Language Transfer as the Main Factors Influencing Segmental Production Errors

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I. Introduction

The goal of TEFL in sound acquisition

Once the writer wrote in her paper that the teacher of a foreign language needs to know how to get students to pronounce it so that at worst they will be intelligible to native speakers and at best, will not strike them as having 'foreign accent'; and as for the teaching purpose, the intelligibility will be a minimum requirement. In the days when there are many discussions on varieties of English, "Many Englishes," "Multinational Englishes," or "International English," what should the goal of TEFL (teaching English as a foreign language) in pronunciation be? Comprehensibility or communicability to native or non-native English speakers will be the answer. However, this does not mean that the target of TEFL should not be necessarily Anglo-American English, as some sociolinguists and language educators abvocate. As Randolph Quirk argues, "to displace Standard English from the center of attention is to deny learners access to the wider world of international communication." Especially in the TEFL scene in a country like Japan, where there is "little or no legacy of localized English" (Quirk. 1989), Anglo-American English will be the best choice for TEFL on the ground that what-

ever variety of English may be taught, the production will be normally deviated from the norm or colored by the learners' language and culture, and will become one of the many Englishes. In the international communication scene "linguistic chauvinism" (Nakamura. 1989. p. 166—168) should be avoided and varieties or deviation of English should be accepted, but deviation should not be the target language to be taught. The deviation will produce its deviation. The varieties once or twice removed could be barriers for international communication.

The scope of the paper

For an effective TEFL in pronunciation for Japanese speakers, an analytical study of segmental production errors which were detected by the writer in a diagnostic test recorded by Japanese EFL learners with at least six years of English education in Japan behind them will be made, trying to verify that language transfer is the main source of their pronunciation difficulties or errors and that contrastive phonological study can still be indispensable and most important for TEFL. The analysis, therefore, will be preceded by a phonological overview of Japanese language contrasted with English, their target language. English here means General American English, and Japanese, Standard colloquial Japanese.

II. The contribution of linguistics to foreign language teaching

Teaching of a foreign language is a practical science interrelated with many disciplines and various forms of cultural knowledge, and above all linguistics had long been believed to contribute most to TFL with the

common object, "language," till 1970's. Linguistics since 1970's has been in the direction of language universal and, according to Minoru Yasui, linguistics which can contribute to TFL is that of before 1970. As written above, TFL is not a theoretical but practical discipline and should adopt whatever is helpful to attain its aim. Linguistics has offered an ordered and systematic concept of language and language learning, providing the base for TFL, in the form of contrastive analysis. Contrastive analysis was developed based on the following hypotheses:

1. Language transfer or interference causes difficulties in learning foreign language.
2. Learning difficulties could be predicted by contrastive analysis of learners' mother tongue and their target language.
3. Teaching materials should reflect the results of the contrastive analysis so that negative language transfer can be minimized.(Longman. 1985. p. 81)

"The claims made by Lado and Fries about the predictive power of contrastive analysis and about the relation between first and second language acquisition faced serious challenges by the 1970"... In other words "empirical research was beginning to show that learning difficulties do not always arise from cross-linguistic differences and that difficulties which do arise are not always predicted by contrastive analyses."(Odlin. 1989. p. 17) According to Odlin some extremists denied the long accepted credibility of contrastive analysis and language transfer which was considered quite important factor in foreign language learning in 1950's began to wane in 1960's, while in the recent years, however, the signif-

icance of the language transfer has been reconsidered. With years of experiences in TEFL and some in TJFL, the writer has believed or rather felt the native language interference in FL learning difficulties, especially native language phonetics and phonology seem to have strong negative influence. Oldin appropriately comments that "viewing transfer as the single most important reality of second language acquisition is clearly risky — though no more so than viewing transfer as a negligible factor in acquisition." (Oldin. p. 151) For an effective TEFL, together with contrastive analysis of learners' and target languages, analysis of the learners' production errors to see the native language interference and other factors will be helpful. The main difference between teaching a native language and teaching a foreign language is the fact that the unconscious learning part of native language learning must be made conscious. According to Charles C. Fries, the mastery of the sound system belongs to the unconcious learning part, and as the advocate of a critical age in mastering the sound system of a second or foreign language tells, it seems a difficult aspect of a foreign language to master. Therefore, native language transfer will probably be seen more significantly in pronunciation.

Ⅲ. Phonological overview of Japanese language contrasted with English

General view

The sound system of two languages are never the same. In the segmental phonemes, suprasegmental phonemes, or distribution rules, English and Japanese are not the same.

Some observation and impressions about Japanese sounds by other language speakers tell us some characteristics of the sound system of Japanese. Basil Chamberlain described (1898) Japanese pronunciation as being much less broad and less heavy than English and having very little or no tonic accent with only a slight rhetorical accent. He also pointed out much less movement of mouth, tongue and jaw, and showed his measurement of the distance between corners of mouth, between edges of teeth, and between upper and lower lips when similar vowel sounds are pronounced in Japanese and American English. (Kimizuka. 1968. p.45) Father Glotas, who had been engaged in missionary work in China before he came to Japan, expressed his first impression of Japanese sounds as 'monotonous machine gun like sounds. '(Kindaichi. 1969. p. 63) Ryoko Nakatsu made interesting discoveries. In her *Nande Eigo Yaruno? (Why Do We Learn English?)* She states that Japanese students of English have to learn the abdorminal breathing first. Their explosive consonants of English are very weak; their stress accent is not strong enough to produce English rhythm. Japanese has tendency to avoid using lips and Japanese sounds can be produced without opening the mouth wide, nor making the lips spread or round.

The above statements tell us that the sounds of both English and Japanese differ in breathing, manner of articulation, accent and rhythm as well as the phonemic patterns and structure. The difference in rhythm between Japanese and English is strikingly noticeable. According to Pike's term, Japanese has syllable–timed rhythm, while English has stress–timed rhythm. In Japanese almost each syllable is pronounced with the same durational time and all the vowels are pronounced clearly. Unlike English there is no tendency for the unstressed vowels to become schwas. Strictly

speaking, 'mora' is the smallest time unit and constructs the base for the rhythm system of Japanese. For the time unit ONSETSU will be used here. Accordingly, Japanese has ONSETSU–timed rhythm. The structure of ONSETSU is simply formulated in one of the four types: I. one vowel (V), II. one consonant (C), III. one consonant and one vowel (CV), IV. one consonant, /y/, and one vowel (CyV). Comparing with the English rhythm unit, much less speech productive activity takes place per rhythm unit in Japanese. It is reported that the number of Japanese ONSETSU in one minute is 310, while that of English is 220. (Kindaichi. 1969. p.66) Such a simple and short ONSETSU–timied mora gives the English speakers the monotonous, machinegun like impression. Obviously it is not simple task for the Japanese speakers to master English rhythm pattern or vice versa.

Except the syllables of syllabic consonant, Japanese syllables are open syllables. In other words, there is little consonant clusters, while typical type of English syllable is a closed one and rich in consonant clusters. It may be said that Japanese language is rich in vowel clusters. This difference in the syllable structures of both languages is one of the most difficult points for Japanese speakers to learn English or vice versa.

Inventory of sounds: phonemes

The inventory of Japanese and English sounds are not in one–to–one correspondence. Besides, the relative value of the sounds within the structure and system of the languages is different. To master the strict phonetic representation of foreign language sounds is not easy, rather next to impossible task. However, as far as intelligibility concerened, you will be understood if you pronounce foreign sounds within the frame of phonemes. In other words the students have to grasp the distinctive fea-

tures of each phoneme of the target language.

According to Lehmann, in phonemic approach to analysis of sound system there exists some contradiction caused by the dual criteria for classification of sound classes; that is, a criteria based on phonetic characteristics and the one based on distribution and relationship of the sounds in the language system. As he states, however, as long as the analysis incorporate all the data and as long as their results correspond to the reactions of native speakers, phonemic systems may vary in details like the interpretation of vowel nuclei in English. (Lehmann. c1972)

About the validity of autonomous or taxhonomic phonemic approach transformationalists are dubious. They reject the notion of a phonemic level and the taxhonomic phonemes, because phonemes are not abstract enough as "systematic phonemes'. For the foreign language teaching purpose, however, taxhonomic phonemes approach is useful. Besides, even though the theoretical base of autonomous and systematic phonemics is different, the phonemic representation is alike in many cases.

Depending upon the criteria used in the grouping of the phones into phonemes, various numbers of Japanese phonemes have been suggested : for example, Bernard Bloch suggests 29, including palatalized nasal, glottal stop and boundary phonemes ; Han Mieko and Tanaka 23 ; Hattori, Ohta, and Young, 20. When the analysis is based upon distribution or relationship of the sounds in the language, the number of Japanese phonemes will be 19 or 20 ; when it relies upon the phonetic characteristic, the number of phonemes become larger than the other case. The difference in the number of Japanese phonemes mainly comes from the way you handle the palatalized consonants and syllabic consonants. Whichever classification you may adopt, you will be easily able to convert one classi-

fication into another. In the writer's opinion classification based on distribution explains the sound system and patterning of Japanese language better than the other. It is also convenient and easy for the language learners to learn writing system and grammar of Japanese. Japanese phonemes established by the writer will be twenty–one as S. Kohmoto suggests in his *New English Phonology* (1969) : five vowels and sixteen consonants, including syllabic nasal /N/ and syllabic consonant /Q/ — /a, e, i, o, u, p, t, k, b, d, g, s, z, m, n, r, h, w, y, N, Q/

Japanese phones; phonetic representation of phonemes

Consonants

	bi-labial	dental	alveo-lar	alveo-palatal	pala-tal	velar	uvular	glottal
stop	p b	t d				k g		ʔ
affri-cate			ts dz		tʃ dʒ			
frica-tive	ɸ (β)(1)	s z			ç			h
nasal	m m'(2)	n				ŋ ŋ'(2)	n'(2)	
flap			ř					
glide	w			y				

(1) [b] is not strong enough in explosion unlike English; it often becomes [β]

(2) [m', ŋ', n'] means syllabic [m, ŋ, n]

Vowels

	front	central	back
high	i i̥(1)		ɯ ɯ̥(1)
middle	e		
low		a	o

(1) [i̥, ɯ̥] means devoiced [i, ɯ]

Japanese phonemes established

Consonants

	bi-labial	dental	alveolar	alveo-palatal	velar	glottal	sylllabic
stop	/p/ /b/	/t/ /d/			/k/ /g/		
fric-ative		/s/ /z/				/h/	
nasal	/m/	/n/					/N/
flap			/r/				
glide	/w/			/y/			
syllabic consonant /Q/							

Phonological rules

A. Sound rule: C → palatalized [C̃] / —/i, y/

All the consonants are more or less palatalized bafore the phonemes /i, y/. As the two glides /w/ and /y/ are not distributed before /i/ and /y/, the consonants here means, "except the glides." Because of this rule, /ʃ, dʒ, tʃ/ are not classed as phonemes. Japanese syllables are all pronounced with the same duration (CyV, CV, V, C) ; and Cy becomes palatalized one consonant [C̃]. This phenomena is especially remarkable in /si, sya, syo, syu/, /ti, tya, tyo, tyu/, /hi, hya, hyo, hyu/, and /zi, zya, zyo, zyu/. Their phonetic representation becomes [ʃi, ʃa, ʃo, ʃu], [tʃi, tʃa, tʃo, tʃu], [çi, ça, ço, çu] and [dʒi, dʒa, dʒo, dʒu]. Comparing with English sounds, the lip rounding is smaller in Japanese [ʃ, tʃ, dʒ].

B. Distributional rule:

/w/ occurrs only before /a/

/y/ and /t, d/ occur only before /a, e, o/

C. Allophones

i. /p, t, k/ → aspirated / # — V

Though the aspiration is very small amount compared to English aspiration in # — V

ii. /b, d, g/ are fully voiced and their explosion is far weaker than English. When they are in the environment of V — V they sometimes become fricatives.

iii. /z/ → [z], [dz] — They are not in contrast but in free variation in most cases. For some people they are in complementary distribution: [z] in V—V ; [dz] in # — V and /ñ/—V

iv. /z/ → [z] or [dz] / —/a, u, e, o/
→ [ʒ] or [dʒ] / —/i, y/ ([dʒ] is more common)

v. /h/ → [ç] / —/i, y/
→ [ϕ] or [h] / —/u/ (They are in free variation. [ϕ] is more common.)
→ [h] / —/a, e, o/

vi. /d/ → [dʒ] or [ʒ] / —/i, u/ (They are interchangeable. [dʒ] is more common.)
→ [d] / —/a, o, e/

vii. /t/ → [tʃ] / —/i, y/
→ [t] / —/a, o, e/
→ [ts] / —/u/

viii. /g/ → [g] / # — (Some people use [g] in all places]
→ [ŋ] / other places

ix. /N/ → [m'] / —/p, b, m/ (Syllabic nasal is assimilated and
→ [n'] / —/t, d, z, n, r/ becomes one of the three.)
→ [ŋ'] / —/k, g/

Japanese Phonemes established

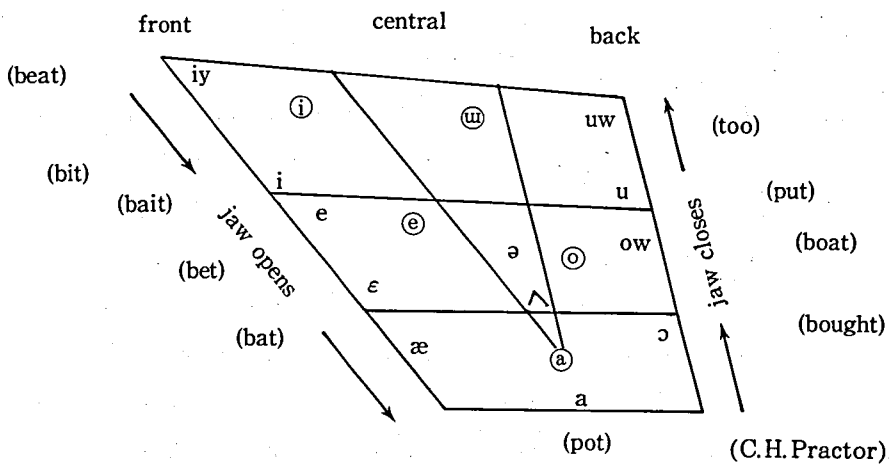
Vowels

	front	back
high	/i/	/u/
mid	/e/	/o/
low	/a/	

Voiceless vowels are allophones of the voiced counterparts. They don't contrast, and the occurrence of unvoicing can be predicted by phonological conditions.

Comparison with English vowels

(Japanese vowels are circled)



Comparing with English vowels Japanese five vowels can be produced without moving the tongue neither too high nor too low in the mouth cavity. They can be produced without opening the mouth very wide nor making the lips spread or round. Apparently they do not correspond exactly to the English vowels. We can predict here the difficulty for Japanese speakers to learn English vowel pronunciation. For the teaching purpose, two features of the Japanese vowels will be discussed: unvoicing of vowels and vowels in sequence, including long vowels.

Unvoiced vowels are the vowels during the articulation of which the

position of the glottice not closed. (M. Han. 1961) It may be important to notice that the native speakers of Japanese are unaware of the phenomena of unvoicing till foreigners mention it. Voiceless vowels are allophones of the voiced ones because phonological rules can predict their occurrence. It occurrs between voiceless consonants in low pitch, or voiceless consonant and word boundary. According to Han's measurement of the relative duration of the five vowels on the sound spectrograph is as follows :

	/u/	/i/	/o/	/e/	/a/
mean value	1.00	1.17	1.26	1.37	1.49

That is, /u/ is the shortest, then /i/, and /o,e,a/ follow in order. This durational order explains why /u/ and /i/ are more readily devoiced in certain environments than the rest of the vowels. The fundamental factors which affect the phenomena of unvoicing are: duration of vowels, tempo, pitch, accent, and neighboring sounds. According to Han's observation, the shorter the vowel duration is, the more readily unvoicing occurrs ; and /a, e, o/ are not unvoiced at normal tempo. /u/ is more readily umvoiced than /i/. As for tempo, unvoicing generally occurrs in rapid speech. As written above, unvoicing occurrs between voiceless consonants. The vowel between voiceless consonants is shorter than the vowel between voiced consonants, because the duration of voiceless consonants is longer than that of voiced consonants. Applying Han's classification of Japanese consonants by their potential duration measured on sound spectrograph we can see the durational relationship of them. (The smaller digit means longer in length)

Class 1 /p, t, k, s/

2 /z, h/

3 /b, d, g, m, n/

4 /w, y/

Voiceless consonants which affect unvoicing are /p,t,k/ and /s,h/.

There is no diphthongs nor triphthongs in Japanese language. The typical syllable structure of Japanese is open syllable and single vowel can be a syllable by itself, and therefore, a vowel can be followed by another vowel. Each vowel should be pronounced clear and even in length. Long vowel of Japanese can be regarded as the same two vowels in sequence and is counted two morae. It will be natural that Japanese speakers should have trouble in English diphthongs or triphthongs.

Though it may not to do with communicability, the writer would like to mention some characteristic of Japanese voices which gives to their English sound 'peculiarity' she has long noticed. In his "Characteristics of Japanese Voices compared with Westerners'" (1984), K. Tateno examines Japanese speaking voices from the eight phases : throat, mouth and throat, timbre, beginning, inspiratory noise, resonance, when uttering loud voice, and expiratory pressure, and he concludes that Japanese speaking voice is essentially noise, while that of Westerners is tune. According to his research, one most distinctive cause of Japanese speaking voice is their choked throat, while Westerner's throat is relaxed. Excess tension or unnatural tightness at the throat gives unnatural tension to the tongue root and makes it hard and raised high and the throat is narrowed. The Japanese, especially eastern Japanese, have got into this voicing habit since their childhood. Together with the tight throat, another most distinctive feature is not-opened mouth and throat. In Westerner's speech mouth and throat are open, tongue root lowered and flat or grooved. Japanese can speak even with clenched teeth. According to Dr. Tateno the lower jaw bone joint of the Japanese is physically stiff and inflexible, and this could

be both the cause and result of their not–opened mouth and throat. These two features are the basis of the characteristics of the Japanese speaking voice. As to expiratory pressure he states the muscular strength and flexibility of the race have a lot to do with their expiratory pressure ; the muscular stiffness or inflexibility of the Japanese is a medical theory. The above observations will explain some production difficulties of English vowels and others.

IV. An analytical study of segmental production errors

A Diagnostic test

Though pronunciation instruction has to cover both segmental and suprasegmental phonemes, the study here deals only with segmental production, consonants and vowels, because of the limitation in time and analysis technique of the data recorded by the same learners.

The diagnostic test used here is from H. G. Grate's *English Pronunciation Exercises for Japanese Students*, "the product of eight year's experience with Japanese students," and its objective is "intensive practice in English Pronunciation, focusing on those sounds which most frequently present difficulty for Japanese students." (Grate. c1974. p.i) The testing procedures are as follows :

The recording assignment was given as a take-home task to thirty-eight college freshmen, sixteen females and twenty-two males, with at least six years of English education in Japan behind them. They are non English majors, but are supposed to have interest in English sounds : listening comprehension training and pronunciation.

Having limitation as a non-native speaker of English, the writer had

to listen to all the tapes five to ten times each to make judgments of the recorded items. The same process was repeated three times to take an average. The number of students whose errors are more than seventy-five per cent was counted.

The test data was rearranged in order, with smaller digit meaning larger number of errors.

Diagnostic Test (1)

	Consonants (2)					Errors		Descriptions of errors
						Students (3)	%	
1	[l/r] : initial	lay ray	lush rush	leap reap	load road	10	26	[l]→[r] [r]→[l] [r]→[ɾ] (4) [l]→palatal flap, ([ey]→[ay], [aw]→[ɔ])
2	[l/r] : medial	belly berry	stealing steering	pilot pirate	tally tarry	17	45	ll, rr → [ɾ] [r] → [l] [l] → [r] or [ɾ]
3	[l/r] : final	pool poor	fail fair	tile tire	owl our	13	34	[l] → [lw] / —# [r] → [ə] / — #
4	[l/r] : clusters	bleed breed	clam cram	glow grow	flock frock	34	89	Inserted vowel [ɯ] or [ə] before [l] and [r] Breathing of initial consonant is too weak.
5	[k] : final (unaspirated)	shack	ache	book	sock	28	74	Too much aspiration [k]→[kʰ] / — # Inserted glottal stop [k]→[ʔkʰ] / [æ,a,u]—#
6	[g] : final (unreleased)	egg	bag	pig	dog	20	53	Too much aspiration [g]→[gʰ] / — # [g]→[gw],[ʔg],[ʔgʰ],[ʔgw],[ʔk],or[ʔkʰ] / — #
7	[p] : final (unreleased)	keep	soap	top	up	15	39	Too much aspiration ; added vowel [ɯ] ; added glottal stop [p]→[pʰ], [ʔpʰ], or [ʔpɯ] /— #

(1) From Grate, Harriette Gordon : *English Pronunciation Exercises for Japanese Students. Regents. c1974.*
(2) Consonants are represented by IPA.
(3) The number of studens whose errors are more than 25%.
The total number of students is 38 ; female and male college freshmen, non−English major.
Errors here mean those of only the Items intended in each column ; other errors are not counted here.
(4) [ɾ] means flapped [r]

8	[b]: final (unreleased)	tub	cab	ebb	fib	6	16	with aspiration
9	[t]: final (unreleased)	note	eight	might	got	24	63	Tend to be released [tʰ]
10	[d]: final (unreleased)	shed	made	odd	sad	11	29	released [dʰ] or [d]→[t] / — # added vowel [ə] ([d]→[də] / — #)
11	Unreleased stops before consonants	necktie tugboat	napkin rubdown	football redcoat	lockjaw dragnet	27	71	No stop or plosive like Japanese eguivalent. Inserted vowel: [nekɯtay], [næpɯkin̩]
12	[kit/kt]: final	packet pack	bucket bucked	ticket ticked	pocket pocked	21	55	glottal stop before stop: [kit]→[kiʔt], [keʔt], [ʔkiʔt] or [keʔtʰ] devoiced vowel: [kit]→[ki̥t] [kt]→[ʔktʰ] [ʔkid], or [ʔked]
13	[t/d]: suffixes	backed bagged	mopped mobbed	raced raised	searched surged	11	29	inserted and added vowels: [d]→[id], [eʔd], [də] or [dɯ] / — # [t] with too much explosion
14	[t/d]: flap	biting biding	mutter mudder	heated heeded	coat it code it	27	71	much aspirated, released [t,d] between vowels: either before an unstressed vowel in the same word or at the end of a word before a vowel in the same phrase.
15	flap/[r]	catty carry	medic Merrick	Betty berry	paddy parry	20	53	rr → flapped [r] ([ɾ]) [t] flap → [ʔtʰ]
16	[d/r]: unstressed prefixes	detain retain	deject reject	devise revise	demote remote	4	11	Prefix [də]→[de]; [r] in prefix is close to [d] [rə] → [re], [ri], or [ré], [rí]

17	[h/f]:initial	who'd food	halt fault	her fur	horse force	19	50	[h]→[f], [ϕ] /— [u], [ɔ] [f]→[ϕ], [h] /— [ɔ]
18	[hw/f]:initial	whit fit	whether feather	whine fine	wheat feet	27	71	Tight lip rounding is missing in [hw] ; [f]→[ϕ]; [hw]→[ϕ], [ho] (whit→[hoi?t])
19	[f/v]:initial	fan van	fear veer	few view	fine vine	15	39	[f]→[ϕ]; [f]→[h] in few; [f]→[fɯ] in fine ; [v]→[b] or plosive in stead of fricative
20	[f/v]:final	leaf leave	half have	waif wave	proof prove	13	34	[v]→[b] or plosive added vowels : [v]→[və], [vɯ] /— #
21	[b/v]:initial	best vest	boat vote	buy vie	bays vase	12	32	fricative[v] becomes plosive ; weak breathing in [b] / # — [t]→[ts] /— # (in best, vest)
22	[b/v]:medial	fiber fiver	saber savor	curbing curving	gabble gavel	21	55	Too much biting in[v] and sounds like plosive; Added vowel : [vi]→[vɯi], [bl]→[bɯlɯ] [b]→fricative between vowels
23	[b/v]:final	jibe jive	dub dove	Gibb give	ebb Ev	16	42	[v]→[b], Plosive; [b], [v]→much released /— # Added vowels [ə]or[ɯ]after[v], [b] /— #
24	[v/w]:initial	vent went	vein wane	vault Walt	vise wise	18	47	[v]→plosive probably because of too much biting [w]→[ɯ] (tight lip rounding is too little or missing
25	[w/hw]:initial	witch which	wet whet	were whir	wine whine	24	63	[w] and [hw]→[ɯ] (with little lip rounding) [hw]→[hoɯ], [hɯɯ], or [øɯ] : whine→[hoɯayn], whet→[hɯɯe?t]
26	[wu]	wood	wool	woman	wolf	35	92	[wu]→[u], [ɯ], [ɯ:] ([w] is missing): wood→[ɯ?d]

27	[w] : clusters	dwell	swan	quake	twin	31	82	No tight lip rounding : [w] sound is missing Added vowels [o], [u], or [ɯ] before [w]
28	[si/ʃi]	sip ship	sill shill	sin shin	simmer shimmer	28	74	[si]→[ʃi], [ʃi]→[si] (Both are unstable) [ʃ] is weak, with little lip rounding [si]→[siy] ; [si]→[sɯi] ; sip = ship = [ʃip]
29	[siy/ʃiy]	see she	seat sheet	seep sheep	seen sheen	25	66	[siy]→[ʃiy] [siy]→[si] (with tongue a little lower)
30	[hi/ʃi]	hip ship	him shim	hill shill	hint shin	12	32	[hi]→[hiy] [ʃ]→[s]
31	[hiy/ʃiy]	he she	heap sheep	heat sheet	heed she'd	16	42	[ʃiy]→[siy] she'd→[ʃed] (because of the spelling ?)
32	[ʃ/ʒ] : medial	mesher measure	Asher azure	vicious vision	Haitian Asian	12	32	[ʒ]→[z] in azure ; [ʒ]→[dʒ] in vision, measure ; [ʃ]→[s] in vicious ; mesher→[meʔʃər] ; asher→[ʌʔʃər]
33	[z/ʒ] : medial	fusing fusion	visit vision	using usual	closing closure	15	39	[z]→[ʒ] /— [i] (visit→[viʒit]) [ʒ]→[dʒ]
34	[ʒ/dʒ] : medial	lesion legion	Asian aging	version virgin	visual vigil	36	95	[ʒ]→[dʒ], [z] [dʒ]→[z], [ʒ] / — [i]
35	[tʃ/dʒ] : initial	chest jest	choke joke	chain Jane	chump jump	1	3	[dʒ]→[ʒ] in jump
36	[tʃ/dʒ] : final	etch edge	march Marge	catch cadge	perch purge	4	11	Added vowels [i] or [ə] : [dʒ]→[dʒi], [dʒə] / — # [dʒ]→[ʒ], [dz] ; [tʃ]→[ʔtʃʰ]

37	[t/tʃ] : initial	tin chin	tease cheese	too chew	tier cheer	5	13	[tʃ]→[ts] ; initial aspiration lacks [t]→[tʃ] /— [i] (in tin, tease)
38	[d/dʒ] : initial	din gin	deep jeep	deuce juice	dear jeer	12	32	[dʒ]→[ʒ], [z] ; aspiration is needed [d]→dental plosive
39	[d/z] : initial	dip zip	dean Zena	do zoo	dear zero	18	47	[d] needs aspiration [z]→[ʒ] /—[i] [z]→[dz] /—[u]
40	[ð/z]	then Zen	than zander	withered wiz ard	scythe size	19	50	[ð]→Plosive instead of fricative ; [ð]→[d] / # — ; [ð]→[z]/— # and medial ; [z]→[dʒ] ; vague distinction between [ð] and [z]
41	[ð/d]	they day	those doze	heather header	bathe bayed	18	47	[ð]→[z], [d] ; [ð]→[zɯ] /— # bathe→[beys] ([ð]→[θ]→[s] ?) initial [d] needs aspiration
42	[ð/θ]	thy thigh	that thatch	either ether	teethe teeth	17	45	[ð]→[z], [d] ; [θ]→[s] [ð]→[θ] in teethe (misconseption ?) [θ]→[z] in teeth ([θ]→[ð]→[z])
43	[ʃ/θ] : initial	Shaw thaw	shirred third	shy thigh	shorn thorn	16	42	[θ]→[s] misconception : [θ]→[ð] in thorn ; [θ]→[t] in thigh ; [θ]→[ʃ] in thaw
44	[t/θ] : initial	tug thug	tank thank	tie thigh	toad Thoden	12	32	[θ]→[s] [θ]→[z] ([θ]→[ð]→[z] in thigh) [θ]→[t] in thug
45	[s/θ] : initial	sigh thigh	saw thaw	sink think	sunder thunder	14	37	[θ]→[s] in think [s]→[ʃ] /— [i] (in sink) [θ]→[ʃ]

46	[s/θ]:final	mass math	tense tenth	face faith	niece neath	17	45	[θ]→[s] ; [s]→[θ] (influenced by its pair word ? [s]→[sɯ] /— #
47	[s/z]:final	dose doze	peace peas	ice eyes	face faze	3	8	[z]→[s], [dz], [zɯ] /— #
48	[s/z]:suffixes	safes saves	picks pigs	oats odes	bets beds	5	13	Inserted vowels: [s]→[ɯs],[os],[es]/ e— # [z]→[oz], [ez] / d— # Added vowels [ɯ] after [s] or [z] /— #
49	[s]:final clusters	gifts	acts	costs	asks	3	8	Inserted and added vowels : [ts]→[tɯs], [tis], [təs] /— #
50	[iz]:suffix	sizes	guesses	dishes	matches	1	3	[iz]→[iyz]
51	[n/m]:final	then them	bean beam	gain game	dine dime	6	16	[n]→[n'] [m]→[mɯ] /— #
52	[n/ŋ]:final	fan fang	win wing	stun stung	kin king	15	39	[n]→[n'] /— # [ŋ]→[ŋg], [ŋgɯ] /— #
53	[g/ŋ]:medial	bagging banging	swigging swinging	gagster gangster	digger dinghy	28	74	[g]→[ʔg] /— gg — [ŋ]→[ŋg] ; [g]→[ŋgɯ] /— #
54	[g/ŋ]:final	wig wing	lug lung	sag sang	hug hung	20	53	[g]→[gʰ], [k], [gɯ] /— # [ŋ]→[ŋg], [ŋgɯ] /— #
55	[g/ŋg]:medial	hugger hunger	figure finger	bigger bingo	juggle jungle	16	42	[g]→[ʔg] /— gg — [ŋg]→[ŋ] [ŋgl]→[ŋɯl], [ŋgɯl], [ŋgɯlɯ]
56	[ŋ/ŋg]:medial	flinger finger	tangy tangle	youngish younger	dinghy dingle	37	97	[ŋ]→[ŋg] ; [ŋg]→[ŋ] (unstable) [ŋgl]→[ŋɯl] ; [ŋgɯlɯ]

Vowels (1)								
1	[iy/i]	eat it	bead bid	keen kin	peek pick	18	47	[i]→[iy] [i]→[iʔ] /— stop [t, d, k] [iy]→ wavy tone
2	[i/e]	itch etch	chick check	miss mess	bid bed	16	42	a little higher tongue position in [i] and [e] ; [i]→[iʔ] [e]→[eʔ] /— voiceless stop
3	[ey/e]	age edge	stain sten	wait wet	chase chess	3	8	[ey]→[e • i] instead of diphthong [e]→a little higher in tongue position [e]→[eʔ] before plosive or affricate
4	[ey/æ]	aim am	fate fat	pace pass	main man	15	39	[æ]→[ʌ], [ə], [a] Too much glottal stop before [æ] / # — Too much front tongue position in [æ]
5	[æ/e]	and end	pack peck	ham hem	sat set	14	37	[æ]→[ʌ], [ə] ; [e] is a little higher in tongue position ; [æ] need a little more sound length
6	[æ/a]	add odd	hat hot	jab job	band bond	14	37	[æ]→[ʌ], [ə], [ʔæ] little distinction between [æ] and [a] ; [a]→[ə], [ʌ], [ɔ] (jaw is a little high)
7	[æ/ʌ]	ankle uncle	mad mud	back buck	staff stuff	15	39	[æ]→[ʌ] (with higher jaw) [ʌ]→[ə], [æ], [a] /æ/→[ʔæ]/#— ;/æ/→[æʔ]/—stop or—ff

(1) Vowels are based on the Trager–Smith system.

8	[ʌ/a]	utter otter	duck dock	nut not	sub sob	23	61	[ʌ]→[a], [ə], [æ] (little distinction between them) [a]→[ʌ], [ə], [æ], [ɔ] (jaw is higher) [a] needs a little more sound length
9	[ʌ/e]	hum hem	muss mess	chuck check	bug beg	13	34	[ʌ]→[ə] [e]→a little high tongue position [ʌ]→[u] when the spelling is "u"
10	[ow/a]	own on	hope hop	goat got	soak sock	14	37	[ow] needs lip-rounding ; [ow]→[o] [a]→[ə], [ʌ], [ɔ]
11	[a/aw]	otter outer	fond found	shot shout	pond pound	22	58	[a]→[ʌ], [ɔ] (jaw should be lower) [aw]→[ow] (Probably because of the spelling) needs more rounded lips
12	[ow/aw]	hoe how	no now	tone town	coach couch	9	24	[ow]→[o], [or] [aw]→[ow] in "couch" (misconception)
13	[ow/ɔ]	so saw	coast cost	boat bought	woke walk	17	45	[ɔ]→[oɯ] (jaw is high) little distinction between [ow] and [ɔ]
14	[ɔ/a]	hawk hock	dawn Don	caught cot	yawn yon	25	66	[ɔ]→[oɯ] [a]→[ʌ], [ə], [ɔ] little distinction between [ɔ] and [a]
15	[ɔ/ʌ]	song sung	long lung	chalk chuck	fawn fun	23	61	[ɔ]→[oɯ], [or] (higher jaw ; lip rounded) [ʌ]→[ə], [æ], [a] ; [ʌ]→[u] when spelled "u"
16	[ʌ/u]	tuck took	buck book	stud stood	shudder should	12	32	[ʌ]→[ju] when spelled "u" [u] need more lip rounding
17	[ɔ/or]	Shaw shore	sauce source	fought fort	pause pores	27	71	[ɔ]→[oɯ] ; [or]→[oɯ], [oə] lip rounding in [ɔ] ; [ɔ] and [or] sound simillar when [or] is [r] less

18	[ɔ/ər]	saw sir	walk work	toss terse	cost cursed	26	68	[ɔ]→[oɯ] (jaw is higher) [ər]→[ar] (jaw is a little lower) [ər] varied probably because of the spelling
19	[ər/or]	herd hoard	turn torn	shirt short	worm warm	24	63	[ər]→[ar] (jaw is lower) [or] varies probably because of the spelling ; [or]→[ar], [oə], [oɯ]
20	[a/ar]	hot heart	dock dark	shop sharp	God guard	23	61	[a]→[ʌ] ; [ar]→[ər] jaw is higher in the both vowels
21	[ar/ər]	far fur	barn burn	hard heard	cart curt	19	50	No or little distinction between [ar] and [ər]; jaw is higher in [ar] and lower in [ər]

Error Frequency

Consonants

order		%	order		%	order		%
1	[ŋ/ŋg]: medial	97	20	[h/f]: initial	50	39	[b/v]: initial	32
2	[ʒ/dʒ]:medial	95	20	[ð/z]	50	39	[hi/ʃi]	32
3	[wu]	92	22	[v/w]: initial	47	39	[ʃ/ʒ]: medial	32
4	[l/r]: clusters	89	22	[d/z]: initial	47	39	[d/dʒ]: initial	32
5	[w]: clusters	82	24	[ð/d]	47	39	[t/θ]: initial	32
6	[k]: final (unaspirated)	74	25	[l/r]: medial	45	44	[d]: final (unreleased)	29
6	[si/ʃi]	74	25	[ð/θ]	45	44	[t/d]: suffixes	29
6	[g/ŋ]: medial	74	25	[s/θ]: final	45	46	[l/r]: initial	26
9	Unreleased stops before consonants	71	28	[b/v]: final	42	47	[b]: final (unreleased)	16
9	[t/d]: flap	71	28	[hiy/ʃiy]	42	47	[n/m]: final	16
9	[hw/f]: initial	71	28	[ʃ/θ]: initial	42	49	[t/tʃ]: initial	13
12	[siy/ʃiy]	66	28	[g/ŋg]: medial	42	49	[s/z]: suffixes	13
13	[t]: final (unreleased)	63	32	[p]: final (unreleased)	39	51	[d/r]: unstressed prefixes	11
13	[w/hw]: initial	63	32	[f/v]: initial	39	51	[tʃ/dʒ]: final	11
15	[kit/kt]: final	55	32	[z/ʒ]: medial	39	53	[s/z]: final	8
15	[b/v]:medial	55	32	[n/ŋ]: final	39	53	[s]: final clusters	8
17	[g]:final (unreleased)	53	36	[s/θ]: initial	37	55	[tʃ/dʒ]: initial	3
17	[g/ŋ]: final	53	37	[l/r]: final	34	55	[iz]: suffix	3
17	flap/[r]	53	37	[f/v]: final	34			

Vowels

order		%	order		%	order		%
1	[ɔ/or]	71	8	[a/aw]	58	15	[æ/e]	37
2	[ɔ/ər]	68	9	[ar/ər]	50	15	[æ/a]	37
3	[ɔ/a]	66	10	[iy/i]	47	15	[ow/a]	37
4	[ər/or]	63	11	[ow/ɔ]	45	18	[ʌ/e]	34
5	[ʌ/a]	61	12	[i/ə]	42	19	[ʌ/u]	32
5	[ɔ/ʌ]	61	13	[ey/æ]	39	20	[ow/aw]	24
5	[a/ar]	61	13	[æ/ʌ]	39	21	[ey/e]	8

Analysis of the test results

Errors detected will be classified into (A) what contrastive phonological study can predict or explain and (B) what it cannot.

(A) will further be subdivided into (a) what the syllable structure of Japanese may have caused, and (b) replacement or substitution on phonemic, allophonic, and phonetic level, including aspiration, breathing, devoicing, glottal stops, etc. (B) will also be grouped into (a) training influence, (b) spelling influence, and (c) misconception, etc.

A. Errors contrastive phonological study can predict or explain :

a) The syllable structure as probable error source

As already stated, open syllable, one consonant and one vowel (CV), is the typical structure of Japanese ONSETSU syllable, because of which consonant cluster will be one of their problelms for the Japanese EFL learners. Here added vowels and inserted vowels are typical errors recognized.

Added vowels at the final position

examples : [l] ⟶[lɯ] in pool, fail, tile, owl

[d]⟶[də] in shed, made

[v]⟶[və] [vɯ] in leave, wave, prove

[b]⟶[bɯ] in jibe, dub, ebb

[dʒ]⟶[dʒi] or [dʒə] in edge, purge

[s]⟶[sɯ] in mass, tense, face,niece

[θ]⟶[θɯ] in math, tenth, faith, neath

[z]⟶[zɯ] in saves, pigs, eyes, faze

[m]⟶[mɯ] in them, beam, game, dime

[ŋ]⟶[ŋgɯ] in fang, wing, king

(In this case [ŋ] is replace by [ŋg] before the vowel is added.)

[g]—[gɯ] in wig, lug, hug

Inserted vowels between consonants

examples : inserted [ɯ] or [ə] before [l] or [r]

in bleed, clam, glow, flock, breed, cram, grow, frock

inserted [ɯ] in necktie [kɯt], napkin [pɯk], safes [fɯs], picks [kɯs], dingle [ŋgɯl], dwell [dɯ], swan [sɯ]

inserted [i] or [e] in raised [zid], surged [dʒed] bucked, ticked [kid] or [ked]

Besides above phenomena too much aspiration of the final stops or released stops could be put here, because they might be the result of effort to avoid open syllables.

b) Replacement or substitution

As already discussed, the sound system of two languages cannot be ex-

actly the same. Japanese and English are not the same either on phonemic, phonetic, or allophonic level. Phonemically, Japanese consonants lack labio-dental fricatives, intro-dental fricatives, lateral, palatal fricatives, and alveolar and palatal affricates, though phonetically they have same similar sounds. Their distrubution rules are also different. Comparing with English vowels, Japanese vowels are not only far fewer in its number of phonems but also far less in articulation movement in tongue, jaw, lips or mouth. Replacement, therefore, by some similar sound or new creation will be the natural results.

Replacement on the phonemic level :

Examples : /l/ replaced by /r/ or palatal flpped [l] in
lay, lush, leap, load

/r/ replaced by /l/ or flapped [r] in
ray, rush, reap, road

/r/ replaced by /d/ in unstressed prefix re–
This will be the result of /r/ replaced by too much retroflexed or flapped /r/.

/f/ replaced by /ϕ/ in food, fault, fur

[hw] replaced by /ϕ/ or [ho] in whit, whine

/v/ replaced by /b/ or plosive instead of fricative in van, veer, view, vine

/w/ replaced by /u/or [ɯ] in witch, wet, were wine

/ð/ replaced by /d/ or plosive instead of fricative in them, than

/ð/ replaced by /z/ in withered, scythe

/θ/ replaced by /s/ in third, thigh, thorn, thank, think, thunder

/i/ replaced by /iy/ eat, beat, keen, peek

/ey/ replaced by vowel cluster instead of diphthong in age, stain, wain, chase

/æ/ replaced by /ʌ/, /ə/ or /a/ in fat, pass, man, pack, ham, sat

/æ/ replaced by /a/ in add, hat, jab, band

/æ/ replaced by /ʌ/ in ankle, mad, back, staff

/ʌ/ replaced by /ə/, /æ/, or /a/ in utter, duck, nut, sub, sung, lung, fun, chuck

/a/ replaced by /ʌ/, /ə/, or /ɔ/ in otter, dock, not, sob, hop, got, sock

/ow/ replaced by /o/ or /or/ in hope, goat, soak, own, no, tone, coach, hoe

/aw/ replaced by /ow/ in found, shout, pound

/ɔ/ replaced by /ow/ or /or/ in saw, cost, fought, caught, dawn, hawk

/ər/ replaced by /ar/ in herd, turn, shirt, sir, work, terse, cursed

/ar/ replaced by /ər/ in heart, dark, guard

Replacement on the allophonic level :

Examples : [h]⟶[f] or [ϕ] before [u] or [ɔ] in who'd, halt, horse

[siy]→[ʃiy] in see, seat, seep, seen

[ʃiy]→[siy] in she, sheep, sheet, sheen

[ʃ]⟶[s] in ship, shim, shill, shin

[s] and [ʃ] before [i] or [iy] are very unstable.

[z]⟶[ʒ] before [i] in visit, fusing, using, zip

[z]⟶[dz] before [u] in zoo

[z] ⟶[dz] in the final position in doze, faze

[ʒ]⟶[dʒ] in fusion, vision, usual, closure

[dʒ]⟶[z] or [ʒ] before [i] in aging, virgin, vigil

[dʒ]⟶[ʒ] or [dz] in the final position in edge, cadge, purge

[t] ⟶[tʃ] before [i] or [ie] in tin, tease

[s] ⟶[ʃ] before [i] in sink

[n]⟶[n'] in the final position in then, bean, gain, dine, fan, win, stun, kin

[ŋ]⟶[ŋg] in the final position in fung, wing, stung, king, banging, swinging

[ŋ]⟶[ŋg] in the medial position in banging, swinging, gangster, dinghy, youngish, flinger, tangy

[ŋg]⟶[ŋ] in medial position in finger, hunger, bingo, jungle, younger, dingle

[g]⟶[k] in the final position in wig, probably because of too much aspirated [g]

Replacement on phonetic level:

Examples : [l] and [r] replaced by flapped [l] and [r] where spelled 'll' or 'rr' in belly, tally, berry, tarry, carry

[t/d] flap replaced by too much aspirated released [t/d] between vowels : in biting, mutter, heated, coat it, biding, mudder, heeded, code it

[t] flap ⟶[ʔtʰ] where spelled "tt" in catty, Betty

[hw] lacks tight lip rounding in whit, whether, whine wheat

Final [k], [p], [t] are too much aspirated

Final unreleased [g], [b], [d], are released.

Initial consonants need stronger breathing.

[də] or [rə] in unstressed prefixes de— or re— replaced by [de], [di] and [re], [ri] with or without accent.

[b] replaced by fricative between vowels in fiber, saber, curbing

[wu] ⟶ [u], [ɯ], or [ɯ:] in wood, wool, wolf, woman (wood ⟶ [ɯʔd])

[w] is missing in [w] clusters.

[w] has little or no tight lip rounding.

[ʃ] needs lip rounding.

Glottal stop inserted between short vowel and stop [t], [k] [p], [g]

[kiʔt], [keʔt] or [ʔkiʔt], [ʔkeʔt] in ticket, packet, bucket, pocket

[kt] ⟶ [ʔkt] in bucked, ticked, pocked

[g] ⟶ [ʔg] in wig, bigger, digger

Initial [æ] with too strong glottal stop, in add, ankle

Devoicing : [kit] ⟶ [kit̥] in packed, bucket, ticket, pocket

[i] and [e] articulated with a little higher tongue

[æ] and [a] with stress need a little more sound length

[a] and [ɔ] articulated with less opened or higher jaw.

B. Errors that do not appear to be of language transfer

Though learner's native language must be an important factor for sound production of their target language, all the error sources will not be language differences, and some language differences may not always cause production errors, partly because of learners phonetic sensitivity, or posi-

tive influence of training method or learner's hard trying with attention.

Training influence : Japanese EFL learners are often advised to make [v] sound, the equivalent of which is not in Japanese, by biting with upper teeth and lower lip instead of touching softly the lower lip with upper teeth. Too much biting by diligent learners may have caused fricative [v] replaced by plosive like [v] sound. As for inter—dental, or tip–dental (as W. Smalley calls.) fricative [ð], the learners are often instructed to put the tip of the tongue between the upper and the lower teeth and force the breath out through them. The tongue is likely to touch the articulation point so completely that the lung air stream is blocked there.

Spelling influences : The following mispronunciations seem to have something to do with spelling influence.

Double 'l' or double 'r' in spelling is pronounced in flapped [r]: in belly, berry, tally, tarry.

[ʃiyd] is mispronounced [ʃed] in She'd.

[z] is devoiced and sounds like [s] in peas, pigs.

Double 'g' in spelling is preceded by a glottal stop in bagging, swigging, digger, hugger, bigger, juggle. (This phenomeon could also be explained by Japanese syllabic consonant.)

[ər] is replaced by [or] in worm, work,

[ʌ] is replaced by [u] when the spelling is 'u' : in tuck, buck, stud, shudder.

[aw] is replaced by [ow] in outer, found , shout, found, couch.

[ɔ] is replaced by [a :] in walk.

Misconception : The following mispronunciations would be covered here.

'Bathe' is mispronounced [beys]. The process would be : by misconception [ð] in bathe ⟶ [θ] and then [θ] is replaced by [s]..

[ð] in teethe mispronounced [tiyθ].

[θ] in 'teeth' and 'thigh' ⟶ [z]. The process would be: by misconception [θ] ⟶ [ð] and then by replacement [ð] ⟶ [z].

V. Conclusion

As the above analytical study shows, contrastive phonological study of the learner's language and their target language will be able to explain most of the segmental production errors and also to predict general error tendency of the learners', even though prediction on the individual level will not be always possible. Therefore, for an effective instruction the findings from the contrastive study should be made the best use of as possible. At the same time instructors should pay attention to the negative training transfer. From the error frequency chart we learn that segmental production difficulty does not necessarily mean that of phonemes which have no counterpart in the learners' mother tongue, but rather that of English phonemes which are allophonic in Japanese. The problem of Japanese [g] and [ŋ], for instance, seems to be reflected in misproduction. As for the problem, Isshiki concluded in her empirical study that both [g] and [ŋ] must be considered as allophones of the same phoneme /g/ in Tokyo Japanese. Tsubaki observes that the present Japanese seem to make little distinction between the two aollophones and tend to replace [ŋ] by [g] whether it is in medial or final position. Another point the writer

would like to stress here is that the less opened jaw and less tight lip rounding are important error sources in English [w] and vowel production by Japanese EFL learners. In the selected list of special pronunciation problems according to students's native language "all the vowels" are properly listed for Japanese students. (Finocchiaro, 1962. p. 371)

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