

On the Role of Intonation and Pauses in the Interpretation of English Parenthetical Adverbs*

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Lee, Yongeun 2007. **On the Role of Intonation and Pauses in the Interpretation of English Parenthetical Adverbs.** *The Linguistic Association of Korea Journal*, 15(1), 83-101. This paper investigates the relative contribution of intonation and pauses in English-speaking listeners' interpretation of certain potentially ambiguous adverbs in English. When 'cleverly', for example, is used in a sentence like 'The people in the basement (,) cleverly (,) opened the vent to the outside', the adverb can be interpreted as having either a parenthetical/sentential reading (i.e., the people are judged to be clever to open the vent, as opposed to leaving it closed) or a manner reading (i.e., the people showed great cleverness in the way they opened the vent). Previous syntactic literature claimed that both the presence of heavy pausal breaks before and/or after the adverbs and a special pitch contour associated with the adverbs might influence listener's interpretation of these adverbs. A perception experiment conducted in the current study indicates that the difference in pitch contour patterns, not the presence or absence of major intonation breaks, plays the major role in affecting listeners' interpretation of the adverbs. Implications of the current findings for the prosodic and syntactic representations of the parenthetical-manner ambiguous adverbs are discussed.

Key Words: English parenthetical adverbs, prosody, disambiguation

1. Introduction

In previous literature on English adverbs (e.g., Jackendoff, 1972), it has been claimed that there exists a distinct set of adverbs that are

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ambiguous in pre-verbal position. The adverb *cleverly*, as shown in (1), illustrates this type of adverbs. In one reading of the adverb, where (1.a) is a preferable continuation of sentence (1), *cleverly* is said to have a parenthetical/sentential interpretation: that is, the people are judged to be clever to open the vent (as opposed to leaving it closed) regardless of the method the people used.

- (1) The people in the basement cleverly opened the vent to the outside,
(1.a) --- so that the poison gas would be pulled from the room.

In the other reading of the adverb, where (1.b) is a good continuation of sentence (1), *cleverly* is said to have a manner interpretation: that is, the people showed great cleverness in the way they opened the vent, although it might have been wiser to leave it closed.

- (1.b) --- with chewing gum and an old pool cue.

The major goal of this paper is to investigate acoustic cues that may affect English-speaking listeners' interpretation of this type of adverbs in preverbal position. Some possible cues have been discussed mainly in syntactic literature. Two major cues that have been frequently cited in the syntactic literature are (i) the presence (or the absence) of heavy pausal breaks before and/or after the adverbs and (ii) a special pitch contour associated with the adverbs. Literature varies with regard to whether both cues are necessary and whether one is more effective than the other. Jackendoff (1972), for example, claimed that if surrounded by heavy pauses, *cleverly* in (1) is interpreted by listener as having a parenthetical interpretation, namely (1.a). Costa (1997), on the other hand, suggested that if the adverb is produced with what often called 'comma' intonation, *cleverly* is interpreted as having a parenthetical reading. Despite these claims, the exact nature and role of the intonation and pauses in the interpretation of the adverbs has not been experimentally investigated and mostly relies on intuitive data alone.

Thus, one major question this study asks is whether the two acoustic cues make independent contributions to the resolution of the ambiguity, as often has been assumed in previous syntactic literature. Specifically, the presence of the special intonation and of the silent pauses has been assumed to be more or less equally necessary in inducing the parenthetical reading of the adverbs. But it may well be that the cues interact in the perception of the adverbs in more subtle way.

In fact, results from previous prosodic studies on the interaction of the intonation and the pauses in the perception of more general parentheticals converge to indicating that the two acoustic cues may not have the equal status. By more general parentheticals, I mean, for example, the italicized relative clause in "The man, who is an architect, lives in Chicago". Rather, it is the intonation that is the main cue of the parentheticals and that the pauses play a minor role, if at all, in the interpretation of the parentheticals (e.g., Henderson (1980), Butcher (1981), Heike (1981), Nespor and Vogel (1986), Wichmann (2001), and Fagyal (2002)). Furthermore, theories of intonational phrasing like Beckman and Pierrehumbert (1986) also suggest that the two cues are not equal in their status, namely that tones alone can make prosodic boundaries. Thus, we can expect that these previous findings may also be true of short parentheticals like the sentential-reading adverbs, the focus of the current study.

In investigating questions above, this study will test the following hypotheses. 1. The parenthetical-reading adverbs (as opposed to the manner-reading adverbs) in preverbal position carry with them the same usual acoustic cues that the more common long parentheticals have (i.e., particular pitch contours and silent pauses possibly at both edges of the words). 2. Both cues make independent and possibly cumulative contributions to listeners' interpretation of them. The goal of the perception study reported below was to test these hypotheses.

2. Perception Study

2.1. Participants

Forty native speakers of English (26 female and 14 male), who were naive with respect to the purposes of the experiment, participated in the production study. They were all undergraduate students at Northwestern University.

2.2. Material

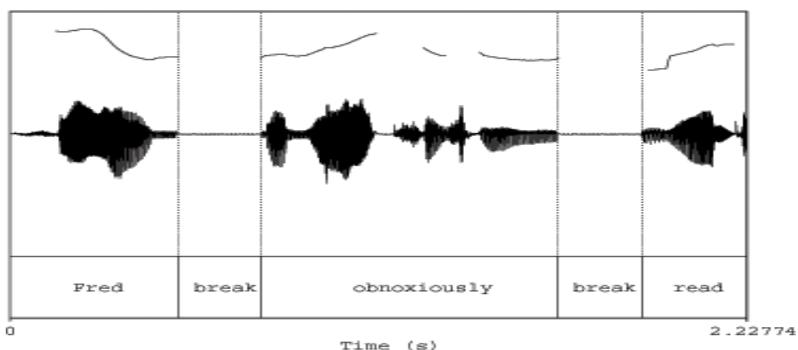
In order to ensure the maximum consistency in the pitch contours to be used for the perception study, an informed native speaker of English read two types of reading lists with the purpose of producing the target adverbs in the two types of ‘proper’ prosodies, namely sentential prosody (SP) and manner prosody (MP). 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, as in (2). Each sentence that contains a target adverb was followed by another short sentence/phrase that was intended to reinforce the speaker to produce the adverbs with prosodies appropriate for the sentential reading. In the other list, the *same* adverb appeared *without commas* around it, as in (3). The sentence was also followed by a short sentence/phrase that was intended to lead the speaker to produce the adverbs with prosodies suitable for the manner reading. All target adverbs were preceded by an NP and followed by a VP. Thus, for example, the speaker read sentence (2), followed by the context sentence (2.a) in one reading list with the intention to produce *cunningly* with an SP prosody, while she read an almost identical sentence (3) except the absence of commas, followed by the context phrase (3.b) in the other reading list with the intention to produce the same adverb with an MP prosody.

- (2) The secretary in the finance department, cunningly, made several copies of the secret document, including a fake one,
- (2.a) -- although everyone questioned the need for it until an industry spy stole the fake one.
- (3) The secretary in the finance department cunningly made several copies of the secret document, including a fake one,

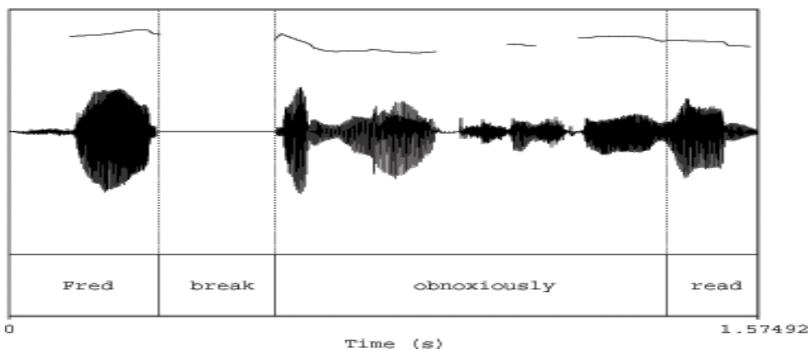
(3.b) -- by using official letterhead and the fake company seal

The representative pitch contours for the sentential prosody (SP) and the manner prosody (MP) used in the perception study are given in Figure 1 below.

Fig 1. Pitch contours and pause for SP and MP type of stimuli
SP-type: breaks before and after the adverb: Fred, obnoxiously, read the introduction for the speaker's graduation.



MP-type: a pausal break only before the adverb: Fred obnoxiously read the introduction for the speaker's graduation.



These two particular types of pitch contours were selected because they agree with the general patterns of pitch contours that the author obtained in a separate production study with native speakers of English.

Specifically, the SP type involves the H* followed by an L- tonal contour with a major intonation break at both sides of the adverbs, while the MP type involves the L*+H tonal contour with no breaks at either side of the adverbs. For the SP and MP versions of stimuli, 250ms silent interval, taken from the background noises, was spliced in to the original recordings. The interval value was never shorter than a minimum duration taken to be equal to the average duration of an intervocalic stop (produced by the informed speaker) increased by four standard deviations. Pauses were spliced in both before the adverb and after the adverb for the SP type, while pauses were spliced in only before the adverb for MP not to disrupt the prosodic constituent of VP. The insertion of pauses only before the adverb for MP type was due to the following two reasons: (i) it was impossible to splice in pauses after the adverb without creating very unnatural speech stimuli, and (ii) the speakers in a separate production experiment also had a similar asymmetric pattern (i.e., the speakers never inserted pauses after the adverb). There were two additional types of stimuli, namely SNP and MNP type stimuli. The SNP and MNP type differed from their counterpart SP and MP type respectively in that the SNP and MNP type had no pauses between the adverbs and the elements surrounding them. Thus, for the SNP and MNP types of stimuli, pauses from the original recordings, if there were any, were spliced out.

Here I would like to *emphasize* that original recordings of the two lists were inspected auditorily by the author and the speaker in order to *ensure* that the appropriate prosodies (i.e., % H* L- % vs. % L*+H) were indeed used for every target adverb used in the current study. After the auditory inspection, some target sentences were re-recorded to correct pitch contour inconsistencies. The recordings obtained were then subsequently converted to WAV file format (16 kHz sampling rate) for the digital manipulations (namely, splicing pauses in and out). With these manipulations of the original recordings, the author could obtain the four types of auditory stimuli, as schematized in Table 1.

Table 1. Four types of auditory stimuli

SP	SNP	MP	MNP
S-intonation with 250ms pause before and after the adverb	S-intonation without pauses	M-intonation with 250ms pause before the adverb but not after the adverb	M-intonation without pauses

Each of the four types of stimuli was then assigned to one particular block out of total four different blocks for the perception experiment. Each block contained the 16 target adverbs with equal number of the four stimuli types (namely, 4 targets each for each type in a given block), as can be seen in the following table. The participants were assigned to one particular block for participation (namely, 10 participants for each block), as in Table 2.

Table 2. Four blocks of stimuli

	Block 1	Block 2	Block 3	Block 4
foolishly	SP	SNP	MP	MNP
oddly	SNP	MP	MNP	SP
aggressively	MP	MNP	SP	SNP
maliciously	MNP	SP	SNP	MP
12 more adverbs

2.3. Procedure

Auditory questionnaire involved participants' listening to the previously recorded sentences containing the critical adverbs played through headphones, and then selecting their preferred sentence continuation on an answer sheet by circling either A or B (see Table 3 below). Two possible continuations of previously recorded sentences were printed on the left or right side of the auditory questionnaire sheets and the participants were asked to choose one of them that they

thought is the best paraphrase of the sentence that they just heard. Thus, for example, they heard a given speech stimulus and then were asked to choose between the two choices in Table 3 (see Appendix 1 for stimuli used in this study).

Table 3. Perception study procedure: participants heard an auditory stimulus and then chose answer 'A' or 'B'

A	B
The senator responded to reporters the other day in a foolish way. (and the reporters didn' t know why she was talking so funny)	It was foolish of the senator to respond to reporters the other day. (though she really didn' t need to say anything to them)

Each participant heard pseudo-randomized 52 sentences (16 targets in medial, 8 targets in initial, 8 targets in final, 20 fillers) in a given trial. They participated in two different trials in total with a 5-minute break inbetween the trials, i.e., they heard two different versions of a given block in Table 2. The two versions differ from each other in terms of the filler materials given and of the order in which the target items were presented. Another difference between the two versions was that in one version, the answer sheet for that version contained the sentential reading as answer 'A' and the manner reading as answer 'B' . In the other version, the order was switched. This was done to balance off the possible response bias. Participants were seated in a sound attenuated room with headphones on in front of a computer screen. A short practice session familiarized them with the task of listening to sentences before the main session. It took about an hour for the participants to complete the experiment.

Table 4 summarizes the basic design of the experiment, as explained above. In order to facilitate the interpretation of the results that the current study found, specific predictions that fall out from the design are also summarized in the table with the explanations below the table.

Table 4. The basic design of the experiment

4 types of stimuli	Intonation type	Pause presence	Predicted reading preference
SP	Sentential	Pause	S > M
SNP	Sentential	No Pause	SP > SNP
MP	Manner	Pause	S > M or S < M
MNP	Manner	No Pause	M > S

(i) SP: Since both the sentential prosody and the pause are present, listeners that hear this version of stimuli should report the "S" reading more often than "M" reading.

(ii) SNP: If intonation and pause work in some cumulative fashion with regard to the sentential reading, listeners that hear SNP version of stimuli will report the "S" reading less often than listeners listening to SP version of stimuli

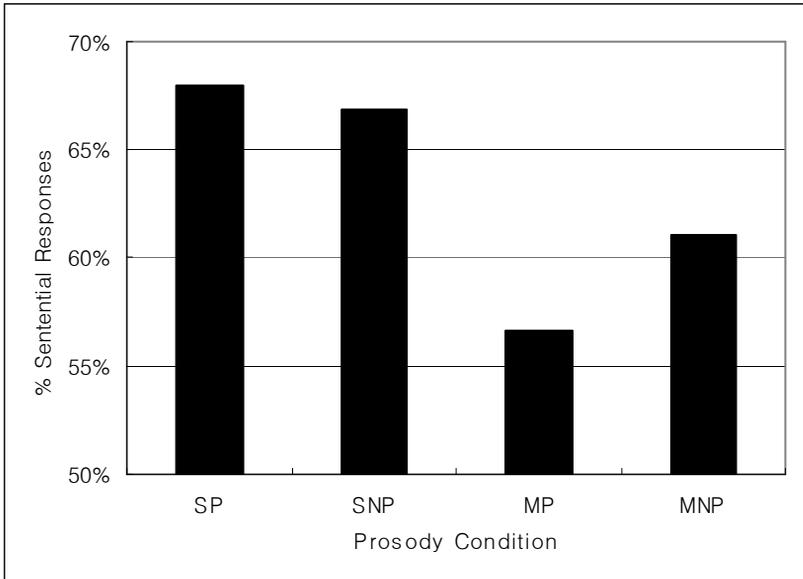
(iii) MP: Since the two cues are in 'conflict' in this type, responses from this version of stimuli may tell us whether pause alone can change the category of the responses. If pause effect can override the pitch contour effect, subjects may report the "S" readings more often than the "M" readings.

(iv) MNP: Since neither the sentential prosody nor the pause is present, listeners that hear this version of stimuli should report the "M" reading more often than "S" reading.

3. Results and Discussion

Fig. 2 below shows the percentages of the sentential-interpretation responses, averaged over the entire listeners, from each prosody condition. The 50% line where X-axis and Y-axis cross can be thought of as a base line that all the graphs would have located if the subjects responded completely randomly to the task.

Figure 2. Percent sentential-reading responses by prosody types



Overall, we see that the participants reported more sentential readings across the board, suggesting some bias toward the sentential interpretations of the adverbs regardless of the prosodies associated with them. Setting aside a discussion of this particular result, we notice the followings from the graph. First, the sentential intonation overall pulled up the sentential reading responses from the random line more than the manner intonation did. A 2X2 ANOVA (the two pitch contours and the presence/absence of pauses) computed for the target items across SP & SNP and MP & MNP sets shows a near-significant effect of intonation ($F(1,15) = 3.40, p=.08$), while another 2X2 ANOVA for the participants shows a significant effect of intonation ($F(1,39) = 3.88, p=.05$).

Second, regarding the effect of silent intervals on the interpretation of the adverbs, there was no difference in percent sentential reading responses across SP and SNP (ANOVA within items for pause (F

(1,15) = .33, $p > .05$) and ANOVA within subjects for pause ($F(1,39) = .02$, $p > .05$). Interestingly, adding pauses to auditory stimuli where such acoustic event is not usually expected (i.e., MP) seems to have caused greatest confusion to the hearers. Percent responses from this MP type best approximated the 50% random line among the four types of stimuli.

The perception data taken together thus indicate that intonation was more important than pauses for the listeners' analysis of the stimuli. Virtually no differences in responses between SP and SNP type stimuli, in particular, suggest that listeners that heard the SP type did not have advantage in their prosodic analysis compared to the listeners in the SNP group. This in turn suggests that as far as the subjects' prosodic analyses went, the intonation evidence alone was sufficient, making the pauses redundant. Under the prosodic model that this study assumes, the fact that the insertion of pauses was not a deciding factor may mean that full IP boundaries with pauses need not have to be present for inducing the sentential-reading intended adverbs. As long as the F0 evidence is there, prosodic boundaries with or without pausal breaks almost equally worked (though not fully sufficient to take the sentential reading over 70%). As for the results from the MP type stimuli, we might say that the pauses did not function very well, since they were interpreted as errors or hesitations, thus making the percent responses from this type best approximate the random line.

Traditional syntactic literature on the representation of parenthetical adverbs in English claims that the sentential adverbs are associated with obligatory pauses as well as with quite distinct intonation. More specifically, these prosodic cues have been taken to signal that preverbal sentential-reading adverbs are syntactically detached from its host sentence and thus are not part of syntactic representation of the host sentence in which the parenthetical adverbs are embedded. In this way, the sentential adverbs are really parenthetical as are the usual long parentheticals.

The results from our perception study show that the empirical basis for these kinds of accounts of the parenthetical adverbs is not well

founded. In particular, we saw that the perceived 'heavy' pause account of sentential reading is naive to the extent that it ignores the prosodic context in which the pause occurs. The current results indicate that pauses (usually associated with full IP boundaries) alone cannot effectively change the perceived interpretation of the potentially ambiguous adverbs. Thus, the presence of pause is redundant at best in perception regarding our parenthetical adverbs.

The current findings are consistent with results reported in pause-detection literature. Henderson (1980), for example, questioned the importance of silent pause as an independent acoustic factor in the segmentation of speech. Insofar as he found, the intonation played more important role in the perception of sentence boundaries than pause, in particular in the case of falling intonation. This does not mean, however, that pause-insertion is always variable and is thus never predictable in speech production. Phrasing breaks or pauses seem to be obligatory in some cases, e.g., following preposed adverbial clause or phrase, topics, and especially (relevant to us) preceding and following relatively long parenthetical appositive relative clauses in preverbal position. This can be explained in the line of Pierrehumbert and Beckman's intonation framework that this study adopts. Our results, thus, are rather taken to indicate that pauses that are obligatorily present in relatively long parentheticals are not necessary for our relatively short parenthetical adverbs in preverbal position.

What would be the difference between relatively long parentheticals vs. parenthetical adverbs in this study? Besides the fact that the adverbs are short, the meaning contributions that the two types of parentheticals make to their hosts may differ. Though various definitions of parentheticals exist, they converge into basically one concept: parentheticals are detached from their host in terms of meaning contributions to the utterances in which they occur. According to Bolinger (1989), speakers use parentheticals among others to convey anything else about what is being said that may enter the speaker's head. OED's definition is similar: parenthetical is a word, phrase or sentence inserted in a passage with which it has either no grammatical

connection or no contextual connection. Biber, Johansson, Leech, Conrad, and Finegan. (1999) also offer a similar definition: 'A parenthetical is a digressive structure which is inserted in the middle of another structure, and which is unintegrated in the sense that it could be omitted without affecting the rest of that structure or its meaning'. These together suggest that some degrees of detachment of the parentheticals in terms of meaning from their hosts are necessary. In the case of our parentheticals, however, they are contributing some meaning to their hosts in that it plays a role as stance-making adverbials in the utterance in which they occur (see Asher (2000)) for a semantic analysis of parentheticals where adverbials do contribute a truth conditional content to the host sentence). This may mean that they will show a greater degree of interpolations into their host sentences than the regular long parentheticals so that the adverbs may show a greater tendency to be integrated in the prosodic strings of which they are part and thus do not have to be separated off from their host with pauses.

One may still want to say that even though the parenthetical adverbs may not be as detached from their hosts as the regular parentheticals are, the former is still 'parenthetical' in the sense that it is somewhat consistently associated with the special sentential-intonation that is rarely observed from the regular manner-interpretation adverbs. In addition, the sentential intonation affects the interpretation of the adverbs to certain degree. In other words, the objection to treating the parenthetical adverbs as really non-parentheticals may be that if the sentential-reading adverbs are indeed generated as part of the syntactic representation of their hosts, why are then they associated with the intonation that has been thought of being typical of syntactic constituents that are not really integrated to their hosts? In addition, we observed that this sentential intonation is indeed a cue that listeners are attentive to (though not by a large amount), since the sentential prosody shifted the meaning of the adverbs somewhat consistently to the sentential reading. This is essentially what is argued to be the case in Browning (1996, 238, fn. 2), where he claims that "a parenthetical intonation of the adverb signals that it is not actually part of the

syntactic representation”.

An alternative to this kind of interpretation of the parenthetical intonation is available that still maintains the idea that the sentential-reading induced adverbs are indeed part of the syntactic representation of the host. The basic idea is that the sentential-intonation is not signaling that the sentential-reading adverbs are not part of the syntactic representation (as is often assumed in previous literature) but rather signaling that it is located in a position that violates a unique canonical base-generation position of English adverb phrases. Specifically, it might be that sentential-reading adverbs are base-generated outside the VP (see more explicit syntactic accounts of them in Cinque 1999, Potts 2002) as the unique specifier of a distinct maximal projection separate from the VP (i.e., not just as normal adjuncts to the VP, as we recall from above that the traditional base-generation approach has envisaged). Since the position is not the canonical position of English adverbs and thus has the potential that it violates the grammar that governs the generation of the adverbs, speakers need to somehow ‘rescue’ the adverbs that otherwise violate a requirement on the base position of the adverbs. One way of rescuing the sentential-reading adverbs is precisely to use the special intonation. This way of interpreting the sentential intonation that is associated with the sentential-reading adverbs can accommodate the fact that the parenthetical approach of the sentential adverbs cannot, i.e., the non-necessity of full IPs with optional pause insertion that is quite categorical of the usual long parentheticals.

4. Conclusion

The current study examined the relative effects of certain pitch contours and the presence and the absence of silent pauses on listener’s interpretations of potentially ambiguous adverbs in sentence-medial position. These adverbs constitute an interesting set of data for theories 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.

The results from the current perception study do not support the claims of traditional syntactic literature on the representation of the adverbs in that (i) listeners do not make a consistent use of heavy pauses in perceiving the particular meanings of the adverbs, (ii) although the comma intonation can affect listeners' interpretations of the adverbs, it can be thought of a measure that speakers and listeners employ to rescue and detect the sentential-reading adverbs' potential violation of being generated in non-canonical position. In sum, the preverbal sentential-reading adverbs in English are not quite parenthetical to their host sentence, contra what has been assumed for them, and parenthetical intonation of the adverbs might signal that it is actually part of the syntactic representation but not in a canonical way.

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Appendix 1. Perception study stimuli

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

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

3. In filling out an application form to be sent to her prospective employer, Jane (,) intelligently (,) replied to all the questions.

3. a-- although her friends thought that leaving out some questions would be O.K.
3. b-- by thinking carefully before answering each one.
4. The Navy special forces (,) cautiously (,) restricted direct confrontation with the enemy.
4. a-- instead, they concentrated on guerrilla warfare that caused more damage.
4. b-- by sending out regular recon patrols and detouring around the front line.
5. The New England senators (,) maliciously (,) stalled the vote.
5. a-- given that the bill passed before the end of the session anyway.
5. b-- by making unfounded attacks on the bill's supporters.
6. Fred (,) obnoxiously (,) read the introduction for the speaker at his sister's graduation.
6. a-- in fact, his sister had hoped Fred wouldn't be there at all.
6. b-- emphasizing the unfortunate political scandal.
7. Sue (,) tactfully (,) let her son win at chess.
7. a-- although normally she hated losing.
7. b-- by making several well-hidden stupid moves.
8. Suzuko (,) politely (,) spoke to his distant relatives.
8. a-- although he could have ignored them.
8. b-- by using all the appropriate honorifics.
9. A close friend of Philip's (,) graciously (,) made conversation with Mary.
9. a-- in order to prevent her from feeling isolated.
9. b-- by saying a few well-chosen words.
10. A co-worker of Vera's (,) craftily (,) withdrew all his funds from

the Argentine bank.

10. a-- since he knew that the bank was going to bankrupt.

10. b-- by making tiny withdrawals spaced over a year.

11. Monica's boyfriend (,) rudely (,) left in the late evening.

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

11. b-- by slamming the door.

12. Last Friday, Petunia and her entire family (,) stupidly (,) ate meat in the Vatican.

12. a-- since Roman Catholic doctrine prohibits eating meat on Friday.

12. b-- using flimsy plastic spoons, so they made a big mess.

13. The well-known senator from NY (,) foolishly (,) responded to reporters the other day.

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

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

14. The big Internet company (,) aggressively (,) wiped out six more companies,

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

14. b-- by temporarily offering services at well below market value.

15. Mr. Nathaniel River's grandfather (,) naturally (,) recited the old poems.

15. a-- since of course he figured everyone wanted to hear him reciting.

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

16. The company's CPA (,) carelessly (,) recorded the debts incurred last year.

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

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

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