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The Use of Prosody in Semantic and Syntactic Disambiguation: Comparison between Japanese and Chinese Speakers' Sentence Production in English

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The present study examined the use of prosody in semantic and syntactic disambiguation by means of comparison between Japanese and Chinese speakers' production of English sentences. In Chinese and Japanese, lexical prosody is more prominent than sentence prosody, and the sentential meaning contrast is usually realized through particles or a change in word order instead of prosodic cues. In order to find out whether Chinese and Japanese speakers of English can produce prosodic differences when they are aware of the syntactic and semantic ambiguity of the sentence, a read-aloud experiment was conducted. The results indicated that both Japanese and Chinese speakers were able to represent the difference of meaning by means of pause and the rising or falling of pitch at the final position of a sentence, which was reflected by their performance on boundary and tag questions. However, it was difficult for them to represent the difference of focus and phrase structure type merely by means of prosody. These findings suggest that some aspects of English prosody, such as a compound accent that is opposite to that of Japanese and Chinese, a phrasal accent that is peculiar to some degree, and an emphatic focus, require more consideration than other aspects. Furthermore, regardless of whether they are Japanese or Chinese learners of English, learners should expend more time and concentration on practicing the specific patterns of prosody that relate to semantic or syntactic disambiguation in English.

Keywords: prosody, disambiguation, sentence production, read-aloud, ESL

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1 Introduction

There is a growing body of research suggesting the importance of prosody in communication (Schafer, Speer, Warren & White, 2000; Sugito, 1996). Native speakers of English can utilize the three parameters of prosody—pitch, length, and loudness—to disambiguate a sentence with a double meaning in both production and comprehension (Allbritton, McKoon & Ratcliff, 1996; Fox, Tree & Meijer 2000; Schafer, Speer, Warren & White, 2000). Non-native speakers, however, do not consistently use prosody to signal meaningful contrasts (Wennerstrom, 1994). Pennington and Ellis (2000) investigated Cantonese speakers' memory of English sentences with prosodic cues. In their experiments, Cantonese speakers with advanced competence in English were tested for their recognition memory of the four prosodic types of English sentences. The results showed that the Cantonese speakers did not perform well in memorizing these different types of sentences. According to their research, lexical prosody functions as a cue for meaning differentiation in Cantonese, while it plays only a minor role in English. Rather than lexical prosody, English utilizes prosody to clarify meaning at the sentence level, such as sentences with focus, question tags, ambiguous boundary, or phrase structure. The use of prosody in cueing sentential meaning in Cantonese is less frequent than it is in English, wherein it is usually realized through changes in word order or the application of particles. In Mandarin Chinese and Japanese also lexical prosody is more prominent than sentence prosody, and the sentential meaning contrast is usually realized through particles or a change in word order instead of prosodic cues. It is possible to speculate that Chinese and Japanese speakers may also have poor recognition memory for prosodic sentences in English. However, it is not clear whether Chinese and Japanese speakers of English can produce prosodic differences when they are aware of the syntactic and semantic ambiguity of the sentence. Will they resort to the use of sentence prosody if they are conscious of the double meaning of the sentence? In light of these questions, the present study, based on the research of Pennington and Ellis (2000), investigates Chinese and Japanese speakers' production of sentence prosody in disambiguating four sentence types, including focus, question tags, boundary, and phrase structure.

2 Prosodic Realization of Sentence Types in English, Japanese, and Chinese

While Chinese and Japanese utilize tone and pitch as cues for differentiating words whose pronunciations would otherwise be the same, sentence level prosody plays a less important role in contrasting differences in meaning. The prosodies of the three languages at the sentence level will be compared next

based on their features of focus, question tags, boundary, and phrase structure.

2.1 Focus

In English, the most important word, which is usually the final word of an assertion or statement, receives the tonic stress. In this case, "the degree of prosodic prominence within the unit parallels the degree of grammatical prominence" (Pennington & Ellis, p. 375). In the case wherein a particular element of an utterance is highlighted by emphatic stress or contrastive stress, as illustrated in Example 1, prosody is tied to that particular element and delivers marked information of focus or contrast.

Example 1
Q: Are you going to LONDON or PARIS for a holiday? (contrast)
A: I'm going to LONDON for a holiday. (emphases)

In Japanese, a marked focus is usually represented by pitch. Deguchi and Kitagawa (2002, p. 74) asserted that, in an utterance with an emphasis, "the lowest pitch induced by the emphatic accent is inherited and prolonged with further gradual declination up to the right boundary of some clausal structure." Koori (1989) also described this feature, as demonstrated in Examples 2a, 2b, and 2c. He indicated that the pitch of the emphasized word rises, whereas that of successive words drops. Moreover, if the final word is being focused, its pitch rises as well; however, it is not much higher than that of the words before it.

Example 2a

Yuji ga *biiruni* *wain wo* *madzeta.*[1] (no marked focus)
Yuji particle beer wine mixed
'Yuji mixed beer with wine.'

Example 2b

Yuji ga *biiruni* *wainwo* *MADZETA.*
'Yuji mixed beer with wine.'

[1] " ▲ " means the pitch is raised.
" ▲ " means the pitch is neither raised nor lowered.
" ▲ " means the pitch is lowered.

Example 2c

Yuji ga BIIRUNI wainwo madzeta.
'Yuji mixed beer with wine.'
(Koori, 1989, p. 326)

In addition, an adjective, quasi-adjective, or adverb is focused by lengthening the vowel, and inserting a double consonant or the kana "n" after the first mora of the word, as shown in Examples 3a through 3c (Koori, 1989).

Example 3a
kireina
'beautiful'
↓
Konna KIRE-EIna hana wo mitakoto ga nai.
such beautiful flower particle see particle have never
'I have never seen such a B-E-A-U-T-I-F-U-L flower.'

Example 3b
sugoi. →*Kare wa SUGGOI.*
'great' he is great
'He is GREAT.'

Example 3c
marui →*MANMARUI katachi da.*
'round' perfectly round shape is
'It's a PERFECTLY ROUND shape.'

In Chinese, when there is a contrastive or emphatic focus on an item or unit, the stress will transfer to the syllable that receives the emphasis, and it is signaled primarily by a change in duration (Chao, 1979): the emphasized syllable is stressed longer than normal. Chao (1979) explained that stress is first represented by expanding the tonal range and lengthening the tonal duration, and then by loudness. Xu (2002) believed that the pitch range of the focus is widened, regardless of whether it is at the end position of a sentence, or if it is highlighted in another part of the sentence. In addition, the pitch ranges of the preceding syllables will decrease, while others remain neutral. In Example 4b, the pitch range of the emphasized word *shu* (book) is widened, and that of the word *yi ben* (a) preceding it is reduced, while the other words retain their neutral pitch ranges. In comparison, pitch ranges do not change in Example 4a without emphasis.

Example 4a
Tā măi le yì běn shū. (no marked focus)
he bought a (quantifier) book
'He bought a book.'

Example 4b
Tā *mǎi le* *yì běn* *SHŪ.*
he bought a (quantifier) book
'He bought a BOOK (not a magazine).'

2.2 Tag questions

In English, there is one, main movement of the voice, which starts on the last prominent word of a speech unit. It is either down, a falling intonation, or up, a rising intonation. A falling intonation indicates that there is information in the speech that the addressee is not expected to know already. Owing to the fact that *wh-* questions are often used to elicit information, they often end with a falling intonation. A rising intonation indicates that the information in the speech unit is not something new, which means that the information has already been shared by the speaker and addressee. Since *yes/no* questions are often used to verify something, they often end with a rising intonation.

Tag questions, which usually deliver an expectation of the response from the addressee, can end with both a falling intonation and a rising intonation. A falling intonation in a tag question means that the speaker is expecting his or her addressee's agreement, as illustrated in Example 5a. A rising intonation in a tag question means the speaker is not sure whether his or her opinion is true and is expecting confirmation, as illustrated in Example 5b.

Example 5a
Great film, wasn't it ?\
'I think the film was great, and you will acknowledge it.'

Example 5b
Great film, wasn't it?
'I think the film was great, but I am not sure if you will agree or not.'

In Japanese, notwithstanding the use of rising and falling intonation, both *wh-* and *yes/no* questions usually have a rise on the utterance-final question particle *ka* (Swan & Smith, 2001). To proclaim new information, the postpositional particle *ga* is usually used instead of rising intonation; to indicate that the information is not new, the topic marker particle *wa* is usually used instead of falling intonation, as shown in Examples 6a and 6b.

Example 6a
Koko wa *doko* *ka.*
here particle where particle
'Where am I?'

Example 6b
Doko ga *sakaecho* *ka.*
where particle Sakae town particle
'Where is Sakae town?'

In tag questions, the particle *ne* is usually used. Similar to English, the question-tag particle rises to show the speaker's uncertainty and falls to show confirmation and agreement, as shown in Examples 7a and 7b (Swan & Smith, 2001).

Example 7a
Ii *eiga deshita ne.*
Great film was particle
'Great film, wasn't it?' (I think the film was great, but I am not sure if you will agree or not.)

Example 7b
Ii *eiga deshita ne*.
Great film was particle
'Great film, wasn't it?' (I think the film was great, and you will acknowledge it.)

In Japanese, final particles with certain intonation patterns indicate the speaker's intention and information. For instance, a rise on the final particle *ka* expresses a query, a rise on the final particle *ne* expresses uncertainty, and a fall on the final particle *ne* expresses agreement. Furthermore, a rise on the final particle *yo* indicates a proclamation of new information, while a fall on the final particle *yo* indicates the speaker's conviction. English equivalents and the functions of these particles are shown in Table 1.

Table 1. English Equivalents of Some Japanese Particles[2]

Japanese		English Equivalents	
Particle	Function	Intonation	Example
ka	questioning	falling/rising	*wh- /yes-no* question
	propose	falling	*could, would, how*
	command or request	rising	question tags (*will you, would you*, etc.)
ne	confirm	rising	tag question
	agree	falling	tag question
yo	new information	falling	
	conviction		

In Chinese, the intonation differs in questions with or without interrogative

[2] The content of Table 1 is a summary based on Hewings (2007) and Kashima (2002).

and final question particles. Namely, questions without interrogative and final particles tend to rise, while questions with them retain neutral intonation (Yang, 1995). In questions without any interrogatives and final question particles, a rising intonation is the only way to display incredulity. This rising intonation shows that the speaker has already had his or her own conjecture, and the addressee may confirm it, as shown in Example 8.

Example 8
Shén me? Zhè shì nǐ zhī dào?
what this thing you know
'What? You knew this?'

In questions with interrogative final particles, notwithstanding that the overall pitch level is slightly higher than that of statements (Shen, 1990), the interrogative particle *ma* is mainly used to indicate that the speaker is soliciting information, and is expecting the addressee's answer. It is different from statements without interrogative and final particles which are mainly used to express the speaker's suspicion or astonishment. Interrogatives and final particles play important roles in delivering different degrees of incredulity, as illustrated in Examples 9a to 9d.

Example 9a
Zhè shì nǐ zhī dào?
this thing you know
'You knew this?'

Example 9b
Zhè shì nǐ zhī dào ma?
this thing you know particle
'Do you know this?'

Example 9c
Zhè shì nǐ zhī dào ba?
this thing you know particle
'Do you know this?' (I think you have known it, and you will confirm it.)

Example 9d
Zhè shì nǐ zhī dào a?
this thing you know particle
'Do you know this?' (I know that you have known this)

Li and Tang (1992) proposed that there are three degrees of incredulity: high, low, and very low. Hence, in Example 9a, the intonation rises as shown in Example 8, to indicate the speaker's conjecture. In Example 9b, the particle *ma* shows that the speaker is asking a question and expecting an answer. In

Example 9c, considering that the particle *ba* suggests that the speaker is expecting the addressee's agreement, low degree incredulity is represented. In Example 9d, the particle *a* means the speaker is more likely stating the information than asking a question, thus the addressee may not answer. Since its degree of incredulity is very low, this kind of question can almost be regarded as a statement. Their English equivalents are shown in Table 2.

Table 2. English Equivalents of Some Chinese Particles[3]

Chinese		English Equivalents	
Particle	Function	Intonation	Example
ma	questioning	rising	*yes-no* question
ne	questioning	falling	*wh-* question
ba	confirm	rising	tag question
	agree	falling	tag question
	command	rising	question tags (*will you, would you*, etc.)
a	questioning	falling/rising	*wh- /yes-no* question
	command	rising	question tags
	state	falling	statement

In tag questions, Chinese makes use of X-*bu*-X (X not X) (such as *shì-bu-shì* (yes or no), *duì-bu-duì* (right or not), and *hǎo-bù-hǎo* (will you)), to express uncertainty, as English makes use of rising intonation in tag questions, as shown in Example 10a. Meanwhile, X-*bu*-X can be replaced by X-*ma* or *bu*-X-*ma,* as illustrated in Example 10b. To express confirmation, Chinese makes use of the final particle *ba* instead of *ma,* whose degree of incredulity is higher than that of *ba.* See Example 10c (Zhang, 2010).

Example 10a
Zhè shì bù hǎo diàn yǐng, shì-bù-shì?
this was a great film yes or no
'Great film, wasn't it? (rising intonation)'

Example 10b
Zhè shì bù hǎo diàn yǐng, shì ma / bú shì ma?
this was a great film was it / wasn't it
'Great film, wasn't it? (rising intonation)'

Example 10c
Zhè shì bù hǎo diàn yǐng, shì ba ?
this was a great film wasn't it
'Great film, wasn't it? (falling intonation)'

[3] The content of Table 2 is a summary based on Hewings (2007), Ding (1961), and Qi (2002).

The degree of incredulity of the particle *ba* needs to be noted, as it differs according to context. That is, *ba* can indicate either confirmation or agreement, depending on the situation (Ding, 1961). Thus, in Example 10b, *shì ma* can be replaced by *shì ba*. However, in this case, it is difficult to distinguish whether the speaker is expecting confirmation or agreement without knowing the context.

2.3 Boundary

The roles of boundary in language are to divide an utterance into correct information units, indicate the size of a syntactic interval, and help clarify syntactic ambiguities. In English, boundary is sometimes marked by a pause in speech. However, the use of pause is not always necessary. Extension of rhythm intervals immediately before or at the end of a sentence is mainly used to indicate boundary (Makino, 1993). In example 11, a comma is used to distinguish the fact that *old* is modifying only *man* or *man and woman* in written English. Nevertheless, in spoken English, a pause inserted between *man* and *and* serves the function of a comma. For English native speakers, pauses are not salient in conversation because the extension of rhythm intervals is enough for disambiguation.

Example 11
old man, and woman
old man and woman

Similarly, in spoken Japanese, a comma can be replaced by a pause, yet in fast speech, pause is not salient. In this instance, a rise of pitch and an extension of mora are necessary for disambiguation (Ayusawa, 1989).

Example 12a
Shinda ishano、*okusan.*
dead doctor's wife
'dead doctor's wife'

Example 12b
Shinda、*ishano okusan.*
dead doctor's wife
'doctor's wife is dead.'
(Ayusawa, 1989, p. 132)

In Example 12a and 12b, *Shinda ishano okusan* can be interpreted in two ways. A pause after *ishano* (doctor's) means that the doctor is dead, while a pause after *shinda* (dead) means that the wife is dead. In Example 12a, given that the lexical accent is on the first syllable of *okusan* (wife), which means

that the pitch of *o* is higher than the succeeding syllables, the pitch of *o* will not be very low even when it comes immediately after a pause in the sentence. For this reason, a pitch division between *shinda ishano* and *okusan* is difficult to understand. Moreover, the pitch of the particle *no* rises before a pause. In Example 12b, the pitch of *da* in *shinda* rises, which comes before a pause as well. In addition, *no* in Example 12a and *da* in Example 12b are lengthened. Therefore, even if the pause is not salient, these two examples can be understood, although with more difficulty.

In Chinese, however, since there is little variation in sentence intonation, it is difficult to discriminate syntactic units simply by means of intonation or tone change. As a result, boundary in Chinese is represented mainly by pause and rhythm. Han (2007) declared that in an utterance, a speaker might make use of pause to divide a sentence into two or more grammatical units depending on the situation, for speaking ease as well as to ensure the listener's comprehension. Those grammatical parts are separated with time-duration and rhythm, as shown in Examples 13a and 13b.

Example 13a
Sǐ qù de yī sheng de, qī zi.
dead doctor's wife
'dead doctor's wife'

Example 13b
Sǐ qù de, yī sheng de qī zi.
dead doctor's wife
'doctor's wife is dead.'

According to Chao (1979), there are "complete pauses" and "incomplete pauses" for boundary in Chinese. Complete pauses are used as boundaries between sentences or coordinate clauses in complex sentences. They are represented by longer silent pauses, acceleration of last syllables, and pitch falls in statements or pitch rises in questions. Likewise, Li (2002) pointed out that longer silent pauses, occurring frequently at major boundaries, and syllable lengthening might occur left or right of minor boundaries. Incomplete pauses are used as boundaries within complex sentences. This is represented by a shorter silent pause, extension of the last syllable, or the use of particles, such as *a, ne, me,* and *ba* that have been introduced previously in interrogative sentences (Chao, 1979; Ding, 1961). As shown in Example 14a, between two interrogative sentences, there is a long silent pause and a slightly rising pitch for boundary. With regard to Example 14b, within a complex sentence, there is a short silent pause and an extension of *er* for boundary. Furthermore, the short pause can be replaced by the particles *a* or *ne*.

Example 14a
Nǐ shàng nǎ er? Tā shàng nà er?
you go where he go where
'Where are you going? Where is he going?'

Example 14b
Nǐ shàng nǎ er (a/ne), tā shàng nà er.
you go where he go where
'Where you go, he goes.'
(Chao, 1979, p. 74)

Han (2007, p. 48) proposed that "pauses can also be used to distinguish between end-placed vocative and apposition, apposition and list," as shown in Examples 15a and 15b. Because pauses are placed in different positions within sentences, the meaning of each sentence can vary. If the pause is omitted, the meanings of the sentences become ambiguous.

Example 15a
Zhè shì zhù míng de gong jué zhān mǔ sī.
this is famous Duke James
'This is the famous Duke James.'

Example 15b
Zhè shì zhù míng de gong jué, zhān mǔ sī.
this is famous Duke James
'This is the famous Duke, James.'

2.4 Phrase structure

In English, stress serves a greater function in disambiguating phrases and derived compounds made up of the same lexical items as in Examples 16a and 16b.

Example 16a
'blackboard ↔ *black 'board*

Example 16b
'cutting board (adjective + noun) ↔ *cutting 'board* (verb + noun)

In both Example 16a and 16b, the compound and the phrase are identical in morphology yet different in stress patterns in which the former's stress lies on the first syllable or a word while the latter lies in the second. Uniquely, their stress patterns change along with the change of their meanings.

Japanese also has compounds and phrases made up of the same lexical

items. Generally, the accent pattern of a compound is determined by the accent of subsequent part (Sato, 1989). In other words, accent of the first part in a compound disappears while accent of the second part overwhelmingly determines the entire accent of the compound. In contrast, accent of every item remains as it is in a phrase. As illustrated in Example 17a, of the original noun phrase *kuro* and *satou*, *the* syllable *sa* is voiced, the accent of its first part *kuro* disappears, and the accent of its second part *zatou* becomes the accent of the whole word, which makes it turn into a compound word.

Example 17a

kuro + *satou*[4] (noun phrase)	↔ *kurozatou* (compound)
black sugar	
'black sugar'	'brown sugar'

Example 17b

kohi no kappu	↔*kohiikappu*
coffee for cup	
'a cup for coffee'	'coffee cup'

(Adopted from Kawagoe, 1999, p. 175)

In Example 17b, *koohii no kappu* and *koohiiikappu* are different in accent pattern, but their meanings are the same, both of which mean a cup for drinking coffee.

Chinese is different from English and Japanese in that both in phrases and compounds, the last syllable is stressed (Chao, 1979). However, the meaning of single word may not change after being combined.

Example 18a

chéng wài	→*chéng-* '*wài* (compound)
'city' 'outside'	'outside the city'

Example 18b

kàn tā men	→*kàn-* '*tā-men* (phrase)
'look' 'they'	'look at them'

(Chao, 1979, p. 182, p. 188)

In sum, Chinese and Japanese are different from English in mainly using prosody at their lexical levels, and semantic and syntactic ambiguity of a sentence is usually escaped by placing particles or changing word order instead of using sentence prosody. Although sentence prosody is also used in Chinese and Japanese to state the intended meaning, the manner of its use is different in the three languages as we have seen above. Having this difference

[4] The pitch starts from low tone to a high, and then falls again.

(and some similarities) in prosodic manifestation, the present study focuses on Chinese and Japanese learners' ability to produce English sentences with distinct prosodic pattern, and aims to find out whether they can disambiguate semantically and syntactically ambiguous English sentences by means of prosody.

3 Method

3.1 Participants

Ten Japanese first language (L1) speakers and 12 Chinese L1 speakers were recruited from a national university in Japan. They were all graduate students whose majors were not English. They were aged from 21 to 29 (M = 24.60, SD = 1.92), among which 3 were males, and the others were females. Regarding the Japanese group, the average time spent learning English as an L2 at school was 12 years, and regarding the Chinese group, it was 10 years. According to the self-reported score of the TOEIC test (Test of English for International Communication), the average of Chinese participants was 783.57 (SD = 89.89) and that of Japanese participants was 689.29 (SD = 116.67).

3.2 Materials

Thirty-two pairs of sentence stimuli were used. The stimuli consisted of 8 paired items for each of the 4 sentence types, with 64 sentences in total. Each sentence was presented with a Japanese or Chinese sentence according to the participants' L1, which clearly indicated the unambiguous meaning of the sentence. The stimuli were not only randomized in pairs, but also according to sentence type. In brief, there were Japanese and Chinese versions, and each version had 4 editions that appeared in randomized sentence order. With respect to the sentence type, it was exemplified as follows.

Focus:
Japanese or Chinese sentence indicated: "They were not "on the table" but under the table."
They were under the table.
Japanese or Chinese sentence indicated: "They were not "under the chair" but under the table."
They were under the table.

Tag:
Japanese or Chinese sentence indicated: "I think it was a great film, and you will confirm this."
Great film, wasn't it?
Japanese or Chinese sentence indicated: "I think it was a great film, but I

am not sure."

Great film, wasn't it?

Boundary:

Japanese or Chinese sentence indicated: "it is the team that said the coach was great."

The team said the coach is great. (There is no punctuation at key boundary position.)

Japanese or Chinese sentence indicated: "it is the coach that said the team was great."

The team said the coach is great. (There is no punctuation at key boundary position.)

Phrase Structure:

Japanese or Chinese sentence indicated: "He built a heated housing glass building."

He built that greenhouse.

Japanese or Chinese sentence indicated: "He built a house that was spotted with green paint."

He built that green house.

3.3 Procedure

The experiment took about 25 minutes in total to complete. Participants were given 10 minutes to preview the content of the reading list. After previewing, participants were immediately asked to read aloud the list of English sentences with an appropriate prosody which they thought was in accord with the L1 sentence. During the experiment, participants could correct errors or repeat sentences. Their readings were recorded with an IC recorder.

3.4 Rating

Participants' recordings were judged by the two authors, whose mother tongues are Chinese and Japanese, respectively. First, the two raters independently listened to the recordings, judged the meanings of the sentences read, and then chose the judged meanings by using multiple-choice answer sheets. The raters did not know the speakers' intended meaning beforehand. The multiple-choice answer sheets had sentence items as question stems, along with three answer choices: two possible meanings of the sentence and the answer choice of "I'm not sure." The example of the multiple-choice answer sheet is given below.

Q1. Is he driving the bus?

A. Sentence in Japanese or Chinese indicating: Is he, not anyone else,

is driving the bus?
B. Sentence in Japanese or Chinese indicating: Is he driving the bus instead of a car?
C. Sentence in Japanese or Chinese indicating: I'm not sure.

There were 64 sentences to judge which was in the order of the reading list. Pearson's *r* was calculated in order to investigate the inter-rater reliability between the two raters. The correlation coefficient was positive, $r = .99$.

Afterwards, the answers of the multiple-choice answer sheets were compared with the reading list to check the actual meanings which the speakers had intended to convey. If the answer was identical to the reading list, it was graded as one point; if not, it was graded as zero. Hence, a full score was 64 points.

4 Results

Participants' average performance for each sentence type was calculated. Table 3 shows the descriptive statistics.

Table 3. Mean Accuracy Rates (MR) and Standard Deviation (SD) across all Sentence Types in Japanese and Chinese Group

	Focus		Tag question		Boundary		Phrase structure	
	MR (%)	SD	MR (%)	SD	MR (%)	SD	MR (%)	SD
Japanese (n = 10)	50.0	2.45	75.6	3.38	78.1	1.65	57.5	2.15
Chinese (n = 12)	59.4	4.38	74.5	3.37	75.5	2.43	53.6	1.98
Total (n = 22)	55.1	3.63	75.0	3.20	76.7	2.07	55.4	3.26

A two-factor ANOVA was undertaken to investigate the effects of language and sentence type, in which scores of the read-aloud test served as dependent variables, while language (Japanese, Chinese) and sentence type (focus, tag question, boundary, phrase structure) served as independent variables. The results are shown in Table 4 and Figure 1.

The interaction between language and sentence type was not significant, $F(3, 60) = 1.004$, $p = .397$, *ns*, $\eta^2 = .048$. The main effect of language was also not significant, $F(1, 20) = 0.006$, $p = .939$, *ns*, $\eta^2 = .000$. However, there was a significant effect of sentence type, $F(3, 60) = 15.870$, $p < .001$, $\eta^2 = .442$. Post hoc analysis was conducted to investigate the difference in average performance across four sentence-types for each group. The results are shown in Table 5.

Table 4. Results of Two-way ANOVA

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
	Between subjects					
Language	.109	1	.109	0.006	.939	.000
Error	360.629	20	18.031			
	Within subjects					
Type	242.913	3	80.971	15.870	.000	.442
Language*type	15.368	3	5.123	1.004	.397	.048
Error (type)	306.121	60	5.102			
Total	925.14	90				

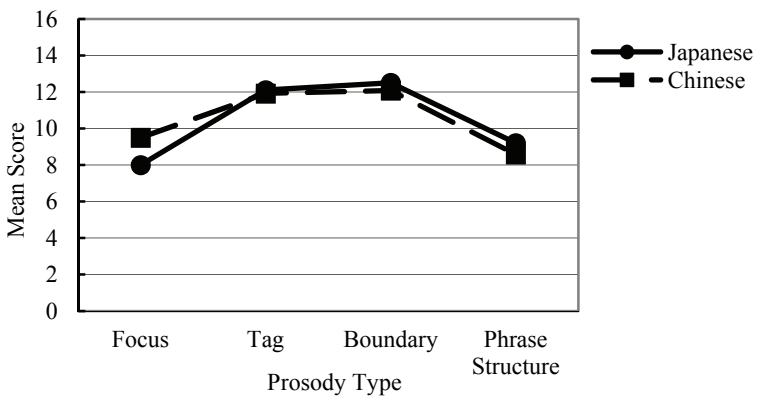

Figure 1. Mean scores for Japanese and Chinese group

Table 5. Results of Bonferroni Pairwise Comparisons Test on Mean Scores across all Sentence Types for Each Group

Language	Type 1	Type 2	Mean Difference	Standard Error	*p*
Japanese	Focus	Tag	-4.100**	1.109	.009
		Boundary	-4.500***	0.898	.000
		Phrase	-1.200	1.110	1.000
	Tag	Boundary	-0.400	1.132	1.000
		Phrase	2.900	1.029	.064
	Boundary	Phrase	3.300**	0.718	.001
Chinese	Focus	Tag	-2.417	1.012	.162
		Boundary	-2.583*	0.820	.030
		Phrase	0.917	1.013	1.000
	Tag	Boundary	-0.167	1.033	1.000
		Phrase	3.333*	0.939	.012
	Boundary	Phrase	3.500***	0.655	.000

Note. * $p < .05$ ** $p < .01$ *** $p < .001$

On the one hand, Japanese participants' mean score for focus type was significantly lower than scores for tag questions and boundary, *MD* = -4.10 and -4.50, $p < .05$, yet it was not significantly different from phrase structure type, *MD* = -1.20. Similarly, the mean scores for tag questions did not significantly differ from those for boundary and phrase structure type, *MD* = -40 and 2.90. However, the mean score for boundary was significantly higher than phrase structure type, *MD* = 3.30, $p < .05$.

On the other hand, the Chinese participants' mean scores for focus and tag questions did not significantly differ, *MD* = -2.42, and neither did focus and phrase structure type, MD = 0.92. However, it was significantly lower than that for boundary type, MD = -2.58, $p < .05$. The scores for tag questions and boundary did not significantly differ, MD = -0.17. Respectively, these were all significantly higher than scores for phrase structure type, *MD* = 3.33, $p < .05$ and 3.50, $p < .001$.

5 Discussion

The results of the analyses suggested that the participants' scores for disambiguation in English production was only influenced by different prosody types, and both groups of Japanese and Chinese participants did not significantly differ from each other in this respect. First, in contrast to the results of Pennington and Ellis, in which the Cantonese speakers' average accuracy rate for the memory of prosody was below the 50% level, the accuracy rate of participants in the present study with production data was above the 50% level. The highest accuracy rate was for the boundary sentence type at 76.7%, with the lowest standard deviation of 2.07. Meanwhile, the lowest accuracy rate was for the focus sentence type at 55.1%, with the highest standard deviation of 3.63. While the participants' performance in producing semantically and syntactically ambiguous sentences cannot be regarded as excellent, they were able to disambiguate, to some extent, some aspects of prosodic cues. The reason might be that production becomes easier than memory with the help of visual explanations of sentences (the reading list), which enabled processing of different meanings of the same sentences. Moreover, as the sentences were listed in pairs, this might have made the participants notice the different prosody of each and realize that they must be read in different ways.

Secondly, Japanese and Chinese participants' performance for each sentence type did not differ from each other. By comparing the mean scores of four sentence types, the results revealed that both Japanese and Chinese speakers' mean scores for tag questions and boundary type were higher than that for focus and phrase structure type.

As for the tag question, English learners might have stored the fundamental knowledge that intonation is most commonly rising for yes/no questions and falling for wh-questions, and that intonation can either be

rising or falling for tag questions. Further, even in their L1s, the rising or falling intonation occurs at the final position of a sentence, despite that the intonation is usually carried on the final particle or word and on a narrower range compared to English. Another possible explanation for the high accuracy on tag questions is that participants might be aware that tag questions listed in pairs should be read in either rising intonation or falling intonation. Once being sure of one answer, participants might be sure of the other one even if they did not have relevant knowledge of the tag question.

As for the high accuracy for boundary, regardless of whether it is an intonation language, a pitch-accented language, or a tonal language, pause can be used as one of the easiest means of disambiguation. In the present study, two raters scored the participants' production for boundary, based on the standard that boundary was successfully expressed as long as a pause was used in the key position of the sentence. As a consequence of this scoring standard, the accuracy for boundary reached 76.7% and was the highest score among the four sentence types. Despite that in reality, boundary is fulfilled through a combination of pitch, rhythm, and pause based on the features of English sentence prosody, pitch change and the extension of rhythm intervals can signal a boundary even without a perceived pause. If participants' performance was scored according to pitch change or extension of rhythm intervals instead of only a pause (a stricter standard where boundary is evaluated through a combination of pitch, rhythm, and pause), the accuracy may have sharply declined.

Surprisingly, the results showed that accuracy for the focus sentence type received the lowest score among participants. This result was contrary to the findings of Pennington and Ellis' research, which showed that after an activity designed to train participants' attention to prosodic contrasts, participants' performance on focus improved. While it is possible for an unmarked focus or a marked focus to be represented by pitch change both in Japanese and Chinese, "it is difficult to recognize the pitch change for emphasis added to the lexical accent in Japanese" (Sugito, 1990, p.365). In Chinese, Chao (1979) likened the relationship between syllabic tone patterns and the sentential attitudinal intonation to small ripples riding on top of large waves. Thus, considering the great influence of lexical prosody in Chinese, it may be difficult to discriminate between normal and emphatic stress. In other words, a Chinese grammatical sentence has an intonation that is usually displayed on the stressed word at the end of sentence, yet this intonation does not change the lexical tone. Instead, the latter has an influence on the former.

In view of the considerable differences among the English, Japanese, and Chinese stress patterns of compounds and phrases, it was difficult for English learners to differentiate phrases, such as adverb plus noun and verb plus object, from compounds by prosody. On the basis of the features of lexical prosody in English, stress lies on the former half in compounds, while it lies on the latter half in phrases that are made up of the same lexical items

as compounds (Kawagoe, 1999). In Japanese, stress lies on the opposite part of compounds as compared to English. In addition, the stress pattern of phrases in Japanese is different from English in that the lexical accent of its items does not change. In Chinese, the stress pattern in either compound or phrase is fixed to some extent, which is commonly placed on the latter half. When saying a compound, even if English learners realize that the first syllables should be stressed, they may mistake the stress pattern of the phrase to be made up of the same lexical items. For instance, in the word *blackboard*, owing to the fact that *black* is important information, many English learners may emphasize *black,* with the thought of conveying this meaning properly, which in turn might confuse the addressee.

Finally, in the case of Pennington and Ellis' research, participants were asked to remember the different prosodic sentence types, and they showed high recognition scores for the heard sentences and low recognition scores for the meaningful contrast sentences. This score pattern suggested that considerable cognitive effort was expended to process the heard sentences, yet that effort did not involve extraction of either a formal or an associated, meaningful contrast. Namely, if the participants processed the prosodic contrast sufficiently and effectively, they scored higher. In contrast, as mentioned previously, accuracy rates of participants in the present study for all four sentence-types were above the 50% level. These scores suggested that when asked to read sentences with different meanings, with intentional meaningful syntactic processing, participants were prone to make use of prosodic information.

6 Conclusion

The present study examined the use of prosody in semantic and syntactic disambiguation by means of comparison between Japanese and Chinese speakers' production of English sentences. The results indicated that both Japanese and Chinese speakers were able to represent the difference of meaning by means of pause and the rising or falling of pitch at the final position of a sentence, which was reflected by their performance on boundary and tag questions. However, it was difficult for them to represent the difference of focus and phrase structure type merely by means of prosody. Therefore, the participants, whose L1s are noticeable in their lexical prosody compared with English, did not significantly differ in their abilities to represent English sentence prosody. These findings suggest that some aspects of English prosody, such as a compound accent that is opposite to that of Japanese and Chinese, a phrasal accent that is peculiar to some degree, and an emphatic focus, require more consideration than other aspects. Furthermore, regardless of whether they are Japanese or Chinese learners of English, learners should expend more time and concentration on practicing the specific patterns of prosody that relate to semantic or syntactic

disambiguation in English.

Given that the present study investigated Japanese and Chinese speakers' production of English sentences for semantic and syntactic disambiguation by means of prosody, it is impossible to know from these results how they would perform in a perception experiment investigating the disambiguation of semantic and syntactic ambiguity while listening to paired sentences with different prosodic cues. Furthermore, while there was a tendency for participants to process different meanings while reading, which may have resulted in high scores for producing the four prosody types, the test items might have been too easy for the participants. Thus, the relative difficulty of sentence items needs to be weighed and analyzed again. In particular, it is necessary to reanalyze the following points: whether Japanese and Chinese participants can disambiguate boundary by a change of pitch instead of using pause, and whether Japanese and Chinese participants still perform well on the four sentence types, especially tag questions, if sentence items are completely randomized. Further research with more participants, and a comparison with native English speakers' productions, following the suggested improvements to materials and procedures, may incur more detailed, meaningful, and reliable results.

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