-L% H* L-L%<br>politely     | H- L* H-<br>politely     | L- H* L-L%<br>craftily      | L-L% H* L-L%<br>craftily  |
| L-L% H* L-L%<br>carelessly   | L-L% L* H-<br>carelessly | L-L% H* L-L%<br>stupidly    | L- L* H-<br>stupidly      |
| L-L% H* L-H%<br>cunningly    | L-L% L* H-<br>cunningly  | L-L% H* L-L%<br>cautiously  | L-L% L* H-<br>cautiously  |

Given this fact, at least as far as this particular speaker is concerned, two relatively clear patterns are observed from the inspection of pitch contours in Table 5<sup>5</sup>: the usual pitch contour for the sentential adverbs seems to be a falling (H\* L) contour with a major intonation break at both edges of the adverb, while the usual pattern for the manner adverbs seems to be a rising contour (L\* H) with almost no breaks at either edge.<sup>6</sup> This result is thus apparently consistent with the prediction that the sentential adverbs and the manner verbs would differ in terms of the shape of the tonal contour involved.

I should note, however, that even within this particular speaker's production, there seemed to be variation with respect to the tonal patterns as a function of the meanings of the adverbs. Specifically, as an anonymous reviewer also observed (see footnote 5), some sentential adverbs seemed to have been produced with a tonal pattern more complex than a simple falling tone (specifically, H\* L-H%; falling-rising tone according to an anonymous reviewer's suggestion). Likewise, a falling (not the expected rising) tone was often observed with some manner adverbs (specifically, H\* on adverb followed by L+H\*). The results taken together thus suggest that falling (H\* L) vs. rising (L\* H) tonal pattern

<sup>5</sup> An anonymous reviewer informed to me that in his/her own judgment of the audio files that I provided during the review process, some of the tonal descriptions given in Table 5 were not in agreement with his/her own judgment. Specifically, in S-reading, 'cautiously': H\*L-L% → H\* L-H% and in M-reading, 'rudely': L\* H- → L\*+H, 'intelligently': L\*+H → H\*(L-), 'carelessly': L\*H- → L\*+H. See the text below for a discussion of this (partial) discrepancy in tonal descriptions between the current and the reviewer-suggested ones.

<sup>6</sup> In particular, we see that there are no pausal breaks especially after the manner-reading intended adverbs (other than 'craftily', which the experimenter judged that the speaker made a reading mistake).

distinction is a production strategy that is used to distinguish the sentential- and manner-adverbs, though not as categorically as previous syntactic works would have predicted.<sup>7</sup>

### 3. Discussion

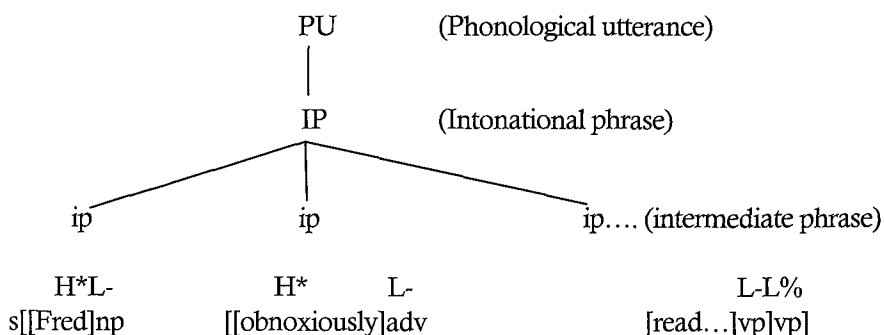
The current findings indicate that first, with regard to pause insertion it seems to be safe to say that the majority of speakers in the current study did not insert pauses where they were expected according to the two-tier syntax. Rather, the indication is that pause-insertion as an indicator of the sentential reading, as opposed to the manner reading, is far less categorical in the production of the sentential adverbs than it has been supposed before. I should note here that this general lack of heavy pausal breaks around the sentential adverbs, however, cannot in itself be a definite indication that the sentential adverbs were produced in a manner that is indistinguishable from the manner adverbs in terms of prosodic category. This is because (as an anonymous pointed out) pauses are optional even after an Intonational Phrase boundary and no clear pause is expected after an Intermediate Phrase boundary either, according to the model of the English intonation that this study adopts (Beckman and Pierrehumbert 1986, Pierrehumbert 1980). This means that, even if the sentential adverbs were produced with an IP or an ip, the adverbs could have been realized without pauses. If this is so, then the presence or absence of pause in itself cannot be definite evidence for or against the prosodic claims from the two-tier syntax.

To illustrate this point further, let me present Figure 5 as a hypothesized (partial) phonological tree diagram of the sentence 'Fred, obnoxiously, read the introduction to his sister's graduation ceremony'. Here the entire sentence is labeled as a separate Intonational phrase and the sentential adverb as an intermediate phrase – a phrase weaker than the full Intonational phrase. Under the assumption that pauses are only optionally present at either IP or at ip boundaries, the apparent surface lack of pauses for the sentential adverbs found in the current study is not inconsistent with the idea that the sentential adverbs were produced with an IP or an ip while the manner adverbs were not. In other words, it is logically possible that the sentential adverbs were indeed

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<sup>7</sup> I have not explicitly analyzed the pitch contour patterns that were used by the rest four speakers, by using the ToBI transcription, as I did for the female speaker. Impressionistic transcriptions of the pitch contours that the rest four speakers used, however, indicated that although the exact pitch contours differed from the female speaker and their tonal patterns varied somewhat across speakers, the overall patterns of the pitch accent type and the boundary tone type combination seemed to be more or less similar to the general patterns seen from the female speaker's production.

produced differently from the manner adverbs, in spite of the fact that this is not apparent from the pause data alone.



**Figure 5.** Hypothesized structure of prosodic units of an utterance and syntactic bracketing.

This supposition that the sentential adverbs might have been produced with a bigger prosodic unit than a simple word gains some support from the fact that, at least as far as the most cooperative female speaker in this study is concerned, the sentential adverbs were indeed quite consistently associated with significant intonation breaks (before and/or after the sentential adverbs). In contrast, the manner adverbs were not, indicating that the sentential adverbs (but not the manner adverbs) were produced with an IP or an ip. This claim gains further support from the current result that we got from the measurement of the duration of adverb-final syllables. The fact that for the majority of the speakers the duration was significantly longer for the sentential adverbs than for the manner adverbs makes it plausible to think that the former type was followed by an IP or an ip boundary while the latter type was indeed followed by a prosodic boundary smaller than an IP or an ip boundary (i.e., a word boundary).

The present claim that the presence or absence of pauses is only a weak/optional prosodic cue to the adverbs gains additional support from an independent perception study involving the same type of adverbs. Y Lee (2007) examined whether pauses make a contribution to the English users' interpretation of the adverbs independent from other variables such as prosodic boundary and tonal patterns. More specifically, the experiment tested the hypothesis that pause-insertion, if it is an independent factor relating to the sentential reading, may boost the sentential reading when it occurs with the right pitch contour and prosodic boundary. The results indicated that the falling tonal pattern and IP prosodic boundary, not pauses, seemed to be the major factors in affecting the listener's interpretation of the adverbs.

To summarize, the data from the current production study thus suggest that

the most consistent strategy that the English speakers use in distinguishing the two types of adverbs consists of manipulating the size of the prosodic boundary after the adverb, namely a larger boundary is present with the sentential adverbs than with the manner adverbs. Other than this, we found more variety, not invariance, in the production of sentences involving the adverbs. This variety, however, is not so surprising when looked at within the context of other previous works that have looked at similar performances by speakers. Schafer et al.'s (2000) study, for example, found that their speakers, like the current ones, also used a variety of prosodic patterns for given syntactic structures. In this regard, the claim from the two-tier approach with regard to the prosody of the sentential vs. manner adverbs receives only limited empirical support. At least the strongest version of two-tier approach that claims that the prosody involved with the two types of adverbs should be simple and invariant seems not to be well supported.

#### **4. Conclusion**

The current study examined English speakers' production of potentially ambiguous adverbs in sentence-medial preverbal position. These adverbs constitute an interesting set of data for theories of syntactic representation of adverbs since the adverbs can have two distinct meanings although there is only one surface position for the adverbs, namely that the adverb appears immediately before the main verb. A syntactic theory of the representation of these adverbs previously claimed that certain acoustic events are quite consistently associated with this type of adverbs and the presence of such speech events is coherent with the hypothesis that the adverbs are not part of the syntactic representation of the host sentence. The current findings provide limited support for this approach. Although, as expected by the theory, the sentential adverbs were followed by a larger-than-word boundary (compared to the boundary associated with the manner adverbs), the production patterns regarding pauses and tonal contours were far less categorical than has been assumed before. These results thus may be an indication that the preverbal sentential-reading adverbs in English are not as quite parenthetical to their host sentence as the two-tier syntax has assumed before, and this fact should be taken into consideration in constructing theories of syntactic representation of the adverbs.

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### Appendix 1: Target sentences with their context-providing (either sentential- or manner-reading) sentences

1. The secretary in the finance department (,) cunningly (,) made several copies of the secret document, including a fake one.
2. At the wedding reception, the bride's best friend (,) oddly (,) led the dance.
3. In filling out an application form to be sent to her prospective employer, Jane (,) intelligently (,) replied to all the questions.
4. The Navy special forces (,) cautiously (,) restricted direct confrontation with the enemy.
5. The New England senators (,) maliciously (,) stalled the vote.
6. Fred (,) obnoxiously (,) read the introduction for the speaker at his sister's graduation.
7. Sue (,) tactfully (,) let her son win at chess.
8. Suzuko (,) politely (,) spoke to his distant relatives.
9. A close friend of Philip's (,) graciously (,) made conversation with Mary.
10. A co-worker of Vera's (,) craftily (,) withdrew all his funds from the Argentine bank.
11. Monica's boyfriend (,) rudely (,) left in the late evening.
12. Last Friday, Petunia and her entire family (,) stupidly (,) ate meat in the Vatican.
13. The well-known senator from NY (,) foolishly (,) responded to reporters

the other day.

14. The big Internet company (,) aggressively (,) wiped out six more companies.
15. Mr. Nathaniel River's grandfather (,) naturally (,) recited the old poems.
16. The company's CPA (,) carelessly (,) recorded the debts incurred last year.

Context-providing sentences or phrases (A = sentential-reading intended, B = manner-reading intended)

1.  
A-- although everyone questioned the need for it until an industry spy stole the fake one  
B-- by using official letterhead and the fake company seal
2.  
A-- since the bride knew that her friend normally hates dancing in public  
B-- by locking her knees and throwing her arms about
3.  
A-- although her friends thought that leaving out some questions would be O.K.  
B-- by thinking carefully before answering each one.
4.  
A-- instead, they concentrated on guerrilla warfare that caused more damage  
B-- by sending out regular recon patrols and detouring around the front line
5.  
A-- given that the bill passed before the end of the session anyway.  
B-- by making unfounded attacks on the bill's supporters
6.  
A-- in fact, his sister had hoped Fred wouldn't be there at all  
B-- emphasizing the unfortunate political scandal
7.  
A-- although normally she hated losing.  
B-- by making several well-hidden stupid moves
8.  
A-- although he could have ignored them  
B-- by using all the appropriate honorifics
9.  
A-- in order to prevent her from feeling isolated  
B-- by saying a few well-chosen words.
10.  
A-- since he knew that the bank was going to bankrupt  
B-- by making tiny withdrawals spaced over a year.

11.

A-- although she begged him to stay and keep her company.

B-- by slamming the door.

12.

A-- since Roman Catholic doctrine prohibits eating meat on Friday

B-- using flimsy plastic spoons, so they made a big mess

13.

A-- though she really didn't need to say anything to them.

B-- and the reporters didn't know why she was talking so funny.

14.

A-- as a result of it, they now face an antitrust suit.

B-- by temporarily offering services at well below market value

15.

A-- since of course he figured everyone wanted to hear him reciting

B-- you could tell from his delivery that he had been a skilled reciter.

16.

A-- instead of hiding them in a limited partnership, as he was expected to

B-- by confusing interest payments to the lenders with payments of the principal.

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