"A Study of English and Japanese Sound Systems for Teaching of Speaking"

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『スピーキング教育のための英語と日本語の音声体系の比較研究』

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I. Introduction

In recent years, as foreign trade has been increasing very rapidly, we often hear the great necessity of English education focusing on teaching of speaking in Japan. Nevertheless, the number of the people who can speak English has not been increasing as rapidly as the foreign trade situation. The more Japanese have contact with foreigners, the more important teaching of speaking English will be. All English teachers now have to be aware of such trend in English education in Japan.

Speaking of English as well as other foreign languages requires mainly three different levels of knowledge, namely, phonological, syntactical and semantic levels of knowledge. Among those three levels of knowledge, the phonological one including phonemic level must have the primary importance because originally human created languages as tools of verbal communication, that is to say, we exchange our ideas through exchange of sounds mostly. Thus teaching of speaking in English education should begin with teaching of correct pronunciation of English sounds. Yet many English teachers at public schools in Japan tend to lack the knowledge of phonetics and phonology which is very essential for their teaching, I think.

In teaching of correct English pronunciation effectively to Japanese students, it will be necessary for teachers to know both English and Japanese "from the point of view of a descriptive analysis in accord with modern linguistic science" (Fries, 1952), to discover the points of difficulty for their students and to prepare teaching materials. With this object in view, I will study and discuss the comparative analysis of English and Japanese sound systems which include the suprasegmental features refering to the results of various researches.

II. Vocalic Sound Systems of English and Japanese

1. Phonemic Level

Two languages, English and Japanese, have fairly different vocalic sound systems. In English there are thirteen vowel phonemes and three diphthongs. (Ladefoged, 1975). They are high-front vowel /i/ as in "beat," high-front vowel /ɪ/ as in "bit," mid-front vowel /e/ as in "bait," mid-front vowel /ɛ/ as in "bet," low-front vowel /æ/ as in "bat," mid-central vowel /ə/ as in "bird," low-central vowel /ʌ/ as in "but," high-back vowel /u/ as in "boot," high-back vowel /ʊ/ as in "put," mid-back vowel /o/ as in "boat," mid-back vowel /ɔ/ as in "bought," low-back vowel /a/ as in "hot" (American English), low-back vowel /ɒ/ as in /bother" (British English), a diphthong /aɪ/, a diphthong /aʊ/ and a diphthong /ɔɪ/.

In Japanese there are only five vowels. They are high-front vowel /i/ as in "isu" (chair), which is pronounced

somewhat midway between the English /i/ and /ɪ/, mid-front vowel /e/ as in "eki" (station), which is pronounced between the English /e/ and /ɛ/, low-central vowel /a/ as in "asu" (tomorrw), which pronunciation is variable ranging normally between the two English vowels /æ/ and /a/, mid-back vowel /o/ as in "oya" (parent), which is pronounced fairly closely to the vowel /ɔ/ in the English word "bought," and high-back vowel /u/ as in "uchi" (house), which is pronounced considerably more advanced than for the English /u/ and often without lip-rounding (this is symbolized [ɯ] — IPA, 1949). In Japanese those five vowels can occur in any position, either independently or in combination with other vowels like /e/ (picture), /i/ (stomach), /ii/ (good), /aoi/ (blue), /ai/ (love), and so on. So we do not need to list the diphthongs of Japanese.

English vowels are pronounced with various movements of the tongue and opening of the mouth, so they are dispersed very widely on the vowel chart. On the contrary, Japanese vowels are pronounced without opening the mouth widely, or often without lip-rounding, so all of the Japanese vowels are very much centered on the vowel chart and are lax sounds if we introduce the phonemic concept of "tense" and "lax." This difference creates serious difficulties among Japanese learners of English.

2. Phonological Level

There are some simple phonological rules that can be applied to English vowels. First English vowels are pronounced longer in open syllables and in stressed syllables. This fact can be found from two pairs of words such as; "sea" and "seat," and "cite" and "citation." Secondly the vowels tend to become nasalized before nasal consonants. In a word such as "ban" the soft plate often lowers for the nasal considerably before the tongue tip rises to make the articulatory (Ladefoged, 1975). Thirdly all the front vowels become considerably retracted before syllable final /l/. When we compare these two words "pad" and "pal," we can note the retraction of the vowel in "pal." Fourthly front vowel /i/ is occasionally pronounced in central position /ɨ/. We can find this phoneme /ɨ/ in the word combination "the boys" (/ðɨ bɔɪz/). This phoneme /ɨ/ is usually pronounced in unstressed syllbles. Also mid-central vowel /ə/ is pronounced only in unstressed syllables except before /r/.

In Japanese there are some phonological rules that can be applied to vowels as well as English. In general Japanese phonological rules for vowels are more complicated in comparison with English phonological rules for vowels. Thus, for example, the feature of duration plays an important role in Japaneese. In some special cases, a Japanese vowel like /i/ has a doubled or lengthened variant such as /čisai/ or /čiisai/ (small), but in most of the cases of lengthing, the difference of quality becomes phonemic. We can see this in some Japanese word pairs such as /obaasan/ (old woman) and /obasan/ (aunt), or /ooku/ (many) and /oku/ (back). A research by Han shows us the facts about this (Han, 1962). The results of the research show that if the actual measurement of the duration of a short vowel is taken as 1, the measurement of the long vowel pronounced in the same enviroment ranges between 2 and 3. The ratio of 1 to 2 is obtained when the short vorwel in question is not proceeded by a consonant. If the short vowel is proceeded by a consonant, the ratio becomes approximately 1 to 2.5. And if the proceeding consonant is voiceless, the ratio is 1 to 3. This much variation of duration never occurs in English vowels. Another interesting example of Japanese phonological rules in vowels can be found in a case of a vowel /a/. The vowel phoneme /a/ is most stable in Japanese (Han, 1962) and has very strong relationship to a semi-vowel /w/. The semi-vowel /w/ is always followed by the vowel /a/ such as in /kawa/ (river) or /iwa/ (rock), and it often disappears and changes to one triple-length vowel in some words such as in /kaaa/ for /kawa/ (Nakagawa and Sakai, 1977). Also various linguists have noted the fact that the vowels of Japanese, especially /i/ and /u/, are unvoiced when they occur between voiceless consonants in an unsterssed syllable. A research which was done by Han shows the fact more exactly just how such unvoiced vowels are produced. She listed the factors as follows (Han, 1962):

1) The effect on the duration of vowels.
2) The effect of tempo.

3) The effect of pitch-accent.

4) The effect of neighboring sound.

The major differences between the vocalic sound systems of English and Japanese are very significant both at phonemic and phonological levels as above. The first thing that Japanese learners of English have to do will be to increase the movements of the tongue and opening of the mouth starting at the phonemic level.

III. Consonantal Sound Systems of English and Japanese

1. Phonemic Level

When we compare the two languages, English and Japanese, we will find some consonantal phonemes which do not appear in common. For example, English has interdental consonant /θ/ and /ð/, and labiodental consonant /f / and /v/, but in Japanese we will find no consonants which have the same places of articulation as such English consonants. On the other hand, Japanese has a voiceless bilabial fricative consonant /Φ/ and a voiceless palatal fricative consonant /ç/, but in English, we can not find the consonants which have the same manners of articulation at the same places of articulation as such Japanese consonants.

Furthermore we can find some consonants which have the same places of articulation, but have different manners of articulation when we compare the consonants of the two languages. For example, English has a voiced alveolaɹ lateral consonant /l/ and a voiced alveolar glide consonant /r/, but Japanese has only one alveolar flap (or tap) consonant /ɾ/ which is equivalent to those two English consonants. In Japanese consonants /t/, /d/, /s/, /z/, /ts/ and /dz/ are dental consonants, but those consonants (except for the last two sounds /ts/ and /dz/ which are not found in English) are alveolar consonants in English.

Besides such differences in consonant articulation, Japanese consonants have a special characteristic which does not appear in English. In Japanese except in a very few cases such as the syllabic [n], the consonants are always followed by vowels, and this sequence is called "onsetsu" in Japanese and "mora" in English. There are three types of sequence which may constitute a mora in Japanese: one consonant followed by one vowel, a vowel itself and a consonant /n/ not followed by a vowel. For this reason Japanese consonant clusters are much more limited in distribution than English, and ordinary Japanese never think of the Japanese consonants in isolation or in free clusters like English consonants. Hence the most of Japanese learners of English have their pronunciation problems at this point.

2. Phonological Level

In English voiceless stop consonants /p/, /t/ and /k/ are aspirated when they occur initially in words, but the voiced ones /b/, /d/ and /g/ are not aspirated in the same condition. Those voiced stop consonants are partly voiced in word initial and final positions. Also these stop consonants affect the duration of vowels. The vowels are much shorter before the voiceless consonants /p/, /t/ and /k/ than before the voiced ones /b/, /d/ and /g/ (Higgs and Hodson, 1978). On the contrary, such voiceless consonants have longer duration time than the voiced ones. This is also true for the Japanese stop consonants (Han, 1962). Another general phonological rule about stop consonants in English is that word final stops are usually unexploded when the next words begin with nasal or stop sounds. Thus stop consonants are very much affected by phonological conditions, especially in English, as above. This can be confirmed by physiological researches. According to a research, word-medial voiceless stop consonants have about two times the glottal width and more than two times the posterior cricoarytenoid activity than word-initial voiceless stop consonants (Hirose and Ushijima, 1978).

There are some phonological rules that can be applied to fricative and affricate sounds in English. One of them is that vowels before voiceless fricative or affricate sounds are much shorter than before voiced fricative or affricate sounds just like the cases of stop sound, and final voiceless fricative or affricate sounds are much longer than the voiced ones (Higgs and Hodson, 1978). This phonological rule is also applicable to Japanese. However,

in the cases of Japanese, there are many exceptions of this rule related to the existence of mora (onsetsu). Thus, for example, a fricative consonant /š/ is lengthened by neighboring moras and the duration of /š/ and /šo/ are pronounced as almost same length (Han, 1962). Another very common phonological rule for fricative or affricate sounds is that those sounds are not fully voiced unless the next sound is also voiced. Of course, this is not applicable to Japanese which sound distribution is very much limited.

In Japanese only /n/ can be syllabic among the nasal sounds, but both /m/ and /n/ can be syllabic as well as /r/ and /l/ when they occur at the ends of words in English. Another nasal sound /ŋ/, which exists in both languages, can not occur initially but can occur only within or at the ends of words in both languages.

There are five approximant consonants, /w/, /r/, / j/, /l/ and /h/ (/l/ is also lateral and /h/ is also fricative), in English, but there are only three, /w/, / j/ and /ɪ/ (/ɪ/ is also a flap), in Japanese. The approximants, /w/, /r/ and /l/, are largely voiceless when they follow one of the voiceless stops, the approximant / j/ usually occurs with the restriction that the following vowel is /u/, and the other approximant /h/ usually can occur only before vowels or before another approximant, either / j/ or /w/, in English. In Japanese all the approximant consonants have to be followed by vowels, hence their phonological rules are very much simple.

As we have seen, the phonological rules for consonants are much more complicated in English than in Japanese largely because of the existence of moras in Japanese. The first thing that Japanese learners of English have to do will be to practice to separate individual consonant from vowels in moras (onsetsus).

IV. Suprasegmental Features of English and Japanese

The suprasegmental features (stress, length, tone, juncture and intonation) are important features as well as the segmental features (vowels and consonants) when we describe the languages. When we describe such suprasegmental features, we usually involve more than a single consonant or vowel. In other words, the suprasegmental features are described syllabically or sententially. For this reason, when we try to compare the suprasegmental features of the two languages, we have to know the substances of the syllables of the two languages first.

In English there is no agreed phonetic definition of the syllables. However there are some general agreements about English syllables. First the vowel itself can be syllabic except one case that is an unsterssed high vowel followed by another vowel without having a consonant between them. Secondly combinations of one vowel and one consonant (or consonants) usually constitute syllables. Thirdly the nasal consonants, /m/ and /n/, and also the approximates, /r/ and /l/, can be syllabic at certain positions in words, such as at the ends of words.

In Japanese the definitions of the syllables are much more clear and simple compared to the English ones. However the substance of Japanese syllables are quite fifferent from the English ones, hence it is not really suitable to call such sound sequences, which function as syllables, as syllables. For this reason, each Japanese sound sequence is called "onsetsu" (Japanese) or "mora" (English), as I mentioned earlier in this paper. There are only three types of sound sequence which constitute moras, and each mora corresponds to one writing symbol ("kana" in Japanese). The characteristic of the moras is unique that is each mora has approximately the same duration as others (Han, 1962). Although the Japanese moras have such different substance from the English syllables, they are still the smallest units that can be used to describe about the suprasegmental features of Japanese just like the syllables for the English suprasegmental features.

Since I already have mentioned features of length (duration) of sounds very much earlier in this paper, I will discuss features of stress, juncture and intonation in the two languages (the two languages are not tone languages and need not to be discussed here).

1. Stress

English is usually spoken in a synchopated fashion, that is, it is spoken with an irregualr rhythm and tempo

based on its stress system. A stressed syllable is pronounced with a greater amount of energy than an unstressed syllable and can occur on any syllables depending upon various factors. For this reason, English can be called a stress-timed language (Ladefoged, 1975). According to the researches, the difinition of stress is quite different from the perception of loudness. Almost invariably listeners identify the vowels that were produced with a greater amount of effort, such as /i/ and /u/, as louder than the vowels having greater amplitude but produced with normal effort, such as /a/ and /o/ (Lehiste, 1970). Stresses can occur on syllables in two ways, word level and sentence level, and have some important functions in English. First a stress can be used simply to give special emphasis to a word or to contrast one word with another. Secondly it can indicate syntactic relationships between words or parts of a word. Thirdly it can distinguish compounded nouns from other word sequences. Thus stresses are probably the most important features among the all suprasegmental features in English.

The term "stress" is not used as a suprasegmental feature in Japanese, but a term "pitch accent" is commonly used to describe the stress-like suprasegmental feature of Japanese. The term "pitch accent" is generally defined as an accented pattern which is produced by a pitch change, not by a stress which is usually defined as a change in the amount of energy. For this reason, the term "pitch accent" shows a quite contrast to the term "stressed accent." A rising of pitch occurs in English, but the degree of a pitch change is much greater in Japanese. According to the various researches, pitch accents occur in the standard Japanese (Tokyo dialect) and some other dialects in Japan, but not all dialects. The changing patterns of pitch accent in Japanese can be divided into three types: high to low, low to high and level to level (Kobayashi, 1969). Unlike the stresses in English, the pich accents in Japanese are not that important as a suprasegmental feature. Thus Japanese leaners of English should study the importance of the stressed accents in English which do not occur in Japanese.

2. Juncture

A juncture is generally known as a suprasegmental feature to distinguish a boundary between two words, when they are pronounced as a word sequence. Roughly speaking, a junction can be defined as a brief pause within a sound sequence when we pronounce a paired words. Both English and Japanese have this suprasegmental feature like the most of the language in the world.

3. Intonation

Intonation is generally defined as changes of pitch at sentence level. In English intonation is related to sentence stresses, and the stressed syllables are often pronounced with the highest pitch. In each intonation pattern there is usually a tonic syllable which carries the major pitch change in the utterance (Ladefoged, 1975). Japanese intonation patterns, on the contrary, have fairly different quality from the English ones, largely because its intonation is usually defined as changes of pitch at sentence level, that is to say, Japanese has pitch accents both at word and sentence level. In spite of such difference in quality, the functions of intonation are almost the same in both languages. In general, intonation carries both linguistic and non-linguistic information in the two languages as well as many other languages in the world. Thus, for example, intonation does not change the meaning of lexical items, but it affects the meaning of the whole utterance, like the different intonation patterns we have to use to discriminate questions from statements in our conversation.

V. Conclusion

I have discussed the sound systems of English and Japanese including the suprasegmental features as in above. In this study I have mainly focused on finding the substantial differences between the sound systems of the two languages that will be helpful for teaching of speaking, and much more detailed discussion may be helpful but probably not necessary for that purpose. Too much detailed explanation of the sound systems should cause confusion among language learners, especially at elementary levels, hence, the functional necessity for teaching of the sound systems must exist in teaching of such fundamental differences. Thus, for example, without knowing

the special characteristic of the Japanese sound distribution, that is, the existence of "mora," a learner may not be able to articulate each English consonantal sound in isolation no matter how he/she knows how to pronounce each of those sounds correctly.

As a conclusion of my study here I would like to suggest the following three primary targets to the English teachers in Japan to achieve a great success in teaching of pronunciation:

1) Teaching of the correct articulation of the four vowels, /i/ /æ/ /a/ and /u/, which are in the four corners in the vowel chart knowing the notion of the cardinal vowels suggested by Daniel Jones (Daniel Jones, 1957) — to increase the movement of the lips and tongue is essential to English learners, and this will really help them to pronounce the English vowels correctly.
2) Teaching of the manners to produce the fricative sounds in English — the greatest difference of the English consonants from the Japanese ones exists in this manner of articulation.
3) Teaching of the notion of "stressed accent" which does not exist in Japanese as a suprasegmental feature — stressed accents have very important functions in English.

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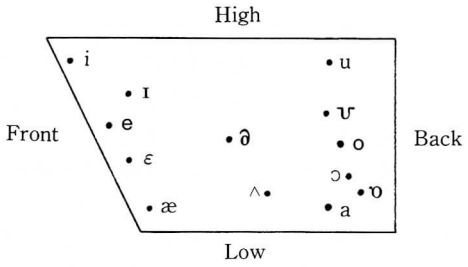
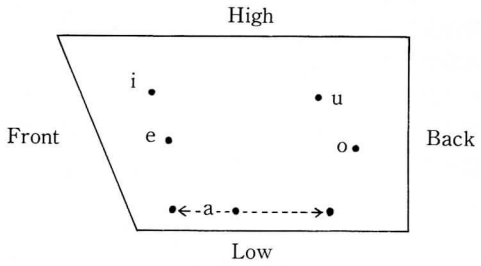
Appendix

1. English Vowel Chart



2. Japanese Vowel Chart



3. English Consonant Chart

manner \ place		bilabial	labiodental	interdental	alveolar	palato-alveolar	palatal	velar	glottal
stop	Vl	p			t			k	ʔ
	Vd	b			d			g	
fricative	Vl		f	θ	s	š			h
	Vd		v	ð	z	ž			
affricate	Vl					č (tš)			
	Vd					ǰ (dž)			
nasal	Vd	m			n			ŋ	
lateral	Vd				l				
approximant (glide)	Vd	w			r		j	(w)	

4. Japanese Consonant Chart

manner \ place		bilabial	dental	alveolar	palato-alveolar	palatal	velar	glottal
stop	Vl	p	t͡				k	ʔ
	Vd	b	d͡				g	
fricative	Vl	Φ	s͡		š	ç		h
	Vd	β	z͡		ž			
affricate	Vl		ts͡		č (tš)			
	Vd		dz͡		ǰ (dž)			
nasal	Vd	m		n			ŋ (ɳ)	
flap (or tap)	Vd			ɾ				
approximant (glide)	Vd	w			j		(w)	

要　　約

近年における日本の外国との貿易の著しい増加は，急速な国際関係の緊密化をもたら，日本社会に話せる英語教育の必要性を痛感させてきているが，学校における英語教育は未だスピーキングに主眼をおいた教育を行なっていないのが実態ある。その理由は，日本の入試制度等，いろいろ考えられるが，英語教師自身がスピーキング教育への第1関門といえる英語音声の発音を教えるのに必要不可欠である言語学上の知識を十分に蓄積していない場合が非常に多いという事もあげられるのではないだろうか。著名な構造言語学者であり且つ外国語としての英語教育における大権威者でもあるミシガン大学のフリーズが言っている様に，正確な英語音声の発音を教育するためには，英語音声と日本語音声を科学的に分析し比較した言語学上の知識，つまり音声学上の知識は絶対不可欠であるといえる。この論文の中では，英語の発音教育において特に重要で且つ役立つと考えられる音声学，音韻論及び超分節要素の基本的な知識を，英語と日本語との音声体系の比較の形で科学的な各種の研究結果に言及しながら検討してみた。

英語の母音については，米国語と英国語間の差異，又，地域的な方言等の変化も存在するのであるが，一般論としては，全体で13種類ある事が広く受け入れられている。これに対して日本語の母音は5種類しかなく，それらは母音表を作ってみると，互いに接近し中央部に集まった形になる。この事は，逆にいえば，日本語の母音が舌の上下及び前後の動きが少ない状態で発音され，結果的に唇の動きも少ない事を意味する。実際に，例えば英語においては舌を最も上方且つ後の方に動かし唇を円形して発する /u/ の音素も，日本語においてはしばしば舌の位置が低いまま，やや後方に舌を動かし平たく緊張していない唇の形で「ウ」と，発音される。以上の事実より，日本人が正しく英語の13種類の母音を発音出来るようになるためには，舌の上下及び前後の動き，そして唇の動きを著しく増加させる事が必要不可欠であるといえる。その他，日本語の母音においては，その長さが英語の場合よりも遙かに重要性をもつ，又，無声の母音が特定の条件のもとで存在する等の特徴が挙げられる。

子音については，子音表を作成して比較してみると，英語と日本語の間にかなりの差異がある事がよく分かる。その差異は摩擦音の部分においてこ顕著で，英語においては使用頻度の高い唇歯部及び舌歯部で発音する子音は，日本語には全く存在していない。この事実より，日本人が英語の子音を正しく発音出来るようになるためには，この摩擦音の発音方法の完全習得という事が，特に重要であるといえる。又，日本語においては，子音は /n/ の音素を除いて常に母音が後にくっつく形でしか発音されず，この音節と，個々の子音の音素との根本的な差異を明確に理解してない限り，日本人にとって英語の正しい発音は出来ない。

超分節要素に関しては，日本語が声調言語，つまり主に音の高低の変化によって意味を伝達する言語であるのに対し，英語はアクセント言語，つまり主に音の強弱の変化によって意味を伝達する言語であるという大きな差異が存在する。この事実より，日本人にとって，正しい英語発音を習得するためには，アクセントの定義及びその英語における重要性を完全に理解する必要がある。

この研究の結論として，日本の英語教師が最重要視しなくはならない次の3つの総括的な重点教育項目を提案する：

1) 英語の母音表の四隅の音素，つまり /i/ /æ/ /ɑ/ /u/ の正しい発音を教育する。これは日本人の唇及び舌の動きを増加させる事に直接結びつく。
2) 英語の摩擦音の正しい発音を教育する。
3) アクセントの定義を正確に教育する。