

Comprehensibility and Sentence Stress Features of Japanese Learners' English

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ABSTRACT

This study addresses the impact of sentence stress on comprehensibility of Japanese learners' English. Analyses of 400 sentences produced by a total of 40 participants¹⁾ compared to those produced by two native American English speakers presented two findings about the relationship between comprehensibility and features of sentence stress - the location of longest words, loudest vowels and vowels with the highest pitch. First, there was a correlation between comprehensibility and effective sentence stress placement ($r = -.449$ at the $p < .01$., and the squared $r = .202$). Second, pitch was found to be the most closely related to comprehensibility ($r = -.381$ at the $p < .05$., and the squared $r = .145$), followed by length ($r = -.331$ at the $p < .05$., and the squared $r = .109$), while loudness showed no statistical significance. This paper also suggests the need for phonological analyses on sentence stress features and pedagogical implications for pronunciation teaching.

Keywords: pronunciation instruction, comprehensibility, sentence stress, pitch

INTRODUCTION

It has been about two decades since oral communicative skills attracted attention in English education policies in Japan (Otsu et. al, 2013). To be able to speak English, learners need to acquire the phonological system, but it is one of the most challenging tasks for them due to many differences between Japanese and English; however, it is not impossible for students to be able to learn the system and speak the language effectively for communicative purposes. My previous study (Chiba, 2012) suggested formal teaching would be able to improve the comprehensibility of learners' pronunciation. The pronunciation lessons in the above study dealt with both segmentals and suprasegmentals that were considered to be problematic for the learners and resulted in an improvement in comprehensibility. Due to curriculum constraints, however, many teachers cannot allocate much time for pronunciation teaching (Munro and Derwing, 2006). Teaching both segmentals and suprasegmentals is ideal, but it may not be realistic in many classrooms. It would be preferable to know which features should be prioritized for teaching.

There are many features that can influence the comprehensibility of a speech, making it impossible to pinpoint

1) The same person read a dialog twice with an interval of about 3 months.

one single factor. Celce-Murcia et al. (2010) indicates that errors with suprasegmentals could lead to more serious misunderstanding than those with segmentals. Suprasegmental features, which include stress, rhythm and intonation, direct listener's attention to information (Grant, 2014). They are also said to "carry more of the overall meaning load than do the segmentals" (Celce-Murcia et al., 2010). They are in close relation to meaning in discourse. Although it would be best to investigate each of the suprasegmental features to see its degree of impact on comprehensibility, I limit the research to sentence stress in this study and leave the others for future research.

Sentence stress

Before getting into phonological features of sentence stress, I will briefly overview how and why speakers use a sentence stress (you will also see the terms, focus, prominence, and primary sentence stress used interchangeably). This is a stress a speaker places to show what is the most important element in each thought group²⁾, which also gives English its rhythm by contrasting it with surrounding unstressed words (Baker & Goldstein, 2008 b). This helps English speakers to distinguish between old and new information, and to group words together (Celce-Murcia et al., 2010), which in turn helps to retain the message in short-term memory as grouped chunks, instead of individual words. The words that are stressed are usually content words such as nouns, verbs, adjective, and adverbs, while function words, articles, prepositions, pronouns, conjunctions, and auxiliary verbs are not usually stressed because they do not have much meaning on their own (Baker & Goldstein, 2008 b). They can be stressed, however, when a speaker wishes to place a special emphasis on a certain element. For example, if you ask your mother where your pencil is by saying "I think I put my pencil on my desk... Can you help me find it?" Then your mother may say, "Oh, I see it UNDER the desk!" Even though the word "under" is a preposition, which is not usually stressed, it should be emphasized here because "under" is a crucial piece of information in this case. English speakers listen for this stress to get a message. In other words, if you stress unnecessary words in English, a listener would think those words are important and may misinterpret your message. For learners whose native languages are not stressed-timed like English, syllable-timed Japanese and Spanish L1 learners for example, placing a sentence stress correctly does not come naturally. What exactly do speakers do to show a sentence stress?

Avery & Ehrlich (2008) says stressed words are louder and longer than others, while Gilbert (2012) states "the vowel of the stressed word is not only lengthened, and made extra clear, but a pitch change is added to the vowel." Grant (2014) indicates that the most salient aspects are clarity and pitch followed by loudness and length. The stressed word sounds louder and longer and is often at a higher pitch according to Baker & Goldstein (2008). Bolinger (1986) emphasizes the importance of pitch because length and loudness are in one dimension (more or less) while pitch also "adopts a variety of shapes, including skips, glides, arrests, and combination of these (p.22)." Celce-Murcia et al. (2010) indicates that a word with sentence stress is longer, louder and higher in pitch.

The above mentioned popular English pronunciation reference books and textbooks indicate that three aspects of a vowel with sentence stress - length, loudness and pitch - are important, and two suggest pitch is the most important. None of them, however, provides us with empirical research evidence to support their claims. This study is designed to investigate whether sentence stress is closely related to comprehensibility, and if so, which features of sentence stress -length, loudness, pitch or combination of two or all - are the most closely related to comprehensibility, by analyzing

2) It is defined as "discrete stretch of speech that forms a semantically and grammatically coherent segment of discourse (Celce-Murcia et al., p.221).

Japanese learners' speech samples. As a criterion for the three features, I refer to features of native speakers' speech sentence stress since there is no research about characteristics of effective sentence stress available to the best of my knowledge.

METHOD

Hypotheses

As mentioned earlier, this research seeks to test the following hypotheses.

Hypothesis #1

If a learner produces more sentences with sentence stress in the same way as a native speaker of English does in terms of length, loudness and pitch for an intended sentence stress, comprehensibility of the learner's speech increases in comparison to those who produce fewer sentences with such characteristics.

Hypothesis #2

The three features for a sentence stress - length, loudness and pitch - are equally related to the comprehensibility rating.

Speech samples

The speech samples used here were those I collected for my preceding quasi-experimental study (Chiba, 2012), which were produced by 20 first-year undergraduate economics majors at a mid-ranking university in Tokyo, Japan - 9 male and 11 female students. They read a diagnostic speech (a dialog) two times, before and after an intervention in Chiba 2012 (Appendix A).

Comprehensibility rating

Four raters evaluated half of the data and 6 raters evaluated the rest on a different occasion in 2011. All the raters were native speakers of American English. They rated the speeches' comprehensibility and accentedness according to Dewing and Munro's 1997 research. Comprehensibility was a listener's perception of how difficult it was to understand the speaker, and accentedness was a listener's perception of how different the speaker's accent was from native speakers in general. As for comprehensibility, I asked the raters to indicate that of each utterance on a 5-point scale (1=extremely easy to understand and 5= extremely difficult to understand). As for accentedness, I asked raters to assess the degree of accentedness on a second 5-point scale (1= very little accent, 5 = very strong accent). The inter-rater reliability for the comprehensibility was .87 among raters in one session, and .89 in the other; the inter-rater reliability for the accentedness was .80 for one, and .91 for the other (the accentedness rating is not discussed in relation to sentence stress here). More details are in Chiba 2012.

Analysis

The scope of the investigation here is the portion of the recorded dialog that was long enough for the raters in my previous study to decide on the comprehensibility and accentedness ratings. All the raters listened to as long as about one-third of the total length of the dialog. Therefore, assuming that the quality that would influence the

comprehensibility rating would appear in the specific portion of the dialog, I analyzed the dialogs of all the participants from “Where’s the library?” to “They’re different in my languages.” with a total of 10 full sentences. I excluded one- and two-word thought groups because the probability of placing a correct sentence stress would increase to a large extent if they were included. Thus 400 sentences produced by a total of 40 participants³⁾ were compared with those produced by two native speakers of American English.

First, I studied speeches of two native speakers, who were English teachers in Japan, in order to see which word was the longest, loudest and highest in pitch in a sentence by using a software “SUGI SpeechAnalyzer.” This software shows the word length in milliseconds, the loudness of a vowel in dB, and the pitch in Hz of recorded samples. Then I analyzed students’ speeches to find where the longest word, the loudest vowel and the vowel highest in pitch was in each sentence, and compared them with native speakers’ samples. Using the native speakers’ placement of the three stress features as a criterion, I counted the number of each of the same three features of learners’ samples if they appeared in the same place as native speaker samples. For example, in a native speakers’ sentence, “They’re different in my language.”, “language” was the longest, the first vowel in “different” was loudest and highest in pitch. I looked at the learners’ speeches of the same sentence to see if “language” was the longest word, and if the first vowel in “different” was the loudest and the highest in pitch in the sentence. If all the three features were the same as the native speakers,’ I tallied ‘one’ for length, ‘one’ for loudness and ‘one’ for pitch for the particular speech. If another speech showed the longest word was not “language,” but “They’re,” and the first vowel in “different” was the loudest and the highest in pitch, I tallied ‘zero’ for length, but ‘one’ for loudness and pitch, for example. I looked at the learners’ data to see whether it behaved like native speakers’ in terms of the three aspects. The raw data is in Appendix B.

RESULTS

Hypothesis 1

In order to test the first hypothesis and determine if there is a correlation between the ‘correct⁴⁾’ number of sentence stresses and the comprehensibility rating, I plotted the results in a graph (Figure 1), with an x-axis for the number of same stress placement as a native speaker sample and a y-axis for the comprehensibility rating. As you see there, there is an apparent correlation between the two, which was tested by a statistic analysis with $r = -.449$ at the $p < .01$. The squared r was .202, which means the effect size is considered rather ‘large’ according to Cohen’s guidelines (Larson-Hall, 2010).

3) The same person read a dialog twice with an interval of about 3 months.

4) I used the word ‘correct’ for now just to indicate the same pattern of the native speakers’ sentence stress features that were available to the research.

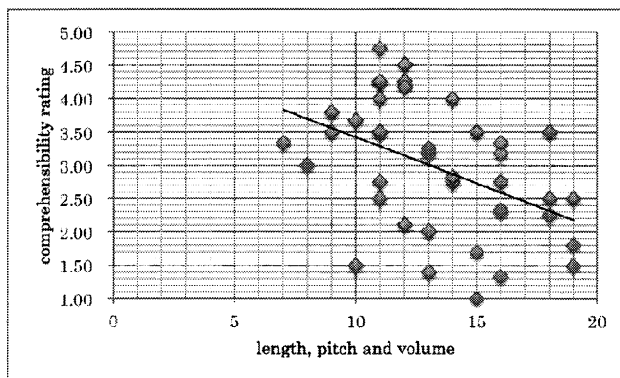


Figure 1. Comprehensibility rating (1=extremely easy to understand and 5= extremely difficult to understand) and the total number of 'correct' words in length and pitch and volume.

Hypothesis 2

To test the second hypothesis that the three aspects of sentence stress are equally related to the comprehensibility ratings, I ran a statistics test to see if there was a correlation between the comprehensibility rating and each of the three aspects, with the result that pitch turned out to be the most closely related to the comprehensibility rating as Table 1 shows, while loudness seems to have the least impact on comprehensibility. The R2s for length and pitch indicate that both of the magnitudes of the correlation of the comprehensibility rating with these two features are medium (Larson-Hall, 2010).

Table 1

Correlation between the Comprehensibility Rating and Length, Loudness and Pitch

	correlation coefficient <i>r</i>	squared <i>r</i> (R ²)
length	-.331 (<i>p</i> <.05)	.109
loudness	-.246 (<i>ns</i>)	.060
pitch	-.381 (<i>p</i> <.05)	.145

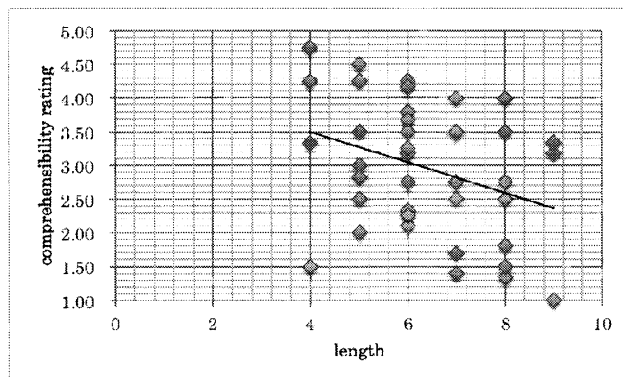


Figure 2. The comprehensibility rating and the number of 'correct' words in length.

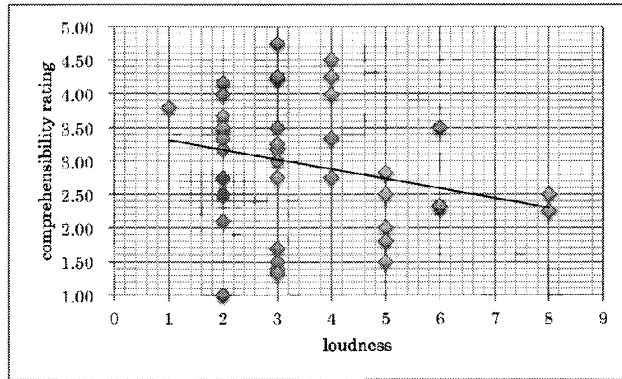


Figure 3. The comprehensibility rating and the number of 'correct' words in loudness.

The approximation straight linear line for the correlation between comprehensibility and loudness is relatively level compared with those for length and pitch as seen in Figures 3, 4 and 5, and as the statistical numbers showed in Table 1.

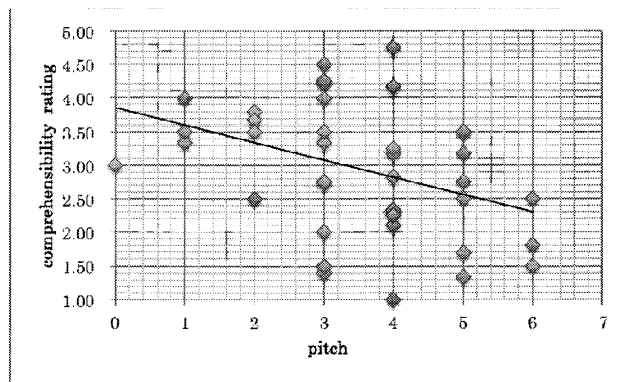


Figure 4. The comprehensibility rating and the number of 'correct' words in pitch.

DISCUSSION

Hypothesis 1

The analysis here has suggested that the more 'correct' sentence stresses a learner employs, the better comprehensibility rating will be. In other words, if a speaker fails to produce a speech with effective sentence stress, a listener would find the speech difficult to understand. Although the effect size was 'large,' about 80 % of the variance of the comprehensibility rating remains unexplained by the three features of sentence stress. This should be accounted for by other suprasegmental features such as rhythm and intonation, and those segmental features that have high functional load⁵⁾. Speech rate also seems to influence comprehensibility to a certain extent as Kang (2010) and Taguchi

5) Relative Functional Load by Catford (1987) shows the relative 'load' of segmental contrasts in English. It indicates that a contrast of p/b in a word initial is 98%, while that of d/z is 6%, for instance, suggesting that an error with p/b in a word-initial

(2011) suggest.

Hypothesis 2

Pitch appears to have the most influence on comprehensibility among the three characteristics of sentence stress, followed by length while loudness seems to have little impact. This result is in line with the findings by Kang (2013). Since she did not separate length and pitch as I did, it is not known which was more closely related to comprehensibility, but the overall results are comparable. In her study, 'stress and pitch' was found to be the strongest contributor to the oral fluency judgement among such features as fluency, tone choice and segmental errors. This finding also agrees with the aforementioned statement by Bolinger that points out the importance of pitch for its diverse dimension, even though I did not look at pitch contour in this analysis.

Limitations and Areas for Future Research

One of the limitations of this study is that I used only two native speakers' sentence stress placement as a criterion. The features of sentence stress have not been studied in detail to my knowledge, and the collected native English speakers' examples indicated that it was not possible to assign all the three features on a single word in thought group. For example in the sentence "You can only borrow them there." the two native speakers articulated 'borrow' the longest and the loudest, and articulated the vowel of 'only' highest in pitch, while 'language' was the longest and 'different' was the loudest and the highest in pitch in "They're different in my language."

Not only the number I used as a criterion was limited, but during an age when English is used as a 'lingua franca', employing only a native-speaker accent as a norm is not preferable. Language teachers cannot agree on which accent they teach (Walker, 2010), and learners would rather not pursue a native-speaker accent due to the low possibility of attaining a native speaker accent (Celce-Murcia et al., 2010). Instead, learners prefer to aim for better comprehensibility when communicating with native English speakers as well as with people of different L1s.

Therefore for the future analysis, I need to collect the same dialog reading from different speakers with good comprehensibility including non-L1 speakers of English and analyze the pattern of sentence stress features, in addition to investigating preceding studies that dealt with those aspects. This would reveal how speakers use the three features to indicate sentence stress.

Another limitation in this study is the rater demographics. They were all American undergraduate students who were learning Japanese in class. Many of them indicated that they were used to Japanese speakers' accented English, which in turn could have influenced their judgement of the learners' speeches. Although there is a greater possibility that Japanese learners of English would encounter English speakers who are familiar with Japanese accented English as long as they are in Japan, teachers should also help learners express themselves clearly to those who have little familiarity with the Japanese language since it is spoken almost exclusively in Japan.

In spite of these limitations, the findings here have provided us with pedagogical implications. First, pitch should get more attention in pronunciation teaching than previously thought. However, it is unclear how to teach it to such learners whose native language does not use pitch the same way English does. The learners would need to create a new phonological system for effective pitch production in English.

Although it is not clear to me exactly how to teach phonological features of sentence stress, teachers would be able

position would lead to a frequent problem than one with a contrast of d/z in the same position.

to teach where to put sentence stress and why through different aspects of English teaching, such as grammar, reading, speaking and listening. For example, during listening instruction, you can teach students that a speaker would indicate an intended message with an appropriate sentence stress by having students listen to a girl saying “I wanted two bananas!” and choose an appropriate description, either a picture with a girl with two apples in her hands or a picture with a girl with one banana in her hand, depending on whether ‘two’ or ‘bananas’ is stressed. Teachers can point out sentence stress in almost any activity, especially when new information or contrast appears so that students will gradually know stress is closely related to meaning. It would be of interest to design a teaching plan with a focus on sentence stress in a wide range of areas of English teaching.

Future studies would also need to investigate pitch contour, and not simply the height of the pitch as in this study, to help understand why pitch plays an important role in comprehensibility.

Finally, as statistical numbers showed that there remained about 80% of variance unexplained by sentence stress, further investigation would need to clarify the factors that influence comprehensibility of English learners’ speeches.⁶⁾

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6) Thanks are due to Adele Lonas for proofreading this text. But I am solely responsible for this paper.

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Appendix A

A diagnostic passage (taken from p.82, *Clear Speech* 3rd edition)

Two University Students Meet

A: Excuse me. Where's the library?

B: It's on the corner of Main Street and Selling Street.

A: Sorry, did you say Selling or Ceiling?

B: Selling. It's directly ahead of you, about 2 blocks.

A: Thanks. I need to buy some books for my classes.

B: Oh, then you need the bookstore. You can't buy books at the library. You can only borrow them there.

A: I guess I confused the words. They're different in my language.

B: I know how it is. I get mixed up with Spanish words that sound like English words, but have different meanings.

A: Are you studying Spanish?

B: Yes, it's going to be my major. What are you studying?

A: I'm studying English now, but my major will be economics.

B: Really? My brother wanted to study economics. He took the entrance exam for that department just last week.

A: Did he succeed?

B: No, quite the opposite. He failed.

A: That's too bad.

B: Oh, it's OK. He would've had to study statistics, and he hated that idea. Anyway, he changed his mind, and now he plans to study music.

A: That's great! Does he want to compose or perform?

B: Both. He wants to compose and perform. He arranges programs for musicians, but he also plays classical guitar.

A: Well, I wish him a lot of luck. And good luck to you, too. It was nice talking.

Appendix B

The learners' comprehensibility rating and sentence stress features

LEARNER	TIME	COM	LENGTH	LOUDNESS	PITCH	ALL
A	1	2.75	7	4	3	14
A	2	3.50	7	6	5	18
B	1	3.80	6	1	2	9
B	2	4.25	6	3	3	12
C	1	2.75	8	3	5	16
C	2	1.70	7	3	5	15
D	1	3.17	9	2	5	16
D	2	2.00	5	5	3	13
E	1	3.50	7	3	5	15
E	2	1.40	7	3	3	13
F	1	3.17	6	3	4	13
F	2	1.50	4	3	3	10
G	1	4.25	4	4	3	11
G	2	2.50	8	5	5	18
H	1	3.33	4	2	1	7
H	2	3.67	6	2	2	10
I	1	4.17	6	2	4	12
I	2	2.50	5	8	6	19
J	1	2.10	6	2	4	12
J	2	2.33	6	6	4	16
K	1	4.25	5	3	3	11
K	2	4.50	5	4	3	12
L	1	2.50	7	2	2	11
L	2	1.33	8	3	5	16
M	1	3.00	5	3	0	8
M	2	2.75	6	2	3	11
N	1	1.00	9	2	4	15
N	2	1.50	8	5	6	19
O	1	4.00	7	4	3	14
O	2	3.25	6	3	4	13
P	1	2.83	5	5	4	14
P	2	2.33	6	6	4	16
Q	1	4.00	8	2	1	11
Q	2	4.75	4	3	4	11
R	1	3.50	8	2	1	11
R	2	3.33	9	4	3	16
S	1	2.25	6	8	4	18

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S	2	1.80	8	5	6	19
T	1	3.50	5	2	2	9
T	2	3.50	6	2	3	11

Note. COM is the comprehensibility rating (1=easy to understand, 5=hard to understand). Time 1 is before the instruction and Time 2 is after the instruction for the study Chiba 2012.