

Teaching intonation of four English interrogative sentence types using audio-visual pitchtracks*

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Park, Jae-Ick. 2010. Teaching intonation of four English interrogative sentence types using audio-visual pitchtracks. *Studies in Phonetics, Phonology and Morphology* 16.1. 65-90. This study provides the result of an experiment to measure the effectiveness of teaching English intonation patterns to Korean college students. The experiment was done with four different types of interrogative sentences: structures ending with a grammatical word, questions with an imbedded sentence, either-or questions, and questions with an intermediate rise or fall. The subjects were explicitly taught using the tape recorder, visually overridden intonation marks, and computer-generated intonation contours. Eight subjects were selected from three different general English levels: high intermediate, low intermediate, and low, and they practiced 164 sentences in four different test lists. After the ten weeks of practice and teaching, the subjects showed a noticeable development in performance. The analysis is based on 36 sentences in the four different question types. The pretest from the subjects and previous general survey showed a very low performance (15-59%), but the post-test of the subjects showed a significantly improved production (63-96%). In the pretest, there were different production abilities among the subjects of different levels of English ability, but in the post-test, no such notable differences were found. The levels of difficulty or easiness were found among the four different interrogative structures. Close-choice (Either-Or) questions are the easiest to learn, questions with final grammatical words are the next, questions with an embedded sentence come next, and questions with a non-final rise or fall intonation are the most difficult. (Kosin University)

Keywords: English intonation, pitchtrack, interrogative sentences, intonation teaching, either-or question, embedded sentence intonation

1. Introduction

1.1 Background and purpose of the study

Many researchers emphasize the importance of teaching supra-segmentals for better English communication, and students should practice the suprasegmental aspects of English pronunciation from the earliest stages of language learning. (Avery & Ehrlich 1992: 169-185, Celce-Murcia et al. 1996:10, 192, Crawford 1987, Gilbert 1993, Morley 1987, 1994, among others)

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With regard to English intonation errors by Korean students, Koo (1991) and Choi (1997) provided an experimental phonetic analysis or the effects of teaching intonation, but the studies were on the acquisition (performance) of at most 10 sentences (one simple sentence for each type), e.g., falling or rising contours in ‘wh-’ questions, ‘yes-no’ questions, tag questions, and declarative sentences. These studies seem to assume that producing the given sentences correctly is the accurate performance of such kinds of sentences. These studies do not guarantee any applicability of acquired intonation to new sentences. There is a possibility of rote memorization.

A recent study on the intonational performances by Koreans in English interrogative sentences was conducted with special reference to the composition of the question. It pointed out learners have much more significant problems in complex sentences (Park 2004). The sources of some intonational errors can be traced back to the composition of the interrogative sentences, and teachers should give a special attention to more complicated sentences required in intermediate and advanced dialogues.

The purpose of this study is to introduce the procedure of diagnosing and teaching intonation on English questions with the four different structures. It will also provide the effectiveness of teaching these outstanding intonation patterns to college students with audio-visual pitchtracks, by showing the self-correcting attempts and development of students’ performance.¹

1.2 Pretest and results

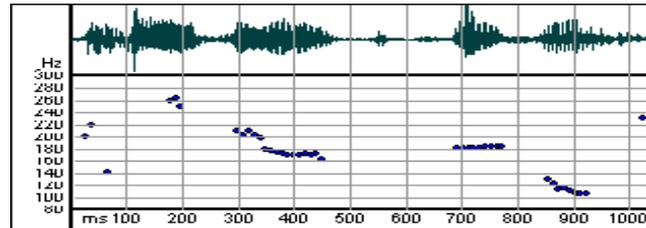
For the current study, four interrogative sentence types were adopted in the pretest: questions ending with a grammatical word, questions with embedded wh-words, choice selection questions, and questions with a non-final intonation unit. In the pretest, subjects showed regular pitch errors in these four types of interrogative sentences as introduced below.

First, interrogative sentences that end with a grammatical word (i.e., preposition, pronoun, etc.) did not show correct (or generally acceptable) final rising or final falling intonation in many cases.

- (1) a. Who would you like to *come* with? (3/13 subjects are correct)
- b. Who is Amy *looking* for? (2/13 subjects are correct)
- c. What are you going to *do* with it? (1/13 subjects are correct)

The major contour change should be on the sentence-final content word. The italicized words, ‘come’, ‘looking’, and ‘do’, are sentence-final content words in these sentences. More accurately speaking, the syllable with the main stress of the content words is the locus of pitch change. Figure 1 is a pitchtrack of sentence “Who would you like to come with?”

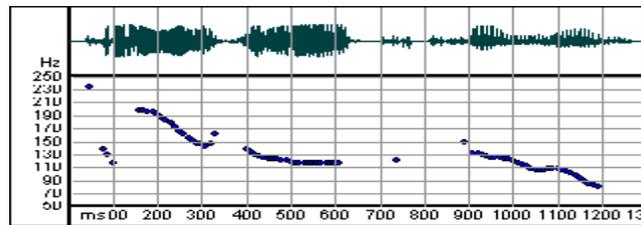
¹ The pitchtracks were produced by Pc-quirer® of Scicon RD.



Who would you like to come with?
 Figure 1. Native-M: Who would you like to come with?

Ignoring the pitch in other parts of the sentence, in the native speaker's contour, we can see that there is a significant pitch drop (70Hz) between 'come' (180Hz) and 'with' (110Hz).

The Korean speaker's utterance in Figure 2 does not show a comparable drop (130-90=40Hz). The final lexical word 'come' should have been a fall pitch, and 'with' should have been fully lowered. The insufficient pitch drop is reflected in the comments from a native speaker—"It sounds like you're not finished speaking and you are going to ask more."



Who would you like to come with?
 Figure 2. Korean-M: Who would you like to come with?

Second, questions with an embedded structure towards the end of the sentence may influence the contours. Wh-words like 'where', 'what' and 'when' usually carry a falling pitch in a simple sentence. Such kind of wh-words were mistaken for a question word requiring a falling pitch even in an embedded sentence. Sentences as in (2) show pitch errors in many students' speech.

- (2) a. Do you know *where* she is? (77/104 correct)
 b. Did Tom tell her *what* happened? (41/104 correct)
 c. Do you know *when* the end of the world will come? (61/104 correct)

The correct intonation for an embedded sentence like "Do you know where she is?" is that the final verb should be a clear rising pitch as shown in Figure 3. The distance between the beginning part and the ending part is about 90Hz (180 to 270Hz).

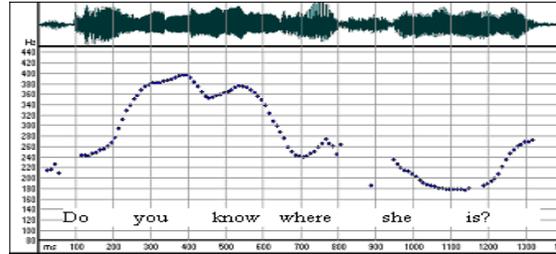


Figure 3. Native-F: Do you know where she is?

However, many Korean speakers uttered this sentence with a falling contour as illustrated in Figures 4 and 5. Comparison among native and Korean speakers, both male and female, shows the opposite contours at various points (words) of the sentence.

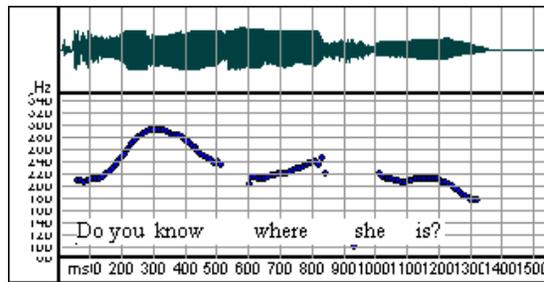


Figure 4. Korean-F: Do you know where she is?

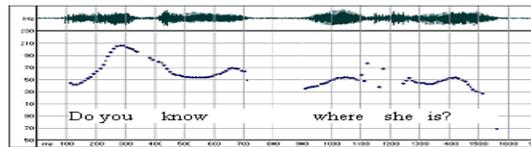


Figure 5. Korean-M: Do you know where she is?

Third, closed-choice alternative questions (either-or questions): Each alternative receives rising intonation until the final one—signaling that no other options are available and the speaker is expected to select from the closed set of choices presented. The last alternative should be a falling pitch. In the pretest, two-thirds of subjects wrongly produced with a rising contour, which is good for open-choice (true) questions. It seemed that learners do not know the contour exactly.

- (3) a. Do you want a *large* or *small box*? (43/94 correct)
- b. Did you pay by *check* or in *cash*? (28/94 correct)

In the contour of the sentences as in (3), 'large' and 'check' should have a rising pitch, and 'small box' and 'cash' should have a falling pitch in closed-choice questions. This can be seen in Figure 6.

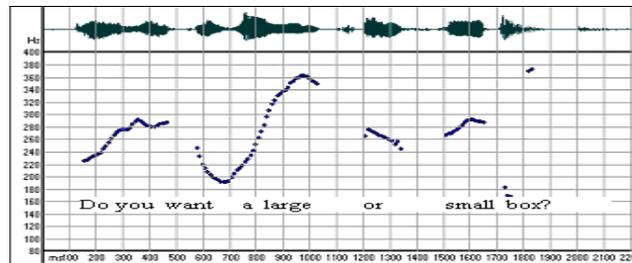


Figure 6. Native-F: Do you want a large or small box?

The pitch rise in *large* (170Hz) and the pitch fall in 'small box' is remarkable (110Hz) in the native speech in Figure 6. Korean speakers did not show any similar contour pattern. The rise in 'large' is about 30Hz and the fall in 'small box' is not found in Figure 7 below. Instead, a slight rise is detected in the final part of the contour.

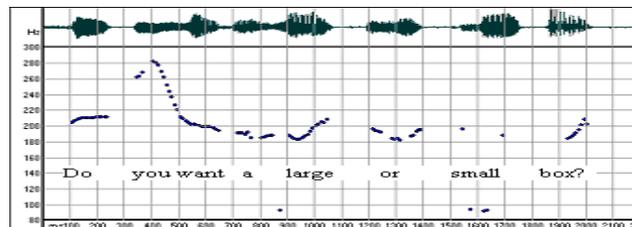


Figure 7. Korean-F: Do you want a large or small box?

Fourth, another important intonation contour in interrogative utterances is the non-final (continuation) rise or fall. Complex sentences often have two or more separate intonation groups. Longer sentences with an embedded structure and a separate phrase or clause require intermediate rise or fall depending on the structure. The rise is often used with lists, conditional structures, and 'yes-no' questions with a slightly raised pitch. The non-final fall does not go down as far as it does for the final contour in wh-word questions.

- (4) a. Haven't you been there when you were young? (62/104 correct)
- b. Why do you think I should remove it? (76/104 correct)
- c. Who do you think Amy is looking for? (78/104 correct)

In Figure 8, the native speaker's speech shows an intermediate rise on 'there', in the question with a final rising intonation contour.

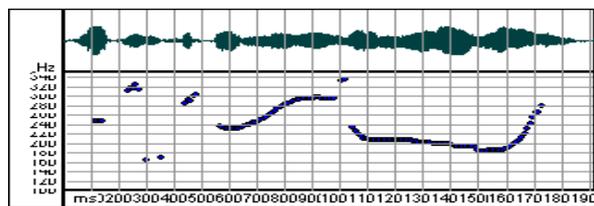


Figure 8. Native-F: Haven't you been there when you were young?

Korean speakers rarely show such an intermediate rise in 'there' (4a) and in 'think' (4b, c). As seen in Figure 9 below, the speaker does not produce any intermediate rise in 'there' in the rising contour sentence. The utterance without such an intermediate rise (4a) or fall (4b, c) sounds as if the utterance has ended in the middle of the sentence or as if there are two separate utterances. This may cause a conversational breakdown or unexpected interruption from the other speaking party.

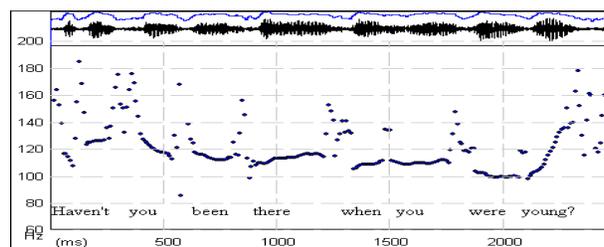


Figure 9. Korean-M: Haven't you been there when you were young?

2. The experiment

The experiment was carried out in the following way. First, the subjects were four male (M) and four female (F) college students from a Korean university in Busan.

Second, the subjects were in three general English levels: Two high intermediate, (one male (LWJ) and one female (KMY)), four low intermediate (two males CYS, JSJ and two females CSK, SJJ), and two low (one male JJY and one female LSM). The levels were based on their English grammar scores and speaking ability.

Third, subjects were taught the correct intonation contours individually by the researcher one hour a week for eight weeks. For practice at home, they were given audio tapes with native speaker's utterances. Two additional weeks without instruction were reserved for additional checkups.

Fourth, the researcher used overwritten intonation contours on sentences, tape-recorded sentences by native speakers, and pitchtracks drawn by Pcquirer[®], a computer-adaptive acoustic instrument.

Fifth, the subjects read four different lists of test sentences (Forms 1-4) with 164 sentences in total. The tape-recorded sentences for practice were reordered (rearranged) in recording to minimize the influence of simple memorization of question contours. They had different sentence lists with a few repeated sentences every other week during the first 8 weeks. Form 4 was used in the 8th and 10th weeks.

Sixth, the subjects' utterances were tape-recorded and/or computer-recorded, and analyzed by the researcher's ears and referenced to recorded native speech from North-American English speakers, 2 males and 2 females.

Seventh, the subjects were instructed to read the sentences with good intonation. If a subject was not satisfied with any particular sentence by the subject, s/he could redo it. They recorded their intonation on the tape recorder by themselves and, after that, they pronounced them again before the researcher.

Eighth, the subjects' development (or learning/acquiring/self-correcting), individual differences, and the difficulty/easiness depending on the complexity of the sentences were tracked.

3. Results and findings

In this section, the result of the experiment of the four different interrogative sentence structures is provided. The intonation performance of each sentence is described in terms of various figures of intonation contours in various stages in learning. Wrong contours and corrected contours after several try outs and self-correcting efforts are shown. Individual difference in learning intonation and different levels of easiness and difficulty among the four question types are also discussed.

3.1 Questions ending with a grammatical word

Questions ending with a grammatical word are relatively easy to learn. The subjects were taught that in English, the first content word from the end of the sentence should get the primary stress (or sentence stress) and have the major change in contour, either rising or falling. Grammatical words shouldn't be the starting point of pitch change—rather, they follow smoothly the trends initiated by the preceding content word. This is one of the most important aspects in producing English intonation as well as rhythm.

In the pretest, the subjects more often than not placed sentence-final contour incorrectly on the grammatical word. The subjects in this research made more errors when the final content word was away from the end of the interrogative sentence. The more words (possibly syllables) there are after the final content word, the more errors are found. Examples of the

varying number of syllables of grammatical words were used in the experiment. A few of the sample sentences in the lists are in Table (5).

(5) Test sentence samples

No	Test sentence	Word/Syllable
a.	What country was Dr. Sooner <i>from</i> ?	1/1
b.	Who would you like to come <i>with</i> ?	1/1
c.	Why do you think I should remove <i>it</i> ?	1/1
d.	Why are you angry <i>with me</i> ?	2/2
e.	What are the children fighting <i>about</i> ?	1/2
f.	Can you explain <i>it to me</i> ?	3/3
g.	Can you change a quarter <i>for me</i> ?	2/2
h.	Would you like to see <i>it</i> ?	1/1
i.	Are you going to buy <i>it</i> ?	1/1
j.	Would you like to see <i>it</i> ?	1/1

Utterances with a falling contour (5a-e) rather than a rising one (5f-j) are better observed after instructions because of the ease of perception. Sentences with a final rise, however, are difficult to judge, especially when the final grammatical word is monosyllabic (5h-j).

After 8 weeks, each subject produced a falling contour in the sentence-final content word instead of the grammatical word. Errors reduced significantly. Figures 10-12 show a fall before the final grammatical word in “What country was Dr. *Sooner from*?” (5a). The contour of the native speaker’s speech in Figure 10 shows the pitch fall from 180Hz to 100Hz (80Hz difference). This sentence was introduced in Sentence List 2 on the third week of the experiment.

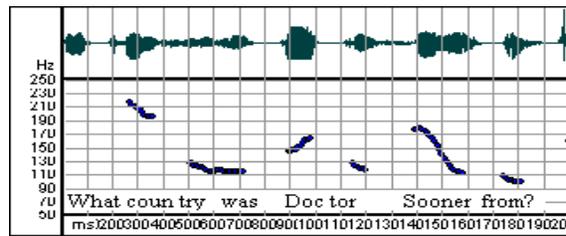


Figure 10. Native-JH: What country does Dr. Sooner from?

The Korean subject’s speech in Figure 11 also shows a significant pitch fall. The first syllable of ‘Sooner’, the final lexical word, has the pitch high of 260Hz and the grammatical word ‘from’ has a 160Hz high pitch.

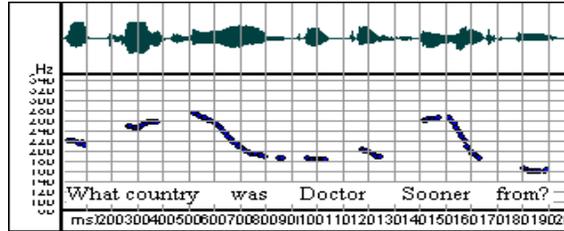


Figure 11. KMY-F: Good rise-fall before final grammatical word

In Figure 12, however, we find relatively less drop between the two words. The lexical word, ‘Sooner’, has 115Hz high and the grammatical word, ‘from’, has 55Hz (60Hz difference). With this less pitch fall at the end of the question sounds incorrect, and it sounds as if the speaker is not sure s/he can ask such kind of question to the listener.

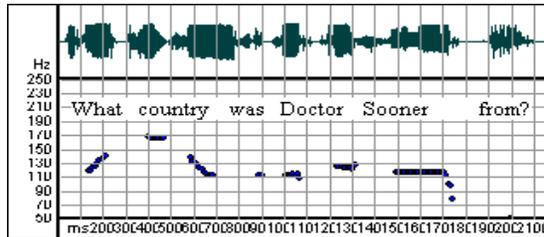


Figure 12. CYS-M: Poor rise-fall before the final grammatical word

Figures 13-14 indicate a rising pitch before three grammatical words in a row in “Can you explain *it to me?* (5f)” The second syllable of ‘explain’ is the locus of major pitch change in the final rising contour. Since the locus is three syllables away from the final word of the sentence, the rise should occur earlier than other sentences with only one or two final grammatical words (5g-j).

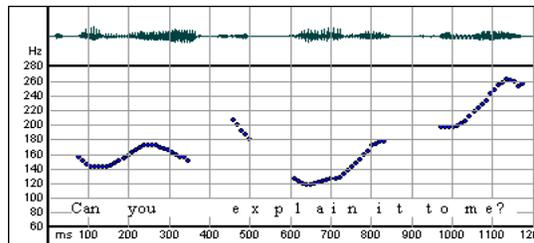


Figure 13. Native-JH: Can you *explain it to me?*

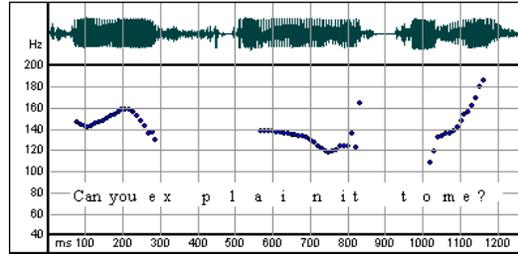


Figure 14. CYS-M: Poor rise before several grammatical words

Contrary to our expectation, producing the correct rising pitch in ‘explain’ in the first try was found only in Subject JJY of low English proficiency level. Seven others tried twice to produce the right intonation.

3.2. Questions with an embedded sentence

Difficulties arise in the final intonational contour when a question contains an embedded structure. The table below introduces various structures that could be found in the intermediate level of English speaking ability.

(6) Test sentence samples

No	Test sentence	Embedded structure begins with
a.	Do you know <i>where she is?</i>	where
b.	Do you know <i>where Tom has gone?</i>	where
c.	Do you know <i>what time it is?</i>	what (*time is it?)
d.	Can you tell me <i>where I can find Linda?</i>	where (*can I...?)
e.	What do you do <i>when you break your glasses?</i>	when
f.	How do you decide which wrestler has won?	which

Figure 15 is the pitchtrack from a native speaker for the test sentence in (6b). The figure shows a rise in ‘know’ and a sharp final rise in ‘gone’.

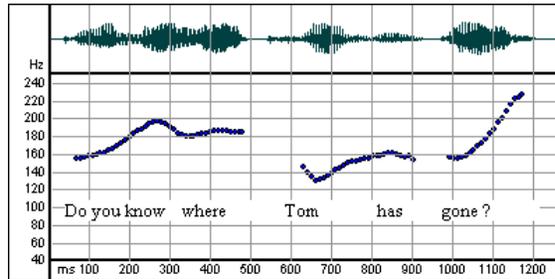


Figure 15. Native-JH: Do you know where Tom has gone?

The common types of errors found are the rise in 'you' of 'Do you know' (6a-c), the fall in 'know' and 'tell me' (6d), and the rise in 'where' and 'what' (6a-c). Subjects should be informed that the pronoun 'you' should be a low pitch the main verb like 'know' should get stressed and high-pitched, and the wh-word for an embedded clause should be lowered so that one can raise the rest of the contour enough to show the speaker's interest.

The error found in Figure 16 is that the levels (or pitch heights) of 'know' and 'where' are almost the same, and that makes the whole contour a monotonous leveling.

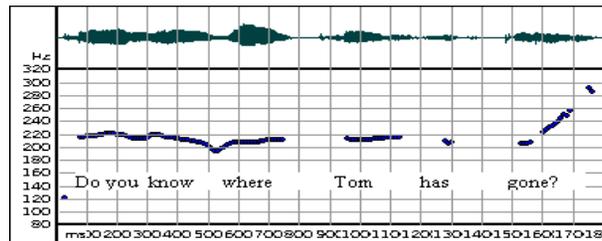


Figure 16. CSK-F: Poor low start for embedded clause (first trial)

The level of 'know' should be raised and 'where' should be significantly lowered. The subject (CSK-F) corrected herself to produce a very good contour in her second trial as shown in Figure 17.

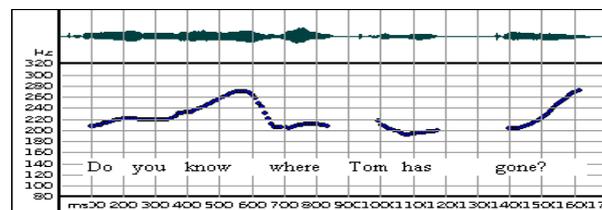


Figure 17. CSK-F: Good low and rise for embedded clause (second trial)

Figure 18 shows a well-done contour for another similar sentence. This intonation was done by LWJ, and he produced this type relatively easily.

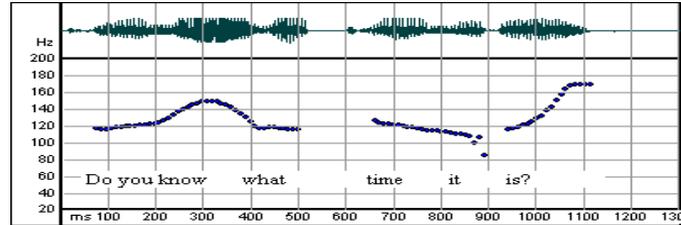


Figure 18. LWJ-M: Good contour for embedded clause

Wh-questions with a wh-word embedded (6e-f) do not bring any serious problem since they are natural with falling pitch in wh-questions too. Figures 19-20 are on falling pitch for the embedded wh-clause. This falling pitch is led by a question word like 'How'. The question word decides the contour of the final contour, which is also a falling contour. The final content word of the sentence 'won' gets a falling pitch corresponding with the leading question word. In Figure 18, we can see a clear falling contour in the final word.

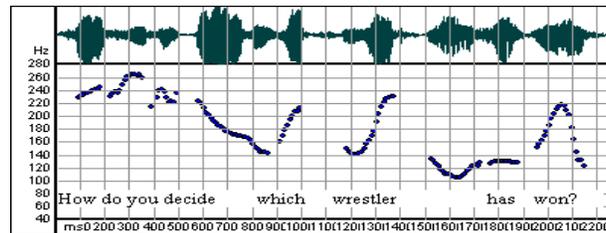


Figure 19. Native-JH: How do you decide which wrestler has won?

In Figure 20, however, the subject did not produce enough contour change in the final content word. The word 'won' should have a clearer (sharper) falling contour for an indication of completion of the utterance.

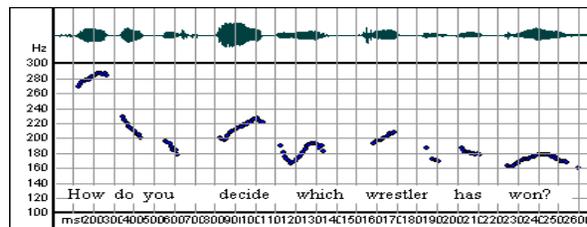


Figure 20. SJJ-F: Poor final fall for embedded clause

3.3 Closed-Choice Alternative Questions (Either-Or Questions)

Closed-choice alternative questions or either-or questions are common sources of intonation problems. Regardless of the sentence's initial words (wh-words or auxiliary words), the intonation has initial rise and final fall. The falling contour on the prominent word after conjunctive 'or' is similar to that of 'wh-' questions. Some of the test sentences are found in (7).

(7) Test sentence samples

No	Test sentence	Or-part structure
a.	Which do you like better, spring or winter?	Word
b.	Which is better, a pen or a ballpoint pen?	Phrase
c.	Do you do your homework in pen or in pencil?	Phrase
d.	Will you go to London by bus or by train?	Phrase
e.	Are you going to rent a car, or drive your own?	Clause
f.	Is it good for a person to weigh sixty kilograms or one hundred kilograms?	Longer Phrase
g.	Do you want to have coffee now, or should we wait until after the presentation?	Clause

Figure 21 is the pitchtrack drawn from an English native speaker. The first choice, 'in pen', is a rising contour, and the second choice, 'in pencil', is a falling contour.

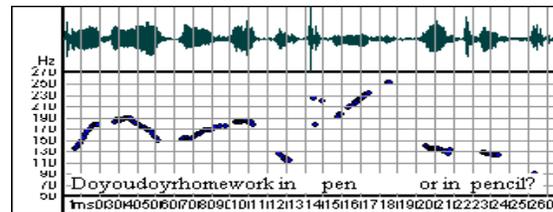


Figure 21. Native-MF: Do you do your homework in pen or in pencil?

The Korean subjects were not familiar with this type of contour and they should be taught this. It seems that the errors are not from the difficulty in making the contour but from simple lack of knowledge on the correct intonation. With a brief instruction on the contour, the subjects easily adopted the correct contours for these questions. Figures 22-24 demonstrate that all three subjects, regardless of their different English proficiency levels (high intermediate, low intermediate, and low), produced proper intonation equally well—a rising contour for the first choice 'pen' and a falling contour for the latter choice 'pencil'.

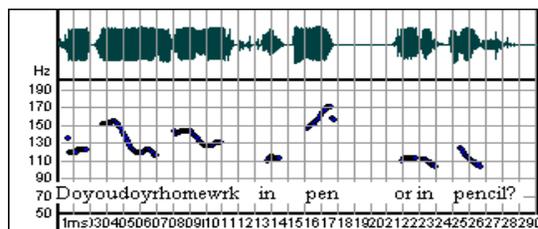


Figure 22. CYS-M: Good rise and fall for alternative question

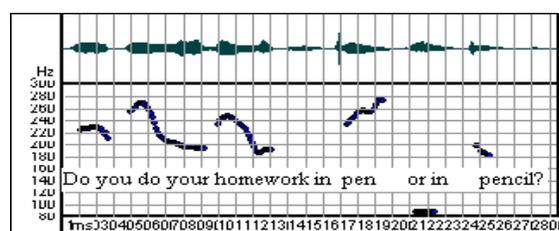


Figure 23. SJJ-F: Good rise and fall for alternative question

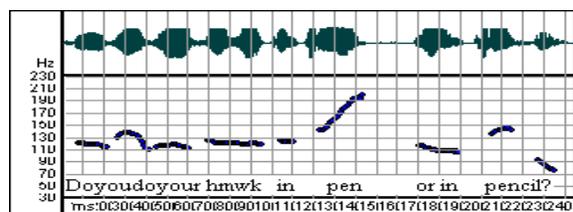


Figure 24. LWJ-M: Good rise and fall for alternative question

For longer structures, such as examples (7e-g), neither subject had any problems in learning intonation. The subjects might have lost the focus on the tone and naturally lowered the final pitch as is in a statement contour. In some cases, though, they took time to recognize the question as a closed-choice alternative question, whose signal ‘or’ delays until the end of the sentence. When they encountered completely new sentences, they need time to recognize the structure. (Note that in ‘yes-no’ questions and ‘wh-’ questions, however, the cues come at the beginning of the utterance.) Learners may have a better chance to perform correctly if they make their own questions with the knowledge of the contour. They will have a primary rising and a secondary or final falling contour in mind before they start their utterance in dialogue situations.

3.4 Non-final rise or fall

According to Celce-Murcia et al. (1996:175-191), a single utterance or sentence may include several intonation units (thought groups), each with

its own prominent element and contour. In compound or complex sentences, each clause has its own intonation pattern, and may terminate in rising intonation or falling intonation, depending on its particular syntax.

There has not been any study on learning and teaching these characteristics. (See Yoo and Lee 2002 on teaching French intermediate contour to Korean students). It was found that Korean learners should be explicitly instructed on these non-final characteristics for advanced intonation performance.

It is shown in the experiment that Korean learners are unaware of the non-final contours. Some of the test sentences are found in (8). Wh-questions and yes-no questions have different non-final contours.

(8) Test sentence samples

No	Test sentence	Non-final contour
a.	What would you <i>do/</i> if you won a million dollars?	Fall
b.	What do the boxers <i>do/</i> before they start fighting?	Fall
c.	How many of the famous <i>people/</i> do you know about?	Fall
d.	What kind of <i>shoes/</i> did Americans <i>wear/</i> in the past?	Fall
e.	Where would you <i>recommend me/</i> to go for my holidays?	Fall from <i>mend</i>
f.	Do you <i>know/</i> where Tom has <i>gone/</i> ?	Rise
g.	Can you <i>tell me/</i> where I can find Linda?	Rise from <i>tell</i>
h.	Can you <i>explain to me/</i> what your problem is?	Rise from <i>plain</i>
i.	Can you lay the <i>table/</i> while I get the dinner ready?	Rise
j.	Can somebody <i>show me/</i> how to change the <i>film/</i> in this camera?	Rise from <i>show</i>
k.	Would you know what to <i>do/</i> if there is a <i>fire/</i> in this building?	Rise
l.	Did I lock the <i>door/</i> when I went out for <i>shopping/</i> the other day?	Rise

As is shown in the pitchtrack of the native speaker in Figure 25, the last word 'shoes' of the non-final intonational phrase has a sharp fall. This fall depends on the contour of the whole utterance, which itself is a fall.

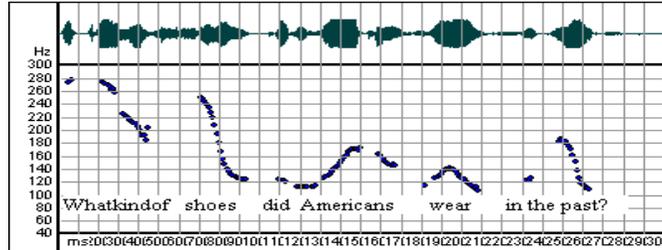


Figure 25. Native-JH: What kind of shoes did Americans wear in the past?

Subject LSM's contour was judged by a native speaker as "Relatively good, but 'Americans' is too high".

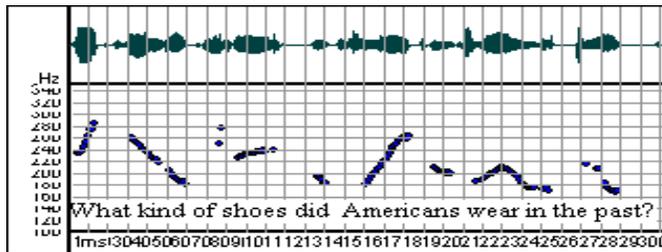


Figure 26. LSM-F: Too high intermediate word in non-final fall

Subject JSJ's speech in Figure 27 has a very good non-final fall on 'car', but not as good on 'buy', which should be fully lowered.

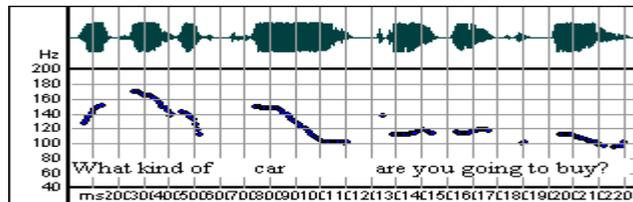


Figure 27. JSJ-M: Good non-final fall but poor final fall

In the rising contour, however, non-final rise (or hold) as in 'mind' is a typical shape. This is shown in Figure 28.

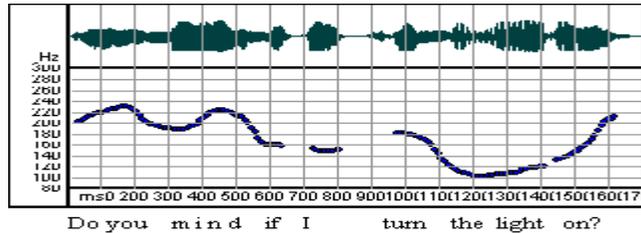


Figure 28. Native-JM: Do you mind if I turn the light on?

Subject JJY did relatively well in the non-final ‘Do you mind’ part, as shown in Figure 29. His English level was low intermediate but his contour for this kind of sentences did not show any significant difference from others.

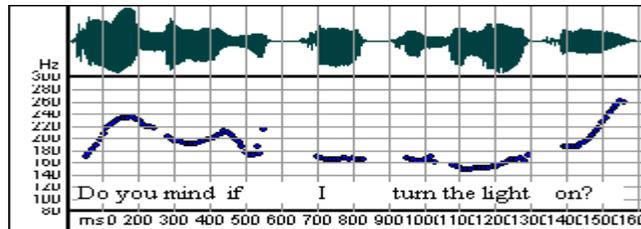


Figure 29. JJY-M: Good non-final rise

Non-final rise on ‘know’ is clearly detected in the native speaker’s speech in Figure 30. The sentence also has a final rising intonation as a yes-no question.

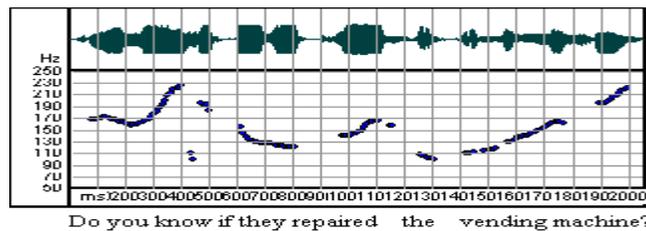


Figure 30. Native-M: Do you know if they repaired the vending machine?

In the speech of subject LWJ in Figure 31, we do not see enough non-final rise on ‘know’, even though his general English level was considered high intermediate.

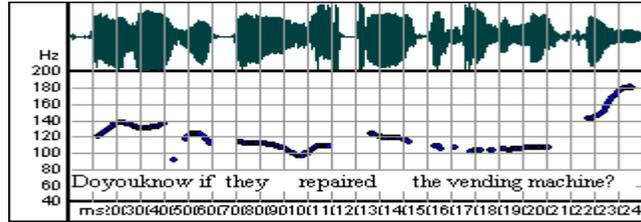


Figure 31. LWJ-M: Good non-final rise in a long sentence

It was commonly pointed out by the subjects that they lose one point when they focus on the other point in producing this type of intonation. If one cares too much for the final rising contour, one forgets the non-final rise; if one focuses on lowering the initial embedded structure, one accidentally lowers the preceding prominent word, and so on.

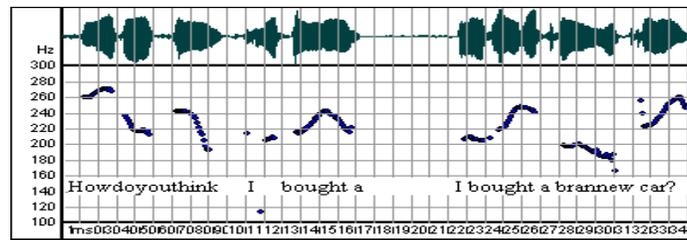


Figure 32. KMY-F: Interrupted non-final fall in longer sentence (first trial)

The subject in Figure 32 focused too much on ‘think’ for a non-final falling contour and then mispronounced altogether. (It should have been a falling pattern.) In the next figure, the same subject finally performed the correct pattern.

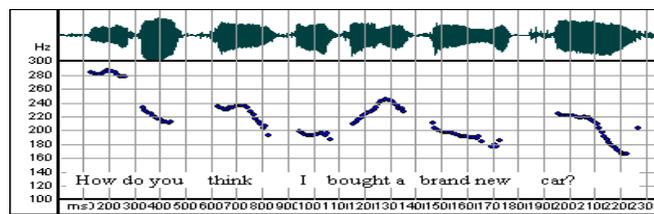


Figure 33. KMY-F: Non-final fall in longer sentence (last [fourth] trial)

Subject KMY took 35 seconds to produce a successful or acceptable intonation for both ‘think’ and ‘car’. Her speech had pauses, stops, reviews and redoes. Though her English level was high, it did not gain her any advantage regarding non-final contours. Figure 34 is the native speech for reference for the subjects to follow.

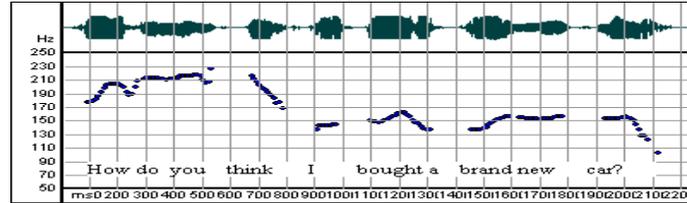


Figure 34. Native-M: How do you think I bought a brand new car?

Further study is required for this part. Intermediate (non-final) rise or fall is very important with regard to rhythm in English for listening, speaking, and reading comprehension since it depends on the intonation groups of grammatically coherent elements.

3.5 Summary

The general survey data in (1-4) of Section 1.2 shows that the rank of the rate of correct intonation is Non-Final R/F (59%) > Embedded Sentence (57%) > Closed-Choice Questions (37%) > Final Gram Word (15%). As is shown in the table in (9), the subjects in the current research showed that their rate of correct intonation is slightly different. Embedded Sentence (41%) > Closed-Choice Questions (37%) > Non-Final R/F (31%) > Final Gram Word (16%). The explicit teaching experiment of ten weeks not only improved the subjects' intonation significantly, but also changed the rank of the rate of correct intonation. The correct rates after teaching are Closed-Choice Questions (96%) > Final Gram Word (91%) > Embedded Sentence (83%) > Non-Final R/F (63%).

(9) Results of general survey and current experiment

Ref. Section	3.1	3.2	3.3	3.4
Question Type	Final Gram. Word	Embed. Sent.	Closed-Choice Questions	Non-Final R/F
General Survey	9/39 (15%)	118/208 (57%)	71/188 (37%)	216/312 (59%)
General Survey Rank	4	2	3	1
Subjects Correct Rate	13/80 → 73/80	20/48 → 40/48	21/56 → 54/56	30/96 → 61/96
Change	16% → 91%	41% → 83%	37% → 96%	31% → 63%
Subjects Pretest Rank	4	1	2	3
Subjects Post-Test Rank	2	3	1	4

The following data (10) illustrates the change of correct intonation production before and after teaching. Sentences whose intonation change was calculated are the data questions in (5-8) of Section 3. In the pretest, the students of high intermediate (HI) and low intermediate (LI) English ability produced more correct intonation than those of low (L) English ability. However, the Post-test shows that the results do not show any significant differences among the groups of different levels of English ability.

(10) Individual results of correct intonation

Subj. Abbr. Name	M/F	Eng. Level	Final Gram. Word (10 Ques.)	Embed. Sent. (6)	Closed-Choice Questions (7)	Non-Final R/F (12)
LWJ	M	HI	3 → 10	4 → 6	3 → 7	5 → 10
KMY	F	HI	2 → 10	3 → 5	2 → 7	6 → 8
CYS	M	LI	2 → 9	2 → 4	3 → 7	4 → 7
JSJ	M	LI	1 → 9	3 → 5	3 → 7	4 → 7
CSK	F	LI	1 → 10	3 → 4	2 → 7	5 → 8
SJJ	F	LI	1 → 8	2 → 6	3 → 6	3 → 6
JJY	M	L	2 → 8	2 → 4	3 → 7	2 → 7
LSM	F	L	1 → 9	1 → 6	2 → 6	1 → 8

4. Conclusion

This study is significant in its focus on English intonation of interrogative sentences with various syntactic compositions. The final contour in interrogative sentences is teachable and can significantly be improved by the subjects of three different English levels. However, learners do not readily recognize non-final contours, but once they are taught explicitly they have the possibility of better learning.

There is not any notable difference in contour patterns among people with low, low intermediate or high intermediate levels of general English ability. Subjects' English levels do not seem to affect learning intonation; rather, it seems that some learners may have better perceptual ability on pitch change. Some of subjects did not follow audio and visual instructions, while others with a lower level of English ability followed instructions (with simple tips) very well and corrected errors immediately. The experiment does not show any individual differences with regard to the structure of the sentences or intonation types. No threshold for mastering was detected for each type of structures, but there is a tendency that closed-choice alternative questions ('either-or' structure) are the easiest, grammatical-word-final structures are relatively easy, embedded structures with a wh-word are slightly more difficult, and intermediate rise/fall in two

or more intonation units are not easily acquired. Newly instructed contours are not fully internalized within the limited period of the experiment, and subjects are not confident of their own utterances. The subjects often doubt the accuracy of their own utterances which are correctly produced. Students have to repeatedly be reminded of the correct contours in their other language activities, not just in separate sessions.

In previous analyses with a handful of sentences, subjects may memorize all the cues yet they may not be able to apply the rules governing the given sentence types. In this study, however, the subjects had several different lists of 164 questions requiring them to apply their knowledge to new sentences each time. This is a challenging method in that learners take self-test and apply self-correction for appropriate intonations. Each subject took time to produce accurate contours for new sentences—independently seeking correct intonation. Pronunciation teachers or analysts may make use of the method and results introduced here in teaching other syntactic compositions as well as interrogative sentences. Since the source of errors is mainly from the target language English itself, the teaching methods employed in this study, i.e., audio-visual approach, can be applied to intonation teaching procedures to English learners of any native language.

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Appendix

Test form 1	
1. What happened?	Nothing!
2. What happened to my cheese?	I ate it.
3. What happened to the cheese in my sandwiches?	I ate it.
4. Are you ready?	Yes, let's go.
5. Are you ready to go on a picnic?	Yes, let's go.
6. Are you ready to go on a picnic on the mountain?	Anytime.
7. Have you seen my keys?	No, never.
8. Have you seen my keys left on the coffee table?	No, never.
9. Have you seen my keys left on the coffee table last night?	I don't think so.

10. Did you take the wrong bus yesterday?	Yes, I did.
11. Did you take the wrong bus and get lost yesterday?	Yes, it is true.
12. What are the children fighting about?	About the cake.
13. Who would you like to come with?	With Tom.
14. What are you going to do with it?	To sell it.
15. Who is Amy looking for?	Tom.
16. Would you like to see it?	Yes, of course.
17. Are you going to buy it?	No, I'm not.
18. Are you picking him up?	Yes, at 7.
19. Why should I remove it?	It's out of order.
20. Why do you think I should remove it?	Because it's bad.
21. Do you know when the end of the world will come?	Not this year.
22. Did Tom tell her what happened?	Yes, he did.
23. Do you know where she is?	She is in class.
24. Who do you think Amy is looking for?	Sam.
25. What do you think of this color?	I like it.
26. How many legs does a spider have?	I think it's 8.
27. What kind of car are you going to buy?	Ford or GM.
28. Which bus goes downtown?	Number 8.
29. Who lives in that building?	The Jones.
30. Do you want a large or small box?	A small one, please.
31. Did you pay by check or in cash?	In cash.
32. Haven't you been there when you were young?	Yes, when I was 8.
33. Isn't it too late for the spring semester?	Yes, it's too late.
34. Didn't you hear about his heart attack?	Yes, I was sorry to hear that.
35. Won't you go with your brother?	Sure, I will.
36. Wasn't that a great movie?	Yes, sure.
37. Can't you be nice to your parents?	I'm sorry, I can't.
38. Haven't we met somewhere before?	Yes, we have.
39. Why don't we invite a few friends?	How about 5?
40. Why don't we invite a few friends to the party?	How about 6?
41. Why didn't Liz apply for the job?	She's found a job.
42. Why doesn't the machine work?	The batteries' gone.
43. What do you want to be when you grow up?	A good teacher.
44. Can I borrow it when you've finished it?	Yes, sure.
45. Can you let me know as soon as you decide?	You will know in an hour.
46. Would Bob mind if I used his phone?	I guess so.
47. What would you do if you won the prize?	I'd buy a car.
48. What would happen if I pressed the red button?	The bell would ring.

Test form 2	
1. What do you do when you break your glasses?	14. Which is better, a pencil or a ballpoint pen?
2. Why do you forget that glasses are useful?	15. How many of the famous people in this chart do you know about?
3. What kind of shoes did Americans wear in the past?	16. What other famous people have you seen on a stamp?
4. What country was Dr. Sooner from?	17. Is boxing safe or dangerous?
5. Who invented the post stamp?	18. What do the boxers do before they start fighting?
6. Do you do your homework in pen or in pencil?	19. Is it good for a person to weigh sixty kilograms or one hundred kilograms?
7. Why was a fountain pen better than the old pens?	20. Do you think it is a good idea for famous athletes to earn a lot of money?
8. How often do you use it?	21. How do you decide which wrestler has won?
9. What do you do when it rains and you do not have an umbrella?	22. Why do you think it's called the puffer fish?
10. Which countries do not use the metric system?	23. What do the Chinese put in eggs to preserve them?
11. How do you know that the Chinese had umbrellas for the first time?	24. What foods did he sample when he first arrived in France?
12. Who was the French army against?	
13. How many of the famous people do you know about?	

Test form 3	
1. Didn't you hear the weather forecast?	28. Would you rather send the materials by boat or by plane?
2. Do you mind if I turn the light on?	29. Do you want to have coffee now, or should we wait until after the presentation?
3. What time do you come with her?	30. Have they been friends?
4. Who prepares the medicine for us?	31. How do I know if I qualify for a permanent position?
5. How long do you think it will take us?	32. How much will it take if we select a new department manager?
6. Have John and Betty been friends?	33. How high is the electric bill when the assembly lines run at full capacity?
7. By whom were you examined?	
8. Where are the new students who just came in?	

9. Can you stay in the park without charge?	34. How many sales staff are you going to hire this year?
10. When can I leave if you get a vacation?	35. What would you do if you won a million dollars?
11. Can you change a quarter for me?	36. Do you ever wish you could fly?
12. Have they been friends?	37. Do you wish you had studied science instead of language?
13. It depends how we go.	38. Have you got any idea how much it will cost?
14. How do you feel about it?	39. Do you know if they repaired the vending machine?
15. Did you leave car lights on?	40. Can I borrow it when you've finished?
16. Who do you have lunch with?	41. How do you think we got from the new shipping company last week?
17. What kind of company does the speaker work for?	42. What do you think I have to do in this year?
18. What department did you apply for?	43. Why do you think he must have got fired this month?
19. Where is your school located?	44. How do you think I bought a brand new car?
20. What are you talking about?	45. Where do you suppose we can go on a picnic for the next semester?
21. What was that weather bulletin about?	46. Why do you think I should read the Bible every morning?
22. When can you join in?	
23. What do you think Tom is looking forward to?	
24. Is that a wolf or a dog?	
25. Will you go to London by bus or by train?	
26. Which do you like better, spring or winter?	
27. Are you going to rent a car, or drive your own?	

Test form 4	
1. Where has Tom gone?	26. What are you thinking about?
2. Would you know what to do if there is a fire in this building?	27. Where are you thinking of spending your holiday this year?
3. What time is it?	28. Did you get into trouble for being late?
4. Can somebody show me how to change the film in this camera?	29. What country was Dr. Sooner from?
5. Do you know what time it is?	30. Can you lay the table while I get the dinner ready?
6. Can you stay in the park without charge?	31. Who do you have lunch with?
7. Can I see the photographs you took when you were on holiday?	32. Are you going to complain about what happened?
8. Do you happen to know if Ann received my letter?	

9. Did you hear what I said or do you want me to repeat it?	33. What are you talking about?
10. Why don't you apply for it?	34. Can you explain to me what your problem is?
11. Can you explain it to me?	35. Do you do your homework in pen or in pencil?
12. What time do you come with her?	36. Where would you recommend me to go for my holidays?
13. Where would you recommend?	37. Did you get into trouble?
14. Can I see the photographs you took yesterday?	38. Did I lock the door when I went out for shopping the other day?
15. Why did Ann leave early?	39. Can you wait here while I make a phone call?
16. What department did you apply for?	40. Did Ann receive my letter?
17. Where can I find Linda?	41. Why was a fountain pen better than the old pens?
18. Did I lock the door when I went out?	42. What are you going to do while you are waiting?
19. Did you leave car lights on?	43. Do you know where Tom has gone?
20. What is this switch for?	44. What do you do when you break your glasses?
21. What kind of shoes did Americans wear in the past?	45. Do you know why Ann left early?
22. Who invented the post stamp?	46. Why don't you come and stay with us for a few days?
23. Can I go now or do you want me to wait?	
24. Why are you angry with me?	
25. Can you tell me where I can find Linda?	

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