

Contrastive Analysis of Sound Systems of English and Japanese

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In learning a foreign language, one is inclined to misinterpret its sounds in terms of the phonological category of one's own mother tongue. This paper is intended to predict the difficulties that Japanese learners of English may face, through a contrastive analysis of the sound systems of English (RP) and Japanese, thus helping to some degree in the effective teaching and learning of English in Japan.

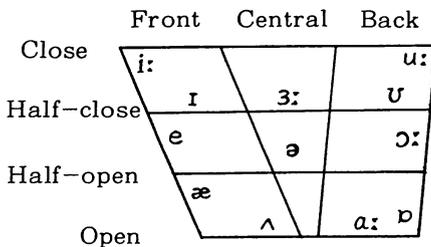
The scope of analysis is to be limited to the segmental phonemes of the two languages. First, we will give the symbols for their vowel and consonant phonemes in diagrams and charts respectively. Then we will describe their syllabic structures, because otherwise the analysis of their segmental phonemes would have little sense for the purpose of this paper. Lastly, we will give a parallel description of their vowels and consonants.

1. Vowel Systems

1. 1 Symbols for English Vowel Phonemes

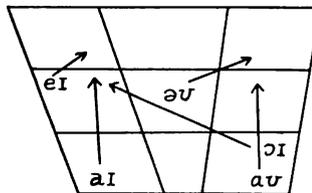
1. 11 Monophthongs

(Diagram 1)

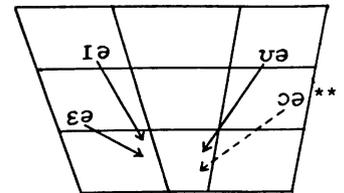


1. 12 Diphthongs

(a) Closing Diphthongs
(Diagram 2)



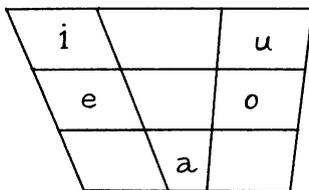
(b) Centring Diphthongs
(Diagram 3)



** According to Gimson, "Many speakers do not possess the distinction *saw/soar*, i. e. pure vowel *ɜ*. diphthong, but use the pure vowel in both cases."⁽¹⁾

1. 2 Symbols for Japanese Vowel Phonemes

(Diagram 4)



Remarks: In Japanese, long vowels and diphthongs are not considered to be mono-syllabic phonemes as in English; but the succession of phonemes which correspond to two syllables. The phoneme which forms the second element of a long vowel can be represented as /H/ ⁽²⁾. Further description of it will be given in 3. 2.

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2. Consonant Systems

Note: The abbreviations used in Charts 1 & 2 stand for the following terms.

B = Bilabial LD = Labio-dental D = Dental A = Alveolar PoA = Post-alveolar
PaA = Palato-alveolar P = Palatal V = Velar G = Glottal

2. 1 Symbols for English Consonant Phonemes (Chart 1)

Manner of Articulation	Point of Articulation								
	B	LD	D	A	PoA	PaA	P	V	G
Stop	p b			t d				k g	
Affricate					(tr dr)*	tʃ dʒ			
Fricative		f v	θ ð	s z		ʃ ʒ			h
Nasal	m			n				ŋ	
Lateral				l					
Frictionless Consonant, or Glide (Semi-vowels)	w				r		j		

* According to Gimson, "In practical teaching it may also be convenient to treat /tr/ and /dr/ as distinctive affricates as well as /tʃ/ and /dʒ/." (3)

2. 2 Symbols for Japanese Consonant Phonemes (Chart 2)

Manner of Articulation	Point of Articulation							
	B	LD	D	A ~ PaA	P	V	G	
Stop	p b			t d		k g		
Affricate				c				
Fricative				s z			h	
Nasal	m			n				
Flap				r				
Semi-vowels					j	w		

Remarks: In Japanese there are two other consonant-type phonemes which form one syllable— 'syllabic nasal' /N/ (4) and 'choked sound' /Q/ (5). Because of the variety of allophones represented by these phonemes, they cannot be included in Chart 2. Further description will be given in 3. 2.

3. Syllabic Structure

3. 1 English Syllabic Structure

The basic pattern of an English syllable is CVC — a closed syllable. It is composed of one vowel with 0 to 3 consonants in the initial position, and 0 to 4 consonants in the final position. Therefore, the maximum possible combination of phonemes within one syllable is CCCVCCCC.

We find some rules in the linking of phonemes within this structure. To give some typical examples;

- (1) /ŋ/ never occurs in the initial position.

- (2) /ʒ/ seldom occurs in the initial position.
- (3) /h/, /w/, /r/ and /j/ never occur in the final position.
- (4) Some fixed patterns are found in consonant clusters.

In spite of such phonotactical limitations, there are so many possible linkings of phonemes in the syllabic structure of English that it is very difficult, if not impossible, to give all its possible syllables. It would be enough to give only an outline here for the aim of this paper.

3. 2 Japanese Syllabic Structure

The basic pattern of a Japanese syllable is CV — an open syllable. Usually it is composed of one vowel with one or two consonants in front and no consonants after it. The only consonant cluster pattern allowed in Japanese is the one in which the second element is /j/ — a semi-vowel.

Japanese has such a simple syllabic structure that it is very easy to give the list of all its possible syllables, as is shown at the right.

The three phonemes shown in capital letters at the bottom of the list, which have been referred to in 1.2 and 2.2, are unique products of the phonological system of Japanese. Here are some descriptions of them.

/ e a o u i	ja jo ju wa /
/ ke ka ko ku ki	kja kjo kju /
/ ge ga go gu gi	gja gjo gju /
/ se sa so su si	sja sjo sju /
/ ze za zo zu zi	zja zjo zju /
/ te ta to /	
/ de da do /	
	/ cu ci cja cjo cju /
/ ne na no nu ni	nja njo nju /
/ he ha ho hu hi	hja hjo hju /
/ me ma mo mu mi	mja mjo mju /
/ re ra ro ru ri	rja rjo rju /
/ pe pa po pu pi	pja pjo pju /
/ be ba bo bu bi	bja bjo bju /

/ H N Q /

/H/ — representing the second syllable of a long vowel, contrasted with the second of two successive vowels; as in

{ /goHku/ [go:kɯ] ‘agony’	{ /meH/ [me:] ‘niece’
{ /gooku/ [go:hoku] ‘five hundred million’	{ /mee/ [mehe] ‘to the eye’

As is shown by the phonetic transcriptions of these words, in the case of the latter word of each pair, the second vowel is followed by [h]⁽⁶⁾ — a slight glottal voiced fricative.

/N/ — representing a syllabic nasal, which has a variety of allophones according to its environment; as in

/koNbaN/ [koɱbaŋ] ‘tonight’	/giNkoH/ [giŋko:] ‘bank’
/oNna/ [oɱna] ‘woman’	/buNi/ [buŋhi] ‘meaning of a sentence’

/N/ — representing a choked sound which forms one syllable. It also has a variety of allophones according to the consonant which follows; as in

/keQkoHdesu/ [kekko:desu*] ‘no, thank you’	{*[ɥ] shows that the sound is devoiced. ⁽⁷⁾
/kaQtoH/ [katto:] ‘conflict’	/iQso [isso] ‘rather’
/geQpu/ [geppu] ‘monthly installment’	/iQcuH/ [ittsu:] ‘one (letter)’

All of them stand only after a vocalic phoneme. From the phonetic point of view, it would be difficult to interpret /N/ and /Q/, which have no vocalic quality, as forming a syllable. They are considered to form a 'phonological syllable'⁽⁸⁾ in the sound system of Japanese.

3. 3 Comparison of Syllabic Structures of English and Japanese

The difference of the syllabic structures of the two languages causes that of the significance of consonants in one syllable. The consonants of a closed-syllable language like English are pronounced with much more force than those of an open-syllable language like Japanese. In the latter case a consonant is so closely linked with the following vowel that the two successive segments are considered to be an inseparable unit. This will cause some possible errors in the pronunciation of segmental phonemes by Japanese speakers of English. They go as follows:

- (1) Vocalic addition may occur after almost all consonants in final positions; as in /maQpu/ [mappu] for *map* /mæp/ [mæp] /kaHdo/ [kaɜdo] for *card* /kaɜd/ [k^haɜd]
- (2) Vocalic intrusion may occur in consonant clusters; as in /pureH/ [puɾeɜ] for *pray* /preI/ [p^hreI] /sutoraiku/ [sɯɾoraikɯ] for *strike* /straIk/ [straIk]
- (3) /Q/ phoneme intrusion may occur between a short vowel and a stop or affricate in a medial or final position; as in /kaQtaH/ [kattaɜ] for *cutter* /'kʌtə/ ['k^hʌtə].

4. Parallel Description of Vowels and Consonants of English and Japanese

Note: In the description below, *Japanese* sound symbols are underlined, as in /e/, to distinguish them from *English* ones, which are not underlined, as in /e/.

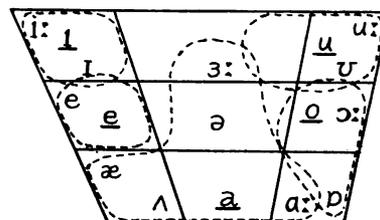
4. 1 Vowels

4. 1 1 Monophthongs

4. 1 1 1 General Tendencies

- (1) Japanese vowels are more centralized in their tongue positions than English ones. Naturally enough, in producing the former, lip moving is not so conspicuous as in producing the latter.
- (2) As remarked in 1.2, a Japanese long vowel is considered to be the same in quality as its short vowel counterpart. This causes interference in the distinction between English long and short vowels.
- (3) A Japanese speaker of English tends to interpret its vocalic phonemes, which are far greater in number than those of Japanese, in terms of the five vocalic categories of his/her own native tongue. They are marked by broken lines in Diagram 5.

Contrastive Positions of English and Japanese Vowels in Terms of the Cardinal Vowel Scale
(Diagram 5)



4. 1 1 2 Description in Detail

- (1) /i/ is closer to /iɜ/ than to /I/ in its tongue raising. Therefore, the replacement of /iɜ/ with /iH/ causes little confusion, while that of /I/ with /i/ causes confusion.
- (2) Articulatorily, the replacement of /e/ with /e/ causes almost no confusion. It is possible, though, to misinterpret /I/ as /e/ auditorily.
- (3) No vocalic phonemes of English are larger in number than those interpreted as /a/. Among them, the replacement of /ʌ/ with /a/ and that of /ɑɜ/ with /aH/ cause little confusion, in terms of their allophonic overlapping. Confusion occurs when /ə/ and /ɜɜ/ are replaced with /a/ and /aH/ respectively and when /æ/ is replaced with /a/. Depending on its preceding consonant, /æ/ is sometimes replaced with /ja/, as in /kjaQto/ [kjatto] for *cat* /kæt/ [kʰæt]. Auditorily, /ɒ/ can sometimes be misinterpreted as /a/.
- (4) /o/ and /ɔɜ/ being almost the same in the degree of their tongue raising, the replacement of the latter with /oH/ causes little confusion, while confusion is caused by the misplacement of /ɒ/ in this category by many Japanese learners. Occasionally, /ʊ/ is auditorily misinterpreted as /o/ in terms of their acoustic similarity in sharing the feature of lip-roundedness. The auditory misinterpretation of /ə/ with /o/ can sometimes occur, too.
- (5) Phonetically, /u/ should correctly be represented as [u], because, in spite of its similarity to /uɜ/ in its tongue position, its phonetic value is fairly different from its English counterpart in terms of its lip-unroundedness and centralization in its tongue position. It lies between /uɜ/ /ʊ/ and /ɜɜ/ in its tongue position, but, partly affected by spelling, /uɜ/ is usually replaced with /uH/, and /ʊ/ with /u/, thus causing confusion. Auditorily, the replacement of /ɜɜ/ with /uH/ and of /ə/ with /u/ can sometimes occur.

4. 1 2 Diphthongs

As remarked in 1.2, Japanese has not the same kind of diphthongs as English ones, which, according to Gimson, are "those which form a glide within one syllable."⁽⁹⁾ Japanese counterparts are considered to be the succession of separate phonemes which form two syllables. Thus, the following replacements occur in the pronunciation of Japanese learners of English.

- (1) Partly affected by the pronunciation of American English, /eɪ/ and /əʊ/ are sometimes replaced with /eH/ and /oH/ respectively because of the proximity of their two elements.
- (2) /aɪ/ /ɔɪ/ and /aʊ/ are replaced with /ai/ /oi/ and /au/ respectively with their two elements pronounced with almost equal length and strength.
- (3) In the same way, /Iə/ /ɛə/ and /ʊə/ are replaced with /ia/ /ea/ and /ua/ respectively.

4. 2 Consonants

We will describe below possible major interferences to be made by Japanese learners on English consonants according to their positions in words.

4. 2 1 Initial Position

- (1) Allophonic Difference in Japanese Phonemes by Palatalization and its Interference
When followed by /i/ /ja/ /jo/ and /ju/, the following Japanese consonantal phonemes are

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phonetically realized as shown below, strongly affected by these palatalized vocalic sounds.

phonemic	/s/	/z/	/c/	/n/	/h/
phonetic	[ʃ]	[dʒ]	[tʃ]	[ɲ]	[ç]

We can predict from this phenomenon the respective replacements of [s] [z] [n] [h] with [ʃ] [dʒ] [ɲ] [ç] by Japanese learners within their /i/ category, though not so prominent actually. What can be replaced with [tʃ] in this category will be mentioned in (3) (a).

The Japanese counterparts of /tʃ/ /dʒ/ and /ʃ/ exist as allophones, though not as phonemes, thus causing little difficulty. /ʒ/ is usually replaced with [dʒ], thus causing some confusion.

(2) Interference Caused by Lack of Japanese Counterparts

- (a) The Japanese phoneme closest to /f/ to be found in Chart 2 is /p/. This replacement, however, is actually improbable. Instead, it is often replaced with [ɸ], which is an allophone of /h/ in the environment of /hu/. /v/ is usually replaced with /b/, thus causing phonemic confusion.
- (b) /θ/ and /ð/ are usually replaced with /s/ and /z/ respectively, thus causing phonemic confusion.
- (c) /l/ and /r/ are replaced with /r/ [ɾ], thus causing serious phonemic confusion.

(3) Interference by Lack of Following Vowels in Japanese Syllabic Table (cf. 3. 2)

- (a) Because of the lack of /u/ and /i/ in the /t/ and /d/ lines, their English counterparts /t/ and /d/, when followed by the /u/ category vowels, are sometimes replaced with [ts] and [dz] respectively. In case they are followed by the /i/ category vowels, the respective replacements by [tʃ] and [dʒ] sometimes occur. In these cases, [ts] [tʃ] and [dz] [dʒ] are allophones of /c/ and /z/ respectively. Recently, however, this kind of confusion has been decreasing among Japanese learners.
- (b) Because of the lack of /e/ /o/ /u/ /i/ in the /w/ line and of /e/ /i/ in the /j/ line, their English counterparts /w/ and /j/, when followed by the vowels of these categories, are often replaced with /u/ and /i/ respectively and are pronounced in most cases as two successive vowels, thus causing some phonemic confusion. The most serious cases are the following.
 - (i) /w/ followed by /u/ or /uz/; as in /uHru/ [uzɾu] for *wool* /wʊl/ [wʊɾ]
 - (ii) /j/ followed by /i/ or /iz/; as in /iHsuto/ [izsɯto] for *yeast* /ji:st/ [ji:st]

(4) Overlapping Area with Little Interference

- (a) /p/ /b/ /k/ /g/ /m/ cause little phonemic confusion.
- (b) /t/ /d/ /s/ /z/ /n/ /h/ cause little confusion except in the cases of (1) and (3) (a).

4. 2.2 Medial Position

In English, consonants can occur in the medial position as clusters, but in Japanese, consonant clusters do not occur except in the special cases mentioned in 3.2, because of the uniqueness of its syllabic structure. Vocalic intrusion and /Q/ phoneme intrusion (cf. 3. 3) are to be referred to as possible interferences caused by this.

The Japanese counterpart of /ŋ/ cannot be found as a phoneme (cf. Charts 1 & 2), but it actually exists as an allophone of /g/ in the medial position for many native speakers of Japanese, including those of the standard Tokyo dialect. They usually replace [g] with [ŋ] in this position; as in /sjuɡaH/ [ʃyŋgax] for *sugar* /'ʃʊgə/ ['ʃʊgə]. This causes some confusion because this contrast is phonemic in English.

4. 2 3 Final Position

Here as well, the consonants of English occur individually or as clustess, while those of Japanese do not occur phonemically except /N/ (cf. 3.2). Vocalic addition and /Q/ phoneme intrusion (cf. 3.3) are to be referred to as possible interferences caused by this.

When Japanese speakers of English pronounce final /n/, its point of articulation is often shifted from the alveolar toward the velar, thus causing confusion with /ŋ/. These two sounds are phonemic in English. while their Japanese counterparts are allophones of /N/.

5. Conclusion

We have attempted this analysis from the phonemic point of view, but actually, because of the variety of allophones caused by the uniqueness of the Japanese syllabic structure, we have been obliged to refer to some phonetic aspects as well; otherwise we could not have produced any meaningful results. This would be an eloquent proof that the basic difference of the two languages lies in that of their syllabic structures.

If we should pursue this problem further, we would go into the domain of suprasegmental phonemes, which remains to be discussed in the future.

Notes

- (1) Gimson, A. C., *An Introduction to the Pronunciation of English* (Third Edition), Edward Arnold. 1980, P. 95
- (2) Kunihiro, T., "Gairaigo Hyooki ni Tsuite (On the Transcription of Loan Words)," *Nichi-Ei Ryooigo no Hikaku Kenkyuu (A Contrastive Study of English and Japanese)*, Kenkyusha, 1963, P. 28
- (3) Gimson, op. cit., P. 152
- (4)(5) Kohmoto, S., *New English Phonology* (Third Edition), Nan'undo, 1971, P. 13
- (6) Umegaki, M., *Bara to Sakura — Nichi-Ei Hikaku-Gogaku Nyuumon (Roses and Cherry Blossoms — An Introduction to a Contrastive Study of English and Japanese)*, Taishukan, 1961, P. 149
- (7) Ohta, A., "Nichi-Eigo no On-Taikai no Hikaku (A Contrast of Sound Systems of English and Japanese)," *Nichi-Eigo no Hikaku (A Contrast of English and Japanese)*, Kenkyusha, 1965, P. 19 & P. 35
- (8) Phonetic Society of Japan, *Onsei-Gaku Dai-Jiten (A Dictionary of Phonetics)*, Sanshusha, 1976, P. 172
- (9) Gimson, op. cit., P. 128