

Vowel Phonemes in Japanese and American English: Similarities and Differences

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Introduction

Over recent decades increasing importance has come to be placed upon English as a means of international communication. It is now the language of choice in many international forums, in some cases even if English is not the national language of any of the participants (Bragg, 1992: 305), and “the main language to carry on the affairs of government, education, commerce, the media, and the legal system” in countries like Ghana and Nigeria in which it isn’t a native language (Crystal, 1988: 2). The profound implications of this phenomenon are made clear by Phillipson in *Linguistic Imperialism*, “At the present time English, to a much greater extent than any other language is the language in which the fate of the world’s millions is decided. English has, in the twentieth century, become the international language *par excellence*” (Phillipson, 1992: 5-6).

For Japan, a country which depends on international trade for its prosperity, the need to be able to communicate in English is of great significance. However, the fundamentally different characteristics of the English and Japanese languages, in syllable sonority versus mora timing, phonotactics, morphology, orthography, for example, create unique problems for learners of each language. Such challenges have been faced by Japanese learners since the outset of the study of Western languages.

One of the earliest teachers of English in Japan was “John” Manjiro, the fisherman who lived in the USA for 10 years after being shipwrecked in 1841. According to the Asahi Shimbun’s “天声人語” (Vox Populi, Vox Dei) column, in “英語襲来と日本人” (How Japanese Coped with the Coming of English), Saito Yoshifumi claims that Manjiro taught numbers in English by creating similar sounding Japanese equivalents from the *katakana* syllabary. Hence, “one” was pronounced, “ワン”, “two”, “ツウ”, “three”, “トレイ”, which appear to have a greater or lesser degree of similarity, but “four” and “five” became “ソ
ワポウ” and “ハッイワ” respectively, which would seem to be almost unintelligible.¹⁾

The same article also discussed a book published shortly after the second world war, “日米会話手帳” (Japanese-American Conversation Notebook), a best seller for decades in Japan and in which the author, Kato Yoshio, similarly used *katakana* to transcribe common English phrases. “Onion” was transcribed as “アニヤン”, and “Take your seat” as “テイキヨウスイート”, which attempt to make Japanese ideography and phonology somehow fit English, even where they are not well suited to do so. The practice has

1) Asahi Shimbun, September 14, 2005, pg 1

become widespread over the years.

Many Japanese people would also be aware of the existence of various mnemonic phrases, which purport to mimic English phrases, for example, “知らん振り” (shiranpuri)²⁾ literally “pretend not to know,” which is reckoned to approximate, “Sit down, please.” Or, “掘った芋いじるな” (hottaimojiruna), literally, “Don’t touch the potatoes which have been dug-up,” which is said to approximate, “What time is it now?” Conversely, from English to Japanese, the phrase, “Don’t touch my moustache,” which is meant to be interpreted as “どういたしまして” (doutashimashite), or “You’re welcome,” is equally well known. As useful as this kind of strategy may prove in certain situations, it would almost certainly owe intelligibility, or communicability, more to context than any purely linguistic factor.

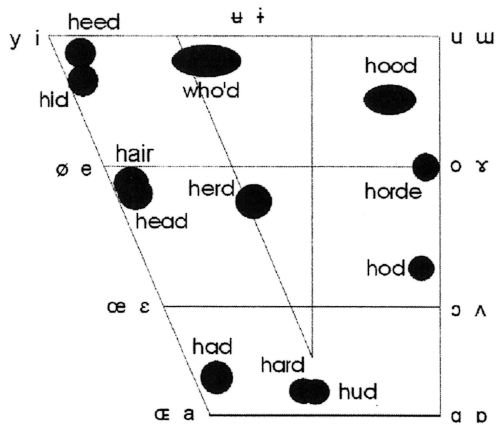
Using orthographic *kana* to represent the sounds of English has become as sophisticated as it has become formalized. It now appears as *furigana* or *rubi* to aid in pronunciation in various Ministry of Education, Culture, Sports, Science and Technology approved textbooks and dictionaries. Linguistic scholar Shimaoka Takashi, for example, has developed a modified system of *kana* usage which purports to assist learners with approaching more natural pronunciation (Shimaoka: 1999). It should be noted, however, that Shimaoka also provides essential information on basic phonology and utilizes the International Phonetic Alphabet (IPA). By itself the use of *kana* has not proved to be a panacea for learners in Japan, and this raises two interesting questions. To what extent are Japanese and English phonetically similar? And to what extent can the knowledge of the similarities and differences in the languages be an aid in communication? This paper aims to partially answer the first question by investigating similarities and differences between Japanese and American English vowels from an auditory perspective based on the vowel definitions in the *Handbook of the International Phonetic Association*, and to provide the beginnings of an answer to the second question by establishing an initial database of comparative phonological items that would be available for application to language teaching.

Vowel Definition

Vowel sounds are difficult to define precisely, and even speakers of the same variety of a language show variation in vowel production. Therefore accurately classifying the exact number and quality of vowel phonemes is a matter of perception, giving rise to possible learner confusion. Informal surveys of colleagues and students of English in Japan showed that most people consider there to be five vowel sounds in Japanese, although there appears to be a great deal of uncertainty on the exact number of vowel sounds in English. In fact, there are linguists who posit more than five vowels in Japanese, and various numbers in English, depending on the variety and the means of analysis.

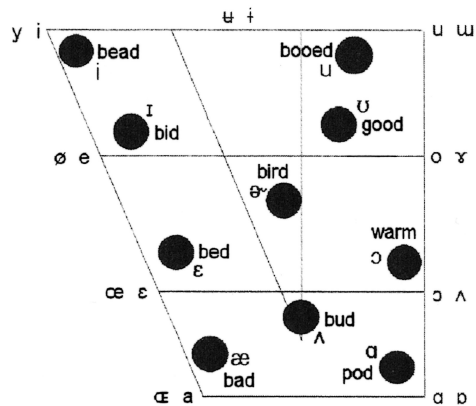
Figure 1 shows the monophthong vowel charts of four different varieties of English from countries in which it is the main language, developed by Dr. Robert Mannell and Dr. Felicity Cox of Macquarie University, for Britain, Australia and New Zealand, and by Dr. Peter Ladefoged for the USA.

2) “Shiranpuri”, “hottaimojiruna” and “doutashimashite” are romanisations of the Japanese immediately prior to each respectively.



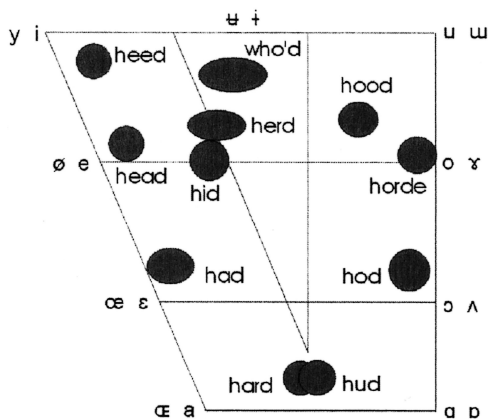
Australian English Monophthongs relative to the Cardinal Vowels

Adapted from Cox (1996)

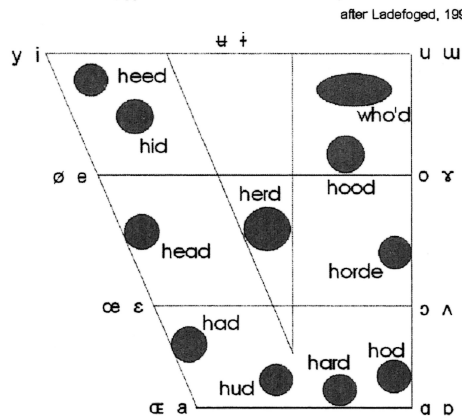


American English Monophthongs relative to the Cardinal Vowels (typical of Midwestern USA)

after Ladefoged, 1993



New Zealand English Monophthongs relative to the Cardinal Vowels



RP British English Monophthongs relative to the Cardinal Vowels

Figure 1. Vowel Charts of Four Varieties of English.

From "The Vowels of Australian English and Other English Dialects," Macquarie University "Phonetics and Phonology" internet website.

It is clear from these charts that there are substantial differences in the pronunciation of English between different countries where it is spoken, yet all these varieties, and many more, are quite intelligible to the speakers of each one.

Taking just one example from the above charts the words, "who'd/bood", we see in Figure 2a that a wide range is spanned in the locus of production of the vowel employed to articulate those two words. Figure 2b shows an "egg-like" shape superimposed over the vowel positions of the four different varieties of English shown in Figure 1. This egg shape can be said to represent the area of intelligibility between these four varieties of English, and it is quite reasonable to expect that, in context, vowel sounds within this area would be intelligible to almost all native speakers of English.

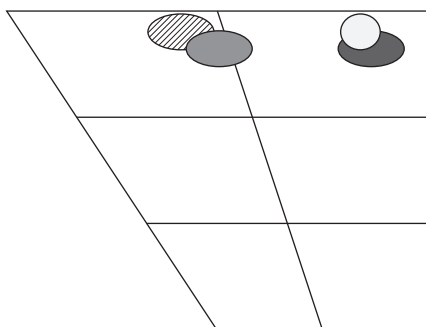


Figure 2a

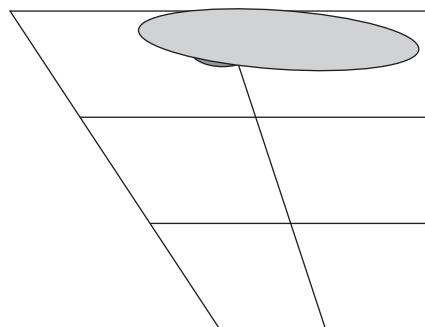


Figure 2b

RP British English ●
Midwestern USA English ○

Australian English ◐
New Zealand English ●

Figure 2. Vowel Locations for “who’d/bood” in Four Varieties of English.

After plotting all the different monophthongs for the four English varieties shown in Figure 1 and superimposing “egg shapes” on them, the vowel chart looks like that shown in Figure 3a.

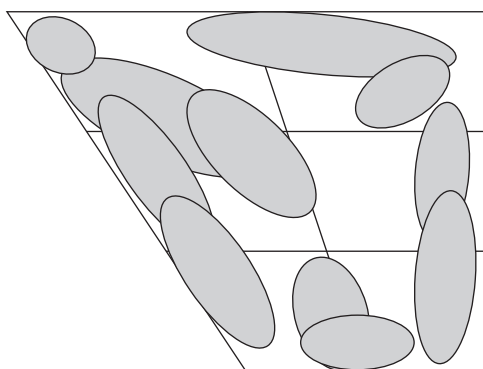


Figure 3a

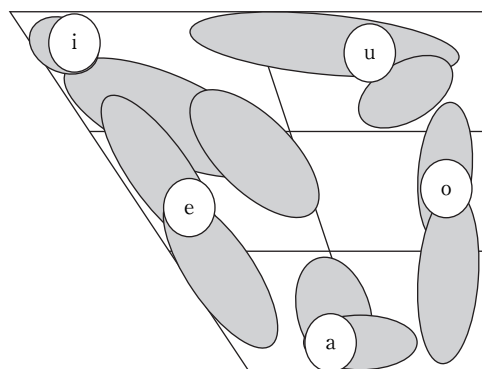


Figure 3b

Figure 3. Vowel Locations for Four Varieties of English and Japanese.

Interestingly many of the eggs overlap, suggesting a large degree of auditory “acceptance” of different pronunciation. Figure 3b shows the five Japanese vowels as charted by Okada in the *Handbook of the International Phonetic Association* (IPA, 1999:117), which may be either short or long, superimposed on the “egg shapes” of the English vowels. It can be seen that there is a high degree of similarity, and all five Japanese vowels coincide with at least one vowel, and in the case of /e/, /o/, and /a/, with two vowels, suggesting that many English utterances by Japanese L2 speakers using only the five Japanese vowels may be understood on a purely phonetic basis by most speakers of English.

Traditionally, the majority of Japanese students have learnt American English in their English language

classes, and most texts on English language in Japan also use American English in pronunciation and spelling. It is also the example of English used in the *Handbook of the International Phonetic Association*, so for the sake of practicality in this paper we will consider American English as the variety for comparison with Japanese.

Figure 4 shows the monophthong and diphthong vowels of American English, as charted by Ladefoged in the *Handbook of the International Phonetic Association* (IPA, 1999: 42), with the five Japanese vowels superimposed over them.

Although there is less convergence of vowels when comparing Japanese vowels against a single variety of English, we can still see nearly identical placements for /i/ and /u/ with some divergence for /a/, /e/ and /o/.

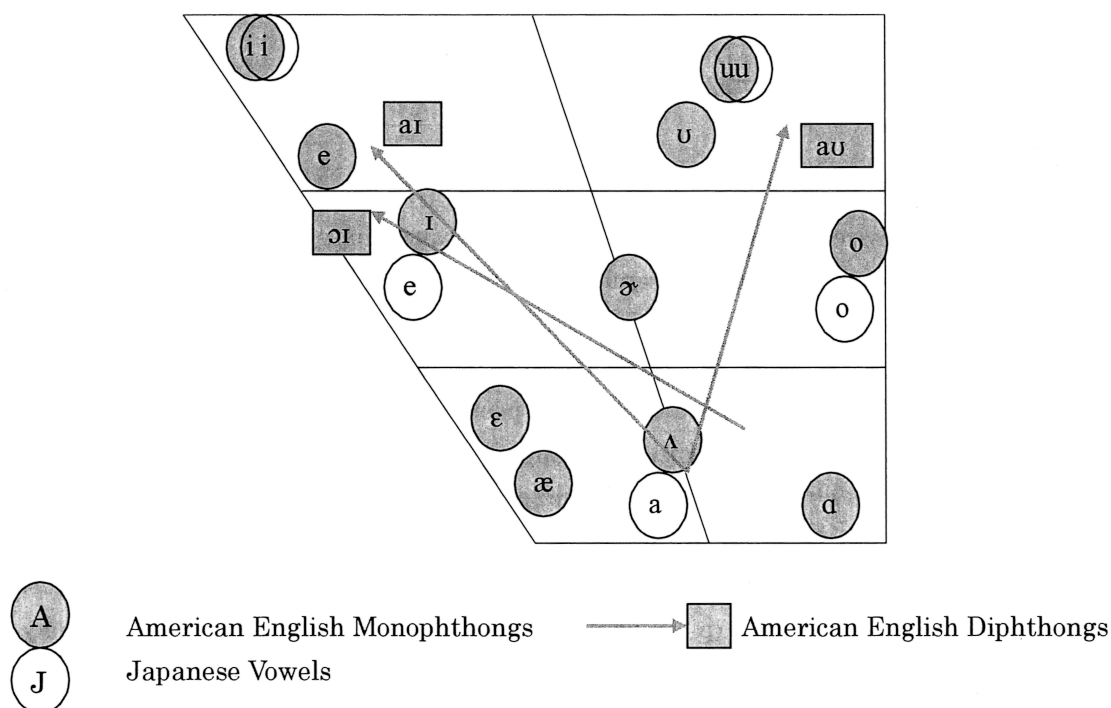


Figure 4. Japanese and American English Vowels.

Hypothesis

As we found in our informal survey, and as is attested to in the IPA Handbook (IPA, 1999: 117) we proceed based on the premise that the Japanese language has five vowels, long or short, but no diphthongs. This is not to say that other Japanese linguists have not argued otherwise. Hamano (1998: 73-75), for example, entertains the notion of diphthongs for Japanese in mimetic adverb expressions, but this is limited to certain onomatopoeic constructions. Kubozono (Tsuji-mura, 1999: 51) has offered an

interesting analysis of lengthening and bi- and trimoraic vowel constructions, but the examples cited are based, not surprisingly, on loan words. Therefore, we would like to investigate whether Japanese vowels in combination may be recognized as diphthongs based on the auditory perceptions of target language listeners. Accordingly, we hypothesize that the vowels in Table 1, including the diphthongs for American English charted in the *Handbook of the International Phonetic Association*, as well as the approximants, /ja/, /ju/, /jo/ will be intelligible to native speakers of English.

Table 1. Hypothesized Vowel Equivalents.

あ	ɑ, ʌ	ああ	ɑ:
い	i	いい	i:
う	u	うう	u:
え	e, ɛ	ええ	e:, eɪ
お	o	おお	o:, oʊ
あい	aɪ	や	ja
あう	aʊ	ゆ	ju
おい	ɔɪ	よ	jo

Experiment

As an experiment we devised twelve nonsensical *kana* utterances based on this hypothesis (see Appendix 1), which mimic short English sentences or phrases, using consonant sounds that had an exact or close correlation between English and Japanese as shown in the *Handbook of the International Phonetic Association*, and the vowels shown in Table 1 above. The utterances were recorded by L1 Japanese speakers without respect to the prosodic features common to English. Consonant sounds from any *kana* used appear only in the initial position, with the exception of the use of [N] which may occur in final position, in order to avoid an extra vowel sound in final position. Six L1 Japanese speakers from the Kansai region, three female and three male ranging in age from early 30s to early 60s, recorded each of the 12 utterances. Recordings were made on a Sharp MD-MT77-S portable MD recorder using a Sony ECM-DS70P microphone.

We then asked native speakers of English to listen to these recordings and transcribe what they heard (see Appendix 2). No discussions about the aims of the experiment were carried out until after the transcription was completed. Our hypothesis anticipated that they would transcribe the sentences as shown in Appendix 3. The recordings were broken into groups of six and then alternated, so that each L1 English speaking transcriber listened to six sentences recorded by a female and six sentences by a male: 12 sentences in all.

It is important to note that the transcribers currently reside in Japan and that knowledge of Japanese language and familiarity with Japanese learners of English may have influenced their transcription, although we don't believe that this detracts from the validity of the experiment as a whole.

Results of Transcriptions

Short, long and diphthong vowels were counted as one vowel sound per occurrence. Sentence 1 contained six vowel sounds, Sentence 2 contained seven vowel sounds, and so on, giving a total of 77

vowels sounds for the 12 utterances. Thirteen L1 English speakers from six different countries transcribed the utterances meaning that there were 1001 vowel sounds transcribed in total. There were 67 errors, which represents a 6.7% error rate. Table 2 shows the errors noted for each sentence and the total number of errors noted.

Table 2. Transcription Errors

Sentence	Total Vowel Sounds	Phonetic Errors	Orthographic Errors	Words Added	Words Missed	Total Errors
No. 1	78	6	11		2	19
No. 2	91		1	1	1	3
No. 3	65	8	1			9
No. 4	78	3				3
No. 5	104	4	1		1	6
No. 6	78	3			1	4
No. 7	78	6				6
No. 8	91					0
No. 9	65	1				1
No. 10	104	12	2	1		15
No. 11	78					0
No. 12	91				1	1
Total	1001	43	16	2	6	67

A phonetic error was one in which the transcribed sound did not match the recorded sound according to our hypothesis. For example, when Sentence 4 was transcribed as, “*Are* baby born in June.” An orthographic error was one in which the sound matched, but the spelling was not contextually accurate. For example, when Sentence 1 was transcribed as, “She may say no you *no*.” There were also two cases of adding words and six cases of omitting entire words. Note that consonantal phonetic errors are also included in this table. There were 12 examples of consonant errors in transcription, meaning that there were 31 errors on vowel sounds, an error rate of just 3.1%. Occasionally two errors were noted in the same position, for example when Sentence 1 was transcribed as, “*C* may say no you know,” in which “*C*” represents a consonantal phonetic error and an orthographic error.

Sentence 1 had the most errors overall, which can probably be ascribed to the transcribers being unsure of what the experiment entailed and exactly what they were listening to/for at the beginning of the transcription exercise, and in fact several said as much. The most common error was in Sentence 10, in which 12 of 13 transcribers took [ああん], which it was anticipated would approximate [ɑ:n], for something other than “on.” There may be several different and, possibly, related explanations for this. Few of the transcribers are natives of the variety of American English targeted in this research. Being acquainted with the Japanese language and Japanese learners of English may have caused the transcribers to, in effect, expect to hear a certain vowel sound. Of course, the hypothesis that Japanese [ああん] will be intelligible to native speakers of English as [ɑ:] may simply not be valid, at least in the case of the preposition “on”. At this point there is a question mark over the relation between these vowel sounds that needs to be addressed in future research.

The transcribers were also asked, after they had finished the transcriptions, to assess the quality of the English they listened to in general terms according to these four questions:

- 1) What was your impression of the pronunciation of the vowel sounds?
- 2) What was your impression of the stress or accent of the recording?
- 3) What was your overall impression of the English you transcribed?
- 4) Which sentences were the most difficult to understand?

In response to Question 1 vowel sounds were variously described as “flat”; “poor”; “lazy”; “relaxed”; and “very Japanese.” One transcriber reported that, “many seemed incorrect, but understandable.” In response to Question 2, transcribers felt that the sentences were flat and unnatural, and the responses to Question 3 were generally of an unfavourable nature — which, from a phonological standpoint, in a sense is favourable, because at least the transcribers recognized the purely *kana* sounds, which were recorded by Japanese speakers without consideration of any potential target listener, as comprehensible English phrases or sentences, regardless of what they thought of the English itself. Sentences 1 and 10 were considered to be the most difficult, which was consistent with the results noted above.

Based on these results we have prepared Table 2, which represents a highly similar, similar and focus point chart for IPA designated American English and Japanese vowels. The chart is not intended to be prescriptive but should serve as a starting point for developing a comprehensive database to support both articulators and listeners.

Table 3. Highly Similar, Similar and Focus Points

	Highly Similar	Similar	Focus
あ		ə, ɑ, æ	ə, ɑ, ʌ
い	i*	ɪ	ɪ
う	u*	ʊ	ʊ
え		e, ɛ	e, ɛ, ɪ
お		o	o

ああ		ɑ:	≠ ɑ: as in [ɑ:n]
いい	i:		
うう	u:		
ええ		eɪ, e:, ɛ:	eɪ, e:, ɛ:
おお		o:, oʊ	o:, oʊ

あい		aɪ	aɪ
あう		aʊ	aʊ
おい		ɔɪ	ɔɪ

* Corpus examples limited

Suggestions for Future Research

In devising the *kana* utterances for the comparative experiment we found the need to place a vowel phoneme in syllable final position quite limiting. For example, attempting to make sentences without being able to make plural nouns or inflect verbs with an [s] was restricting, so research on final unaccented /su/ that appears in formations such as “です” (*desu*) which is often reduced to [s], as suggested by Okada, is one important area to address in future research. Limitations with prepositions also lead us to believe that perhaps they should be studied pronunciation-wise in their own category. Adapting the *kana* utterances to mimic the prosodic feature of liaison in English may prove to be fertile in searching for ways of overcoming the limitations we experienced in these areas.

To what extent the ability to understand utterances of this kind is informed by cultural factors and to what extent by purely phonological factors is unknown and should be further investigated. The item which was most problematic in our experiment, [ああん] ↔ [ɑ:n], may provide an entry point for future research.

Many Japanese and English consonants are very similar, but become qualitatively different in certain circumstances. While consonants are outside the realm of this study, the inaccuracies noted in transcription suggest that they should also be examined more thoroughly in separate research.

Ladefoged (IPA, 1999:42) did not chart the unstressed vowel, schwa [ə], in the *Handbook of the International Phonetic Association* because “its quality varies considerably”, and consequently it does not strictly fall within the parameters of the hypothesis used in this paper. However, we did attempt to approximate [ə] with [あ] in the indefinite article, “a”, and the word, “dancer” which proved to be recognizable on 61 occasions from 65 instances of transcription. On the four occasions when it wasn't recognized, it was in sentence initial position, suggesting that a particular line of research is warranted to investigate the implications of this result. Hasegawa has noted the difficulty schwa presents for Japanese learners of English, and some of the ways in which schwa acts to “stabilize” English syllables, for example by being inserted into consonant clusters, or used to create comprehensible contractions (Hasegawa, 1999: 63–64). However, as “the most frequent sound of RP and GA” (Jenkins, 2000: 146), and one that is of variable quality, schwa will require separate research to determine which of the Japanese vowels can be used to approximate its use in English, and under what circumstances it can be used.

For most L2 speakers of English, a great amount, perhaps the majority, of their English language interaction will be with other L2 speakers of English, although from different L1 backgrounds (Jenkins, 2000: 11). Research between the phonology of English and languages other than Japanese will be necessary, and will require new, unique and innovative research experiments that complement each set of languages. The data from that research may then be applied to developing strategies to aid different L2 learners in communicating with one another in English.

Conclusion

British RP English and North American GA English have been the main target pronunciation models in ESL/EFL for some time, but less than 3% of people in Britain speak pure RP (Crystal, 1988: 65), and only about 33% of people in the USA and Canada speak GA (Jenkins, 2000: 204), so it would seem unnecessary

for learners to continue to focus on these varieties over any other. Additionally, phonological transfer from L1 to L2 means that pronunciation will almost always be difficult for L2 learners for a variety of reasons (Jenkins, 2000: 99-120). This being the case, together with the reality of mutual intelligibility of most varieties of English it would seem equally unnecessary for learners of English to aim to master all the vowel sounds of every variety.

In this paper we have investigated what phonological similarities exist between vowel phonemes in Japanese and American English. While the research indicates more similarity than one may expect between the vowels based on the auditory perceptions of transcribers, further research, some examples of which are outlined above, will be necessary to develop a comprehensive list of comparative phonological items which would allow learners to focus more clearly on learning strategies that are relevant to individual learners and the particular context which applies to a given learner.

The research carried out and described in this paper is anchored upon the IPA, and comparative phonology research will only function as a tool to improve pronunciation when coupled with an understanding of the IPA. In doing this, a learner acquires the ability to adjust to the circumstances of the evolving linguistic landscape. An understanding of the fundamentals of phonetics and phonology, together with a working knowledge of the IPA and vowel charts, would provide learners with a solid foundation on which to make comparisons between their native language and a target language.

Appendix 1

下記に書かれた日本語を無意識に読んでください。

1. しい めい せい のお ゆう のお
2. ゆう ばい まい かあ なう おけえ
3. ああ ゆう いんせいん じょん
4. あ べえび ぼおん いん じゅうん
5. わい ああ ゆう いん まい かあ ぼび
6. ああ ゆう あ かうぼい けん
7. ゆう めい ごお すうん とおに
8. ああ ゆう あ ごおごお だんさ
9. たいが いん あ ずう
10. ちぎん いん わいん ああん ぼていとう
11. ばい あ にゆう とい かあ けん
12. ああ ゆう おけ なう まい ぼい

Appendix 2

Please listen to the recordings and transcribe what you hear. Listen for a maximum of three times. Please do not move on to the next sentence until you have finished writing.

1. _____
2. _____
3. _____

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4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____

Name : _____ Nationality : _____

Appendix 3

1. She may say no, you know.
2. You buy my car now, OK?
3. Are you insane, John?
4. A baby born in June.
5. Why are you in my car, Bobby?
6. She may say no, you know.
7. You may go soon, Tony.
8. Are you a go-go dancer?
9. Tiger in a zoo.
10. Chicken in wine on potato.
11. Buy a new toy car, Ken.
12. Are you OK now, my boy?

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