Pan-Pacific Association of Applied Linguistics 14(2), 25-39

A Study of Co-relation between the Length of English Low Vowels and Diphthongs by Korean Exchange Students

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Park, H-S. (2010). A Study of Co-relation between the Length of English Low Vowels and Diphthongs by Korean Exchange Students. *Journal of Pan-Pacific Association of Applied Linguistics, 14*(2), 25-39.

This paper aims at comparing the five English diphthongs, /ei/, /ou/, /au/, /ai/, /ɔi/, in the aspect of length, to find out a common feature in /au/, ai/, /ɔi/ and /ei/, and /ou/ and to see if there is any evidence between English low vowels and diphthongs. This study is a following research of Park (2009), and I analyzed each diphthong statistically to find out the co-relation between English low vowels and English diphthongs, /au/, /ai/, /ɔi/, beginning with English low vowels. To make this research, four Korean college students and five Americans participated in the experiment as subjects. All the subjects are female, and their age ranges from 21 to 39. Through statistical analysis of experimental data, I couldn't find out anything in common between the length of the two English diphthongs /ei/ and /ou/. From this I could see that there isn't any common feature between the two diphthong groups, which begin with front mid and back mid position, respectively. However, in the English diphthongs /ai/, /au/, and /ɔi/, there is a common feature among them; the average length of the Korean subjects' pronunciation is less than that of the native subjects' pronunciation, regardless of its sentence positions. Because English diphthongs, /ai/, /au/, and /ɔi/, have a common feature in that they begin with English low vowels, /a/ and /ɔ/, I could get a hint that Koreans' difficulty of pronunciation of these English diphthongs may come from the difficulty of English low vowels, and we could use the results in the classroom in teaching English vowels effectively.

Key Words: diphthong, low vowel, vowel length, pronunciation

1 Introduction

It's not easy for many Korean speakers to pronounce English diphthongs and low vowels as native speakers of English do. There have been some studies on the lengths of English vowels (Klatt 1973, Yang 1976). Many Korean speakers could have difficulty pronouncing English diphthongs because of the difference of rhythms between Korean and English. As Koreans are familiar with the syllable-timed language, many Koreans are apt to recognize

* This research was supported by the Namseoul university research fund in 2010.

the phonetic symbols of English diphthongs as the real sound symbols and ,according to Park (2001, 2004), show foreign accent in vowel length. In order to understand and pronounce English diphthongs correctly, they should listen to the Ladeforged's (2006) explanation of the quality of diphthong. He points out that each of the diphthongs involves a change in quality within the one vowel. He describes that the first part of the diphthong is usually more prominent than the last. He also says that the last part is often so brief and transitory that it is difficult to determine its exact quality (P. 90). As phoneticians explain the quality of diphthongs using phonetic transcriptions, the transcription of diphthongs varies according to the different phoneticians (Kenyon & Knott, 1953). For example, while Jones describes English diphthong /o/ as /ou/, Gimson transcribes it as /əʊ/, and Trager and Smith express it as /ow/. As many Koreans don't know exactly the quality of diphthongs, they are apt to pronounce them following their transcription. Actually, most English-Korean dictionaries adopt the transcription of English phonetician Jones, whose transcription for diphthong /o/ is /ou/, and this misleads many Korean speakers to pronounce English diphthong /o/ as two syllables /o/ and /u/ (Jun, 1995).

This is the reason, in this study, why I plan to carry out experimental study of five diphthongs – /ei/, /ou/, /au/, /ai/, /ɔi/ – with the help of acoustic instruments to measure their vowel lengths. To investigate and compare the vowel lengths of English diphthongs, I carried out an experiment and compared their vowel lengths among native English-speaking Americans with Korean college students who have participated in an exchange student program. I am going to classify these five diphthongs in two groups: One is two English diphthongs /ei/ and /ou/, which are apt to be diphthongized in American and British English, especially in British English; the other group is English diphthongs /au/, /ai/, and /ɔi/, whose pronunciation begins with English low vowels /a/ and /ɔ/.

As this study is related to Park (2009), I will compare the five diphthongs respectively and focus on the three English diphthongs, /au/, /ai/, /ɔi/, to see if they are connected with the result of the English low vowels. If the result shows similar features between English low vowels and English diphthongs beginning with low vowels, we could use the results in the classroom in teaching English vowels effectively.

2 Experiment

2.1 Subjects

Four native speakers of English and five Koreans participated in this experiment. The native speakers of English are all from the United States and teach at the Language Institute of Indiana University at South Bend, Indiana. Their ages range from 25 to 39 and all are from Indiana (a state in America) and

speak General American English. The five Koreans are Korean college students studying abroad for one year at the Language Institute of IUSB. Their ages range from 21 to 24 and have grown up in Gyeonggido and Seoul, where people speak the standard Korean language. They were asked to pronounce the test words and sentences four times, and I had them read through them before pronouncing them. I got the length of English diphthongs with the help of the Praat software program.

2.2 Materials and procedures

This study focused on the analysis of five English diphthongs, /ei/, /ou/, /au/, /ai/, and /ɔi/. Three of them, /au/, /ai/, and /ɔi/, are specifically analyzed to examine the relation between the result of English low vowels in Park (2009) and these three English diphthongs. To do this, the data used in Park (2009) is reanalyzed. Though the data is the same as Park (2009), in this study, I try to research with a different angle by analyzing the data statistically. The main concern of this study is a comparative research between the feature of foreign accent of English low vowels and diphthongs beginning with low vowels by analyzing statistical data. To see the change of the length of English diphthongs, I made test sentences by placing the same English diphthongs in two different positions; one in the sentence initial and the other sentence final. As test words I selected five English words: vacation, photograph, surroundings, society, and employment. The common feature of these five diphthongs is that they receive primary stress on the diphthongs, and the followings are test words and sentences (Park, 2009).

Vac**a**tion [ei]
The vacation in Florida gave them a feeling of refreshment.
The job includes two weeks' paid vacation.
Ph**o**tograph [ou]
A photograph was made by using his camera.
Please enclose a recent passport-sized photograph.
Surr**ou**ndings [au]
The surroundings are pleasant to work in.
The buildings are designed to blend in with their surroundings.
Soc**ie**ty [ai]
The Society of Newspaper Editors is concerned about current issues.
They were discussing the problems of Western society.
Empl**oy**ment [ɔi]
The employment of children under ten in the cotton mills is prohibited.
The government is aiming at full employment.

3 Results and Discussion

Park (2009) dealt with English low vowels between Korean college students participating in an exchange program in America and native speaking Americans. However, this study aims to see the English diphthongs between them by analyzing statistical data and getting the relation between English low vowels and English diphthongs, beginning with English low vowels in the pronunciation of two subject groups. Among those five English diphthongs, /ei/, /ou/, /ai/, /au/, and /ɔi/, in the case of /ei/, /ou/, the length of Korean subject group is bigger than the American subject group in general, regardless of their positions.

On the contrary, in the pronunciation of /ai/, /au/, /ɔi/, the length of the Korean subject group is smaller than the American subject group, regardless of their positions. This result shows that we could relate the results of three English low vowels, /æ, ɑ, ɔ/, in Park (2009) to the English diphthongs /ai/, /au/, /ɔi/ in the length of pronunciation. It means that we Koreans have difficulty in pronouncing not only English low vowels but also English diphthongs beginning with low vowels. The followings are the results of each diphthong.

3.1 The comparison of English diphthong /ei/ length

According to Table 1, the average length of the Korean subjects' pronunciation of the English word ‘vacation’ is greater than that of the native subjects'. The t-value tells us that the difference is significant. Table 2 shows that ,in word position, the average length of the Korean subjects' English stressed diphthong /ei/ is greater than that of the native subjects'. The t-value tells us that the difference is significant.

Table 1. The Length of the English Word 'Vacation' in Word Position

Subjects	mean	standard deviation	t
Koreans	776.57	30.44	4.45
natives	641.16	59.78	

$^{**}p < .01$

Table 2. The Stressed English Diphthong Length of /ei/ in Word Position

subjects	mean	standard deviation	t
Koreans	178.13	18.51	5.35
natives	119.51	12.89	

$^{**}p < .01$

According to Table 3 and Table 4, in sentence-initial position, the average length of the Korean subjects' pronunciation of the English word ‘vacation’ and the English stressed diphthong /ei/ is greater than those of native subjects' and the t-value tells us the difference is significant.

Table 3. The Length of English Word 'Vacation' in Sentence-initial Position

subjects	mean	standard deviation	t
Koreans	657.04	42.39	2.65
natives	560.95	66.64	

$^{*}p < .05$

Table 4. The Stressed English Diphthong Length of /ei/ in Sentence-initial Position

subjects	mean	standard deviation	t
Koreans	148.09	15.40	3.66
natives	117.45	6.81	

$^{**}p < .01$

According to Table 5 and Table 6, in sentence-final position, the average length of the Korean subjects' pronunciation of the English word ‘vacation’ and English stressed diphthong /ei/ is greater than those of native subjects'. The t-value tells us that, in the English stressed diphthong, the difference is significant.

Table 5. The Length of English Word 'Vacation' in Sentence-Final Position

subjects	mean	standard deviation	t
Koreans	685.97	52.84	1.41
natives	625.19	76.81	

Table 6. The Stressed English Diphthong Length of /ei/ in Sentence-final Position

subjects	mean	standard deviation	t
Koreans	143.64	10.18	4.53
natives	117.15	6.26	

$^{**}p < .01$

Table 7, Table 8, and Table 9 tell us that, in the ratio of the average English stressed diphthong /ei/ to that of word ‘vacation’, the Korean subjects' proportion is greater than that of the native subjects', not only in word position but also sentence-initial and sentence-final position. The t-value tells us that, in word position, the difference is significant.

Table 7. The Ratio of the Length of English Stressed Diphthong /ei/ to that of Word 'Vacation' in Word Position

subjects	mean	standard deviation	t
Koreans	.229	.021	3.47
natives	.187	.015	

$^{*}p < .05$

Table 8. The Ratio of the Length of English Stressed Diphthong /ei/ to that of Word 'Vacation' in Sentence-initial Position

subjects	mean	standard deviation	t
Koreans	.225	.019	.76
natives	.212	.033	

Table 9. The Ratio of the Length of English Stressed Diphthong /ei/ to that of Word 'Vacation' in Sentence-final Position

subjects	mean	standard deviation	t
Koreans	.211	.028	1.23
natives	.189	.023	

3.2. The comparison of English diphthong /ou/ length

Table 10. The Length of English Word 'Photograph' in Word Position

subjects	mean	standard deviation	t
Koreans	541.35	51.31	.16
natives	536.67	28.26	

According to Table 10, the average length of the Korean subjects' pronunciation of the English word ‘photograph’ is greater than that of native subjects'. However the difference is not significant.

Table 11. The Stressed English Diphthong Length of /ou/ in Word Position

subjects	mean	standard deviation	t
Koreans	114.52	10.62	.20
natives	111.38	33.65	

Table 12. The Length of English Word 'Photograph' in Sentence-initial Position

subjects	mean	standard deviation	t
Koreans	474.42	24.16	-1.91
natives	511.50	34.30	

Table 13. The Stressed English Diphthong Length of /ou/ in Sentence-initial Position

subjects	mean	standard deviation	t
Koreans	103.33	11.58	-.99
natives	112.35	15.85	

Table 14. The Length of English Word 'Photograph' in Sentence-final Position

subjects	mean	standard deviation	t
Koreans	478.85	26.75	-3.48
natives	558.23	41.75	

$^{*}p < .05$

Table 15. The Stressed English Diphthong Length of /ou/ in Sentence-final Position

subjects	mean	standard deviation	t
Koreans	90.19	22.80	-1.4
natives	107.68	9.60	

Table 16. The Ratio of the Length of English Stressed Diphthong /ou/ to that of Word Photograph in Word Position

subjects	mean	standard deviation	t
Koreans	.212	.03	.15
natives	.208	.06	

Table 17. The Ratio of the Length of English Stressed Diphthong /ou/ to that of Word Photograph in Sentence-initial Position

subjects	mean	standard deviation	t
Koreans	.218	.03	-.12
natives	.220	.04	

Table 18. The Ratio of the Length of English Stressed Diphthong /ou/ to that of Word Photograph in Sentence-final Position

subjects	mean	standard deviation	t
Koreans	.188	.04	-.27
natives	.193	.01	

3.3. The comparison of English diphthong /au/ length

Table 19. The Length of English Word 'Surrounding' in Word Position

subjects	mean	standard deviation	t
Koreans	778.54	42.28	7.84
natives	567.95	36.80	

Table 19 shows that the average length of the Korean subjects' pronunciation of the English word 'surrounding' is bigger than that of native subjects'. The t-value tells us that the difference is significant.

Table 20. The Stressed English Diphthong Length of /au/ in Word Position

subjects	mean	standard deviation	t
Koreans	165.59	20.41	-3.51
natives	217.85	24.45	

$^{*}p < .05$

According to Table 21, in sentence-initial position, the average length of the Korean subjects' English word 'surrounding' is bigger than that of native subjects' and the t-value tells us the difference is significant.

Table 21. The Length of English Word 'Surrounding' in Sentence-initial Position

subjects	mean	standard deviation	t
Koreans	677.10	52.54	3.39
natives	555.61	54.71	

$^{*}p < .05$

Table 22, however, shows that, in sentence-initial position, the average length of the Korean subjects' English stressed diphthong /au/ is smaller than that of the native subjects'. However, the difference is not significant.

Table 22. The Stressed English Diphthong Length of /au/ in Sentence-initial Position

subjects	mean	standard deviation	t
Koreans	171.17	14.32	-1.02
natives	182.77	19.91	

Table 23. The Lengths of English Word 'Surrounding' in Sentence-final Position

subjects	mean	standard deviation	t
Koreans	721.26	58.83	2.48
natives	626.99	53.86	

$^{*}p < .05$

Table 24. The Stressed English Diphthong Length of /au/ in Sentence-final Position

subjects	mean	standard deviation	t
Koreans	169.47	11.58	-4.16
natives	199.08	9,15	

$^{**}p < .01$

Tables 25- 27 tell us that, in the ratio of the average English stressed diphthong /au/ to that of word 'surrounding', Korean subjects' proportion is smaller than that of the native subjects' not only in word position but also sentence-initial and sentence-final position. The t-value shows that, in Table 25, 26, and 27, the difference is significant.

3.4. The comparison of the English diphthong /ai/ length

Table 28. The Length of English Word 'society' in Word Position

subjects	mean	standard deviation	t
Koreans	698.35	38.69	.99
natives	673.18	36.69	

Table 28 shows that the average length of the Korean subjects' pronunciation of the English word 'surrounding' is bigger than that of native subjects'. However the difference is not significant. Contrary to the result of Table 28, Table 29 shows that the average length of the Korean subjects' English stressed diphthong /ai/ is smaller than that of the native subjects', and the result of the t-value shows that the difference is significant.

Table 29. The Stressed English Diphthong Length of /ai/ in Word Position

subjects	mean	standard deviation	t
Koreans	165.74	22.22	-3.53
natives	208.43	10.13	

$^{*}p < .05$

According to Table 30, in sentence-initial position, the average length of the Korean subjects' pronunciation of the English word 'society' is bigger than that of native subjects'.

Table 30. The Length of English Word 'Society' in Sentence-initial Position

subjects	mean	standard deviation	t
Koreans	691.31	82.54	1.04
natives	635.39	76.59	

Table 31, however, shows that, in sentence-initial position, the average length of the Korean subjects' English stressed diphthong /ai/ is smaller than that of the native subjects'. The difference in the length between two groups in Table 30 and Table 31 is not significant.

Table 31. The Stressed English Diphthong Length of /ai/ in Sentence-initial position

subjects	mean	standard deviation	t
Koreans	173.81	5.38	-1.70
natives	188.12	18.18	

Table 32. The Length of the English Word 'Society' in Sentence-final Position

subjects	mean	standard deviation	t
Koreans	640.37	26.64	-4.64
natives	707.86	12.28	

$^{**}p < .01$

According to Table 32, in sentence-final position, the average length of the Korean subjects' pronunciation of the English word 'society' is smaller than that of native subjects', and the difference is significant. Table 33 also shows that, in sentence-final position, the average length of the Korean subjects' English stressed diphthong /ai/ is smaller than that of the native subjects'. However the difference is not significant.

Table 33. The Stressed English Diphthong Length of /ai/ in Sentence-final Position

subjects	mean	standard deviation	t
Koreans	173.71	12.95	-1.84
natives	200.50	29.53	

Tables 34-36 tell us that, in the ratio of the average English stressed diphthong /ai/ to that of the word 'society', Korean subjects' proportion is smaller than that of native subjects' not only in word position but also sentence-initial and sentence-final position. The t-value shows that, in word and sentence-initial position, the difference is significant.

Table 34. The Ratio of the Length of English Stressed Diphthong /ai/ to that of Word 'Society' in Word Position

subjects	mean	standard deviation	t
Koreans	.237	.03	-4.53
natives	.310	.01	

$^{**}p < .01$

Table 35. The Ratio of the Length of English Stressed Diphthong /ai/ to that of Word 'Society' in Sentence-initial Position

subjects	mean	standard deviation	t
Koreans	.251	.29	-2.67
natives	.296	.15	

$^{*}p < .05$

Table 36. The Ratio of the Length of English Stressed Diphthong /ai/ to that of Word 'Society' in Sentence-final Position

subjects	mean	standard deviation	t
Koreans	.271	.02	-.57
natives	.284	.04	

3.5. The comparison of English diphthong /ɔi / length

Table 37. The Length of English Word 'Employment' in Word Position

subjects	mean	standard deviation	t
Koreans	803.64	124.75	2.50
natives	640.68	36.88	

$^{*}p < .05$

Table 38. The Stressed English Diphthong Length of /ɔi / in Word Position

subjects	mean	standard deviation	t
Koreans	172.36	13.87	-.89
natives	182.70	20.99	

Table 39. The Length of English Word 'Employment' in Sentence-initial Position

subjects	mean	standard deviation	t
Koreans	785.84	85.08	3.74
natives	604.01	51.11	

$^{**}p < .01$

Table 40. The Stressed English Diphthong Length of /ɔi/ in Sentence-initial position

subjects	mean	standard deviation	t
Koreans	183.39	10.87	5.25
natives	149.65	7.51	

$^{**}p < .01$

According to Table 39, in sentence-initial position, the average length of the Korean subjects' pronunciation of the English word 'employment' is bigger than that of native subjects', and the difference is significant. Table 40 shows that, in sentence-initial position, the average length of the Korean subjects' English stressed diphthong /ɔi/ is bigger than that of the native subjects', and also the difference in Table 40 is significant.

Table 41. The Length of the English word 'Employment' in Sentence-final position

subjects	mean	standard deviation	t
Koreans	813.75	97.69	3.31
natives	636.61	45.75	

$^{*}p < .05$

Table 42. The Stressed English Diphthong Length of /ɔi/ in Sentence-final Position

subjects	mean	standard deviation	t
Koreans	169.92	10.51	1.22
natives	159.34	15.57	

According to Table 41, in sentence-final position, the average length of the Korean subjects' pronunciation of the English word 'employment' is bigger than that of native subjects', and the difference is significant. Table 42 also shows that, in sentence-final position, the average length of the Korean subjects' English stressed diphthong /ɔi/ is bigger than that of the native subjects', whose difference is not significant.

Table 43. The Ratio of the Length of English Stressed Diphthong /ɔi/ to that of word 'Employment' in Word Position

subjects	mean	standard deviation	t
Koreans	.214	.03	-3.15
natives	.285	.04	

$^{*}p < .05$

Table 44. The Ratio of the Length of English Stressed Diphthong /ɔi/ to that of word 'Employment' in Sentence-initial Position

subjects	mean	standard deviation	t
Koreans	.233	.02	-1.08
natives	.249	.01	

Table 45. The Ratio of the Length of English Stressed Diphthong /ɔi/ to that of word 'Employment' in Sentence-final Position

subjects	mean	standard deviation	t
Koreans	.209	.02	-2.23
natives	.250	.03	

4 Conclusion

Through statistic analysis of experimental data, I could find out the following: Firstly, in the length of English diphthongs /ei/ and /ou/, I couldn't see anything in common between them. In diphthong /ei/, the average length of the Korean subjects' pronunciation is greater than that of native subjects' regardless of its sentence positions. However, in diphthong /ou/, in some positions the length of Korean subjects' pronunciation is bigger than that of the American subjects', while in other position the length of the Korean subjects' pronunciation is smaller than that of the American subjects. From this I might point out that there aren't any common features between two diphthong groups, which begin with front mid and back mid positions, respectively.

Secondly, in English diphthongs /ai/, /au/, and /ɔi /, there is a common feature among them; the average length of the Korean subjects' pronunciation is smaller than that of native subjects' regardless of its sentence position. In general, if the length of the word including a diphthong is long, the length of the diphthong included in the word tends to be big. As a result we need to find out the feature of ratio of the English diphthongs, /ai/, /au/, and / ɔi /, to that of words 'surrounding', 'society', and 'employment' in word, sentence-initial, and sentence-final position, and the results are following.

Through Tables 25- 27, I saw that, in the ratio of the average English stressed diphthong /au/ to that of the word 'surrounding', the Korean subjects'

proportion is smaller than that of the native subjects' not only in word position but also sentence-initial and sentence-final position. The t-value shows that, in Tables 25, 26, and 27, the difference is significant. Through Tables 34- 36, I found out that, in the ratio of the average English stressed diphthong /ai/ to that of the word 'society', the Korean subjects' proportion is smaller than that of the native subjects' not only in word position but also sentence-initial and sentence-final position. The t-value shows that, in word and sentence-initial position, the difference is significant. Through Tables 43- 45, I saw that, in the ratio of the average English stressed diphthong / ɔi / to that of word 'employment', the Korean subjects' proportion is smaller than that of native subjects' not only in word position but also sentence-initial and sentence-final position. The t-value shows that, in word position, the difference is significant.

From this result, I saw that three diphthongs, /ai/, /au/, and / ɔi /, have a common feature, not only in the length but also in the ratio of these three average English stressed diphthongs to that of the words, 'surrounding', 'society', and 'employment'. The Korean subjects' proportion is smaller than that of the native subjects' not only in word position but also sentence-initial and sentence-final position. I already pointed out that in Park (2009), Koreans have difficulty in pronouncing English low vowels. Now I want to add English diphthongs beginning with English low vowels to the difficult vowel list for Koreans.

The English diphthongs, /ai/, /au/, and /ɔi /, have a common feature in that they begin with English low vowels, /a/ and /ɔ/. This means that Koreans could have difficulty in pronouncing not only English low vowels but also English diphthongs beginning with English low vowels.

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Received: August 30, 2010
Revised: November 25, 2010
Accepted: December 5, 2010