The Relationship between Listening Comprehension Scores and L2 Speech Sentence Stress

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Abstract

This study analyzes the listening test scores and speeches of 20 Japanese learners of English. The results of the study show a statistically significant correlation between the L2 learner listening comprehension test scores and their use of sentence stress (r=.638**), while they also show a non-significant relation between the use of sentence stress and comprehensibility rating of the participants' speeches (r=-.401) and between the listening test scores and speech comprehensibility (r=-.111). The results suggest that those who can use sentence stress well can comprehend a spoken text well, and those who can comprehend a spoken text well can use sentence stress well. A pedagogical implication is that pronunciation teaching, especially emphasizing sentence stress should be incorporated in listening comprehension instruction because pronunciation can be facilitated through listening comprehension, and listening comprehension can be improved by paying attention to pronunciation.

Key words: listening comprehension, sentence stress, comprehensibility, Japanese learners of English, listening, pronunciation

Introduction

Previous studies have shown that an L2 learner's pronunciation is comprehensible enough for communication even when the speech is not perfect in all the segmentals (Brown, 1991; Munro and Derwing, 2006; Levis and Cortes, 2008), while most of suprasegmental errors can lead to greater misunderstanding (Celce-Murcia, Brinton and Goodwin, 2010). The reasons for the importance of suprasegmentals are that they give clues as to word boundaries (by word stress) and thought groups for meaning (by sentence stress and pauses), for example. If a speaker fails to use appropriate suprasegmentals, the speech will be confusing and may end in miscommunication. Even though recent pronunciation research has narrowed the features to be taught in a classroom, many students still do not receive systematic and effective pronunciation instruction (Foote, Holtby and Derwing, 2012). It does not mean, of course, that most learners will naturally be able

to produce comprehensible pronunciation with exposure to ample input alone. On the contrary, preceding intervention studies indicate that instruction helps learners to become comprehensible speakers (Lee, Jang and Plonsky, 2014).

While claims have been made to encourage teachers to deal with pronunciation in their classes, it is understandable that they do not spend time on pronunciation instruction if they think they need to teach pronunciation independently of other skill instruction to make the instruction effective. The reality is, however, that the instruction can be integrated into other skill teaching, not infused by random correction of student errors.

Listening is one area where a focus on pronunciation can be systematically included (Celce-Murcia et al., 2010). It is assumed that because listening to speech requires bottom-up processing, teaching how to pronounce sounds in units and how to place sentence stress facilitates better listening; and that teaching how actual English sounds are connected and how some words are stressed through careful listening helps learners monitor their speech in production. These two areas –pronunciation and listening - reciprocally help each other. This study attempts to show empirical support of that claim through an investigation of learners' listening comprehension scores in relation to their use of sentence stress, one of the suprasegmental features.

First, I will briefly overview L2 listening comprehension in reference to learners' listening difficulties. Following, I will discuss a study on pronunciation factors that can influence comprehensibility of L2 speeches, suggesting that a relationship exists between listening comprehension and use of sentence stress.

L2 Listening Comprehension in Light of Learners' Difficulties

Let us first look at a framework for listening processes.

Listening involves two major processes, according to Field (2008):

decoding: translating the speech signal into speech sounds, words and clauses, and finally into a literal meaning.

meaning building: adding to the bare meaning provided by decoding and relating it to what has been said before. (Field, 2008, p.125)

The two operations are indispensible to each other. If a listener fails to decode a stream of sounds, s/he cannot go on to the 'meaning building' process. And if s/he fails to use the context[1)] to select an appropriate

1) Context here refers to general knowledge and personal knowledge, and what has been said before. (Field, 2008)

meaning (meaning building process), the decoded message will be of no use.

Which then, is more important for successful L2 listening? Research suggests more advanced listeners have greater decoding skills, with the result that they do not have to depend much on context (Tsui and Fullilove, 1998), while less-skilled listeners pay a lot of attention to decoding and cannot move on to the meaning building process (Oakeshott-Taylor, 1977; Osada, 2001). It is logically plausible to assume that the second process (meaning building) will not be successful without the first one (decoding).

The importance of smooth processing that requires less working memory is suggested by Goh (2000), who analyzed self-reports and interviews about difficulties in listening of 40 Chinese learners of English. The most frequently mentioned difficulty (reported by 26 students) was that they would quickly forget what they had heard. This indicates that the learners could not use working memory properly to retain the meaning they extracted from a spoken text. Since working memory is very limited, a listener needs to have some capacity free for retaining meaning while working on decoding and meaning building for the next spoken text. If they have to work on decoding with a lot of effort, there will be little capacity in working memory for meaning building, let alone retaining a message. It is like a domino effect.

What does automatic and effective decoding involve that makes it possible to save working memory capacity for other tasks (meaning building and retention)? To identify sound signals as words and phrases with a minimal effort, one needs to have a repertoire of exemplar combinations of sounds and lexis so that s/he can simply retrieve stored information that matches, and get the literal meaning (Field, 2008, p.166). As for the meaning building process, sentence stress (called primary sentence stress, prominence or sentence focus) plays an important role by contrasting content words with function words, and new information with old, because sentence stress makes certain words stand out and draw a listener's attention. A skilled listener can allocate working memory capacity mainly for the processes that cannot rely on stored information (familiar vocabulary, identifying function words and old information). S/he would work harder on meaning building for new information in light of the context s/he is in. In other words, a listener needs to know a certain amount of vocabulary and to be able to identify and use stress appropriately in order to narrow a focus on a spoken text. This is an efficient way to use limited capacity of working memory.

Features of Speech and Oral Proficiency –Sentence Stress

A major function of sentence stress that helps listeners to allocate limited working memory efficiently in a spoken text is also suggested in Kang (2013). It investigated which pronunciation features are more related to oral proficiency levels by analyzing 120 one-minute monologs of different L1 learners taken from Cambridge ESOL General English Examinations, which assess learners' oral proficiency in terms of grammar,

vocabulary, discourse, pronunciation and interactive communication, in addition to global achievement. Kang (2013) looked into a relation between the test takers' proficiency levels[2] and four of their speech characteristics - 'stress and pitch,'[3] 'fluency,' 'segmentals,' and 'tone choice' – and they accounted for 70 % of the proficiency levels in her statistical analysis. Among the categories, the most related to proficiency levels was 'stress and pitch' (squared r=.309) followed by 'fluency' (squared r=.267). This result is intriguing because pronunciation is only one fifth (or sixth when overall achievement is included) of assessment scales but speech characteristics accounts for a major portion of the general oral proficiency test. In other words, it shows that a person whose speech has such phonological characteristics is considered more orally proficient. This suggests that such a speech is helpful for listeners because s/he does not have to use working memory for decoding and meaning building to the full extent. We can say such a speech has good 'comprehensibility,' which is defined as ease of understanding (Dewing & Munro, 1997),[4] because it does not demand a lot of effort on the part of a listener.

While Kang's stress and pitch includes analysis of lexical stress, her results are basically in line with Taguchi's (2014), who analyzed 400 sentences produced by a total of 40 Japanese learners of English and found a relationship between comprehensibility of learner speech and features of their sentence stress placement– the location of longest words, loudest vowels and vowels with the highest pitch. While Kang's (2013) speech data was unscripted (oral expression of own ideas), Taguchi's was scripted (a dialog reading); however, both show a positive correlation between an effective sentence stress placement and comprehensibility of the speech.

Listening Comprehension, Sentence Stress and Comprehensibility of Learner Speech

Although there are a number of factors influencing L2 listening comprehension, a framework for listening suggests that automatic decoding is a first requisite for successful listening, and good use of sentence stress

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2) "The study included the following four proficiency levels using the Common European Framework of Reference for Languages (CEFR) from B1-C2: the Preliminary English Test (PET, B1), the First Certificate in English (FCE, B2), the Certificate in Advanced English (CAE, C1), the Certificate of Proficiency in English (CPE, C2)" Kang, 2013, pp.10-11.

3) "To measure stress and pitch, space (the proportion of prominent words to the total number of words), pace (number of prominent syllables per run), primary stress (number of misplaced lexical stresses), and overall pitch range were examined" Kang, 2013, p.11.

4) We can also assume that those who can use stress and pitch effectively are good learners who have a good command of grammar, vocabulary and discourse, and vice versa. In other words, we can assume that a proficient speaker should be proficient in almost all the aspects of the language.

seems to make speech more comprehensible. A person who knows how to employ sentence stress effectively can comprehend a spoken text with ease because working memory capacity is not exhausted but saved for meaning retention, and that s/he can also produce a speech with effective use of sentence stress that highlights certain pieces of information that saves a listener working memory for later meaning retention (good comprehensibility).

Although the relationship indicated just above between perception and production is not clear, research suggests that they are related. Celce-Murcia et al. (2010) indicates that if a learner does not have an internalized knowledge about phonological features, s/he may not be able to successfully perceive, interpret and evaluate a spoken text. This indicates that a learner could transfer pronunciation skills to listening comprehension and vice versa.

The following figure (Figure 1) below shows the aforementioned relationship between sentence stress, comprehensible speech production and listening comprehension.

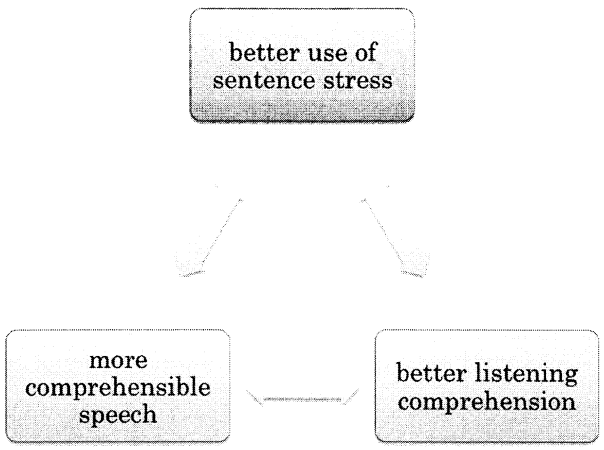

Figure 1. Relational map between, sentence stress, comprehensible speech production and listening comprehension.

To test the above assumption, I attempted to test the following hypotheses.

Hypotheses

Hypothesis #1

There is a positive correlation between those who use appropriate sentence stress and those who obtain a higher score on a listening comprehension test.

Those who can use sentence stress more appropriately are hypothesized to be able to use the skill for

listening so that they use working memory more efficiently for meaning building and meaning retention, resulting in better comprehension of spoken text, in other words, they can achieve a higher score on a listening comprehension test.

Hypothesis #2

There is a positive correlation between those who produce more comprehensible speech and those who obtain a higher score on a listening comprehension test.

Those who can produce more comprehensible speech are hypothesized to be able to apply their pronunciation skills to listening comprehension, with the result that they can achieve a higher score on a listening comprehension test.

Method

I collected listening section scores of a TOEIC test (as listening comprehension assessment) and speech data (for sentence stress placement and comprehensibility) from 20 Japanese learners of English.

Participants and Data Collection

The participants were 20 first year economics majors at a Japanese college where I taught in 2010. They took a TOEIC test administered just before new school year courses began. About two weeks later, the students read a dialog, which was rated by ten native English speakers in the following year. I held two rating sessions, with each of the inter-rater reliability, .882 (4 raters) and .887 (6 raters). For more detailed information, see Chiba (2012). I obtained an informed consent from the Japanese learners and the raters after explaining the purpose of the study and anonymity of the data. The speech used here is half of that studied by Taguchi (2014), which was collected before a pronunciation treatment.

The TOEIC Test

The TOEIC, the Test of English for International Communication, created by ETS, "directly measures ability of nonnative speakers of English to listen and read in English in the global workplace" (TOEIC official website). The test consists of a total of 200 multiple-choice questions, 100 listening (45 minutes) and 100 reading comprehension questions (75 minutes). Each of the score for listening and reading comprehension ranges from 5 to 495 points, with the total score from 10 to 990 points (The Institute for International

Business Communication, 2013).

The reliability of the TOEIC is above .90, as shown below, and the estimated standard error of measurement is around 25 points, according to Liao, Hatrak and Yu (2010).

Table 1 *Reliability Estimates of Scale Scores for the Redesigned and Classic TOEIC Listening and Reading Test*

Test section	Number of items	Classic TOEIC Listening and Reading test	Redesigned TOEIC Listening and Reading test
Listening	100	0.90–0.93	0.92–0.93
Reading	100	0.90–0.94	0.92–0.93
Total	200	0.93–0.95	0.95–0.96

Note. The students in this study took the 'redesigned TOEIC test.

Comprehensibility of Learner Speech

Comprehensibility is a measurement Dewing and Munro used in their 1997 research, which is a listener's perception of how difficult it is to understand the speaker. Accent, the extent to which an individual's L2 speech differs from a particular variety of English (Derwing and Munro, 2005) is not considered to be a significant problem now, but part of normal variation. Current pronunciation instruction approaches set a learner's goal as to be able to produce a message without causing too much effort on the part of a listener (Grant, 2014).

Even though my studies follow the same concept as Derwing & Munro (1997) in terms of comprehensibility, I modified the scale to a 5 point-Likert scale (in which 1=extremely easy to understand and 5=extremely difficult to understand) from a 9 point-Likert scale in Dewing and Munro's 1997 study, considering the human memory span[5] and either a 5 or a 7 point-Likert scale is used in many psychometric studies (Colman and Preston, 1997). This measurement has been found to be reliable according to my previous research. In Chiba (2012), the inter-rater reliabilities of comprehensibility were .872 in a 4-rater group and .887 in the other (n=6), whereas Taguchi (2014) had .841(n=10), .857 (n=12) and .780 (n=6).

Sentence Stress Placement

Based on previous studies that indicate a sentence stress is pronounced with a higher pitch, a louder vowel and longer than others (Avery and Ehrlich, 2008; Baker & Goldstein, 2008; Bolinger, 1986; Grant, 2014), I counted the number of each of the three features of learners' samples (20 participants' 10 sentences=200

5) People can have an immediate memory if categories are about 7, but if more than that would be futile (Colman & Preston, 1997).

sentences in total) if they appeared in the same place as native speaker samples. The procedures are the same as Taguchi (2014).

Results

Means and standard deviations of the data are as follows.

Table 2 *Descriptive statistics of TOEIC Listening Scores, Comprehensibility and Sentence Stress of the 20 Participants' Speeches*

	Mean	S.D.
Sentence Stress	12.4	2.9
TOEIC Listening	242.8	31.2
Comprehensibility	3.19	0.8

Note. Possible range is 0-30 for Sentence Stress, 5-495 for TOEIC listening scores and 1-5 for Comprehensibility (the lower the rating, the easier to understand).

The Pearson correlation coefficient shows that there is a statistically significant correlation (r=.638**) at $p<.01$ level between sentence stress placement and the TOEIC listening comprehension scores (Table 3). The squared r (effect size) is .407, which means that approximately 40% of variance is accounted for with this correlation, as below in Figure 2, which illustrates the distribution of this data set. Neither a correlation between sentence stress and comprehensibility rating (r=-.401), nor between comprehensibility and TOEIC listening comprehension scores of the participants (r=-.111) was found. This means Hypothesis #1 was supported, while Hypothesis #2 was not.

Table 3 *Correlation Matrix of Sentence Stress, TOEIC Listening Section Scores and Comprehensibility Rating*

	Sentence Stress	TOEIC Listening	Comprehensibility
Sentence Stress	-	.638**	-.401
TOEIC Listening		-	-.111
Comprehensibility			-

Note. **$p<.01$, df=18.

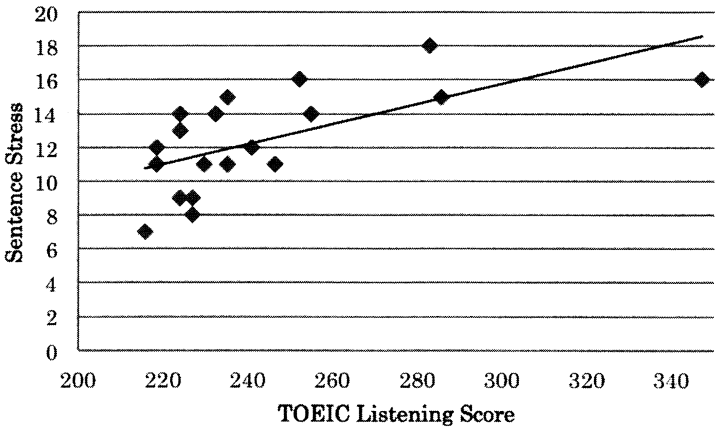

Figure 2. Scatterplot of sentence stress and TOEIC listening score.

Discussion

Here I will discuss possible reasons for the statistical results and present a modified relational map among the relation of sentence stress, listening comprehension and comprehensibility of L2 speeches.

Hypothesis #1

There is a positive correlation between those who use appropriate sentence stress and those who get a higher score on a listening comprehension test.

The results support Hypothesis #1. This indicates that knowledge of sentence stress plays a crucial role in listening. As hypothesized above, such a person who can employ sentence stress well in production can transfer the skill in listening so that s/he can use working memory efficiently by focusing on a target that requires close attention. This allows a listener to decode, build meaning and retain the message well while listening to a stream of text. On the other hand, a person who is less skilled in sentence stress employment would try to use working memory extensively without knowing what to listen for, with the result being that s/he would miss decoding some parts, infer meaning with little basis by heavily relying on context, and fail to retain an extracted message.

Hypothesis #2

There is a positive correlation between those who produce more comprehensible speech and those who get a higher score on a listening comprehension test.

Before discussing possible reasons for failing to support Hypothesis 2, I need to refer to the relation between sentence stress placement and comprehensibility. Although my study (Taguchi, 2014) and Kang (2013) previously showed that these two are correlated, this data set showed no statistically significant correlation. This may be due to a weaker correlation than that between sentence stress placement and listening comprehension, and therefore, a smaller sample size, 20, in comparison to 40 in Taguchi (2014) and 120 in Kang (2013), may have contributed to failure in detecting a correlation (Type II error). On the other hand, a correlation between comprehensible speech production and listening comprehension skills are not directly linked, and the tentative relational map (Figure 1) above needs to be modified as Figure 3, to reflect that there was almost no relation (r=-.111) between listening comprehension scores and comprehensibility of the participants.

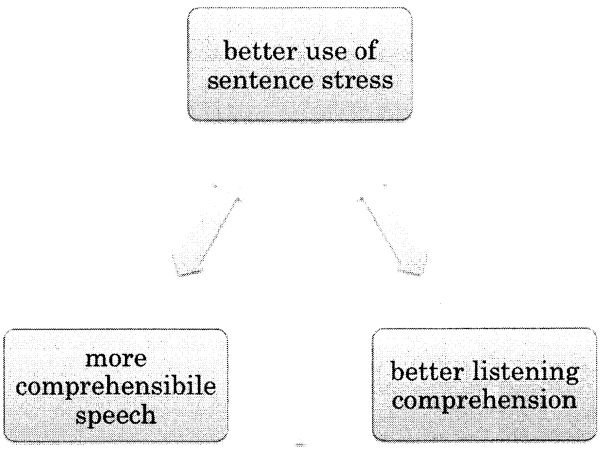

Figure 3. A modified relational map between, sentence stress, comprehensible speech production and listening comprehension

The failure to support Hypothesis #2 may be partly because of the small sample size, which weakened the statistical power, and partly because the two –producing a comprehensible speech and listening to a spoken text better – share only a small part and involve more unrelated variables. For example, comprehensible speech consists of not only better use of sentence stress but fluency, voice quality and segmentals, and better listening skills mean knowing a good size of vocabulary, having a repertoire of acoustic exemplar sounds and being able to build meaning in light of context. The other two relations were stronger than this, probably because one end of the other relations is sentence stress, which does not involve as many variables as the others. Therefore, comprehensibility of L2 speech may be only correlational to listening comprehension skills if I postulate 'sentence stress' in between. In other words, these two may be related, but not directly.

Limitations and Implications

The current study has attempted to present empirical support for the assumption that listening and pronunciation reciprocally help each other, by analyzing listening test scores and speeches of 20 Japanese learners' of English. The results show a statistically significant correlation between the L2 learners' listening comprehension test scores and their use of sentence stress, while neither a relation between use of sentence stress and comprehensibility rating of the participants' speeches nor between TOEIC listening test scores and comprehensibility of their speeches is found to be significant.

Although this study only shows a correlation between listening test scores and use of sentence stress, I still postulate a relational framework (Figure 3), which keeps a relation between use of sentence stress and comprehensibility of learner speech. It is because the preceding studies, Kang (2013) with $r=.556$, and Taguchi (2014) with $r=-.449^{**}$ at $p<.01$ level, $n=40$, supported the relation, whereas this study seems to fail to detect a correlation due to its small sample size. For future studies, I will collect a larger sample size to investigate whether this result is true due to a matter of sample size or not.

As for the other relation between comprehensibility and listening test scores, it seems the two have a weak relation. I actually tested this relation with different data in Chiba (2014) and initially detected a weak relationship ($r=-.351^{*}$ at $p<.05$ level, $n=45$). Although this may also be the result of a smaller sample size used, I presented the relation as weak in a modified figure considering the effect size in Chiba (2014), which was also small, .124.

I was not able to support both of my two hypotheses, but this study has provided with some pedagogical implications. First, English teachers may benefit students by spending more time teaching sentence stress in class. Especially for learners whose L1 is not stress-timed, explicit instruction on how English speakers use sentence stress would be greatly beneficial. It may take time to incorporate such knowledge internally to be able to use for listening and speaking, but practicing paying attention to such prosodic features in class should give learners an additional tool to understand and use English better because it would enable them to use working memory more efficiently, with the result that they can process streams of sounds better and retain extracted messages. Secondly, the study has shown a relation between pronunciation (especially sentence stress) and listening comprehension, which suggests that teachers should include pronunciation instruction in teaching listening, which is more widely conducted than pronunciation instruction alone. This study has suggested reciprocal effects by doing so. In addition, when learning pronunciation, learners need to be conscious that pronunciation functions are contingent upon context, and so teaching that aspect of pronunciation is not straightforward. It requires exposing learners to a variety of contexts to show how a

specific prosodic feature is used. This study has pointed out listening instruction as one feature with which pronunciation can be taught together; but other types of instruction, such as grammar and reading, can include pronunciation instruction with the purpose of informing learners of pronunciation roles in communication. It is almost impossible to teach suprasegmental features without context. Explicit reference to pronunciation in almost all instruction of grammar, reading and listening, would promote learners' understanding of pronunciation functions further, and it is expected that they can likewise learn grammar, reading and listening better as well.[6)]

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