Perception of English Approximants by Korean-speaking Students

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Yune, Suejin. (2016). Perception of English Approximants by Korean-speaking Students. *The Linguistic Association of Korea Journal, 24*(3), 63-85. This paper examines Korean speakers' perception of English approximants [l], [r], [w], [j] which are thought to be difficult sounds for Korean-speaking English learners. Experimental studies were conducted to examine which sound(s) is the most difficult to perceive among the four English approximants and whether English proficiency plays a significant role when perceiving approximants. For this purpose, an identification test and discrimination test were implemented on 61 college students with two English proficiency levels: high proficiency (HP), and low proficiency (LP). The 4 stimuli are real English words beginning with each target sound. The result of the identification test showed that [r] and [w] were the least detectable sounds for high proficiency level. The result of discrimination test indicated that [l]-[r] sounds pairs (*lap-rap*, and *rap-lap*) were the most difficult sound pairs. Interestingly, the *lap-rap* pair was significantly less recognized than the *rap-lap* pair regardless of the participants' proficiency level.

Key Words: English approximants, liquids, glides, perception, English proficiency

1. Introduction

Approximants are the sounds that do not involve any kind of closure of the vocal tract (Ladefoged, 2001) and more specifically, they are made in such a way that one articulator is close to another without narrowing the vocal tract to create any friction (Yavas, 2006). Approximants have liquids and glides as a subcategory. Approximants exist in both English and Korean; however, they are

phonetically as well as phonologically different so that Korean-speaking learners of English consider the approximant sounds in English to be difficult to perceive (Jamison & Yu, 1996; Jun, 2003; Kang, 2006; Park & Ingram, 1995). Few studies have focused on the whole sound categories of approximants. In other words, many studies have only focused on each subcategory of approximants such as liquids or glides separately. In this study, the perception of four approximants in English will be integratedly examined in order to find out which approximant sound is considered to be the most difficult for the Korean learners of English to perceive, and whether English proficiency level affects the perception of approximants.

2. Literature Review

2.1 Korean vs. English approximants

In English, specifically American English, since American English was used for the experiments in this paper, four approximant phonemes are found: [l,r,w,j]. Interestingly, lateral [l] has two allophones as in clear (or light) [l] word-initially, and dark [l] word-finally. In the language of Korean, contrastively, only three approximant phonemes are found; [l,w,j]. It is known that the [l] has two distinct allophones [r] and [l]. Korean liquid sound in word initial position is flap, and the IPA reads [ɾ]. English retroflex symbolizes as [ɹ] in the IPA system. This paper marks approximant in Korean and English as [r] for convenience. According to Shin (2012), the Korean consonant inventory has only one liquid sound which is known to have two allophones such as [r] and [l] in the language of English. Though the two sounds distinctively have acoustical differences, Korean learners of English do not pay attention to the acoustic distinctions on the two sounds. What is more important on Korean liquids is word-initial constraints of [l]. According to the phonological constraint, the law of initials or also called word-initial avoidance, the [l] is pronounced as [n] in word-initial position or after a consonant whereas [l] is pronounced as [l] only in syllable-final position. One of the allophones of [l], [r] is only found in well-known loanwords word-initially. Those two sounds are in

complementary distribution. Korean word-final [l] is produced as a light [l] in English (Jamieson & Yu, 1996; Jun, 2003; Kim & Lotto, 2004; & Park & Ingram, 1995).

In articulation of glides, Korean [w] and English [w] indicate a distinct difference. Korean [w] at the syllable-initial position showed a slight degree of coarticulation with the upcoming vowel whereas English [w] showed no coarticulation with the upcoming vowel (Kang, 2006). Acoustically, the third formant (F3) transition has a significant role in differentiating [l] from [r]. The F3 trajectory of /r/ begins at a point just slightly above F2 and has a rising transition into the next vowel formant whereas /l/ shows little or no transition in F3 (Park & Ingram, 1995). English laterals represent high F3 in common. On the contrary to lateral sounds, English retroflex lowers F3 values with more lip rounding in syllable onset. Since the lip rounding lowers both F2 and F3 values together, [w], one of the English glides also has lower F3 values, however, the F3 value of [w] is not as drastically low as the F3 value of retroflex. English [w] in the syllable-initial position has constant low frequencies, in particular, low F2 across all vowel contexts (Kang, 2006). This is caused by the fact that [w] has qualities of semi-vowels, which means formant transition is more salient. Since lip rounding is an essential part of [w] (Ladefoged, 1982) and lip rounding could be indicated by F3 acoustic value, it is likely for native speakers of English to perceive [r] and [w] indiscriminately. The distinctive acoustic cue of glide [j] is the gap made from F1 and F2 and the gap is much bigger than the gap of [w] sound even though [w] and [j] are both glides, the subgroup of approximants.

2.2 Previous studies on English approximants

Kim and Lotto (2004) examined Korean approximants phonetically. They measured acoustical cues such as formants, duration of each approximants in the Korean inventory with twelve native speakers of Korean. The subjects were given a reading list and instructed to read the sentences as naturally as possible. The speech made by the subjects were recorded and analyzed acoustically. Kim and Lotto concluded with some predictions for the English-speaking learners of Korean: first the Korean word-final [l] has F2

values that overlap with English word-final [r] sound which would cause category interference for learners. Secondly since the range of F2 values for [w] is much higher for Korean speakers, glides would be hard to distinguish by F2 values and also learners of Korean would have difficulty in distinction of [w] and [j]. In the Kim and Lotto's paper, the authors made predictions for the second language learners of Korean; in other words, Kim and Lotto's paper primarily described acoustic features of Korean approximants in order to assist learners of Korean who have English as their first language; however, other researchers compared cross-linguistically: Ingram and Park (1998) compared English /r/ and /l/ produced by Japanese and Korean listeners by conducting identification and discrimination tests with minimal pair stimuli. They investigated speaker effects within word contrast position as well as listening task in order to evaluate the relative importance of language-specific and language-independent factors operating at the acoustic-phonetic and phonological levels of signal processing in foreign sound speech perception. They also concluded that on the identification test, previous exposure to phonological learning and relative acoustic discriminability of the items affected participants' results. They wrapped up with the conclusion that phonological processing of the signal was more associated with the identification test. MacKain et al (1981) examined categorical perception of a synthetic /r/ - /l/ continuum with Japanese bilinguals who are in two different levels of English: inexperienced vs. experienced. They designated American-English control group in order to confirm classic categorical perception. The inexperienced experimental group informed that near-chance performance on all tasks, with performance no better for stimuli that straddled the /r/-/l/ boundary than for stimuli that fell in either category. In contrast, it is proved that the experienced experimental group perceived /r/ and /l/ categorically. Interestingly, their overall performance levels on the discrimination tests were lower than for the Americans despite the fact that the result of identification task was not different from the one from American-English controls. They allegedly concluded that native Japanese adults learning English as a second language are capable of categorical perception of /r/ and /l/. Best and Strange (1992) focused on the idea that the degree of difficulty that adults have with discriminating nonnative segmental contrasts varies considerably across contrasts and languages and they

thought this idea may be explained by differences in how the nonnative phones are perceptually assimilated into native phoneme categories by testing identification and discrimination of three synthetic series of American English approximant contrasts. In order to evaluate differences between subgroups of the Japanese subjects who had two different levels of English conversation experience, they came up with the assumption that perceptual assimilation may be modified by learning the second language (L2). In other words, they compared identification and discrimination of synthetic /r-l/, /w-r/, and /w-j/ series by American and Japanese listeners and their experiments are mostly based on the experiment by MacKain et al. Best and Strange measured F1, F2, and F3 values on the stimuli /jak/, /wak/, /rak/, and /lak/ while MacKain et al used the stimuli *rock* and *lock* which are listed in dictionaries.

In this paper, the idea from MacKain et al and Best & Strange was blended and employed by implementing two tests, an identification and a discrimination test, with stimuli [*rap, lap, wap, yap*] which are meaningfully listed in dictionaries. Jamieson & Yu (1996) started with the phenomenon that native speakers of Korean often have difficulty perceiving the English liquid sounds. Jamieson & Yu investigated the speech perception abilities of adults who were native speakers of Korean but who had lived for many years in an English-speaking environment. They conducted three tests of speech perception with thirty native speakers of Korean. They specifically researched accuracy under optimal listening conditions, accuracy under more difficult listening conditions, accuracy as a function of the position of the garget in the syllable, and lastly distribution of identification errors. The results of this study are 1) that native speakers of the Korean language have considerable difficulty identifying tokens of the English language [l] and [r] sounds and 2) that Korean listeners identified English [r] and [l] sounds most accurately when these target sounds were presented in final singleton position. Jun (2003) also examines Korean speakers' perception of English liquids [l] and [r] which are considered difficult for Koreans. She carried out an experimental study considering factors such as phonetic environment, L1 transfer, unmarkedness, form style, foreign accent, and experience of English exposure. The experimental study was conducted to 80 Korean-speaking English learners with 14 words of l-r pairs in different word position. The result confirms the prediction that /l/ would be

perceived better than /r/ by Korean speakers. The statistical analysis shows that the form difference affects the /l/ and /r/ perception, more specifically, the subjects perceive better when the items are presented as words in isolation than those occurring in sentences. Regarding the experience to English-speaking environment, the subjects' experiences are related to English liquids perception and affected it positively. Jun also detected that the perception of [r] in the word final position is the most difficult for Koreans among all the positions of [l] and [r].

Kang (2006) examined the acoustic properties of Korean /w/ in various phonological contexts and explained the reason why English/w/ is perceived differently by Korean speakers depending on the phonological contexts. She also claimed that the F2 transitional pattern is an important factor in the perception of /w/. She conducted three different experiments in order to support her arguments. The first experiment was implemented to measure the F2 onset (glide) and the F2 vowel in the sequence of /wV/ at the syllable-initial position in Korean. The second experiment was about the acoustic properties of the sound /w/ in Korean when it occurs after a tautosyllabic stop and considered how closely /w/ is co-articulated with the following vowel and the preceding consonant. In the third experiment, Kang compared the English /w/ after a tauto-syllabic stop with Korean /w/'s in the same linguistic environment to identify any acoustic differences or similarities. The study showed that 1) there are acoustic differences between English and Korean /w/s in various phonological contexts and 2) the direction of F2 transition and extent of F2 change affect the perception of speakers, which results in different adaptation of the same English segment /w into various forms in Korean. Park & Ingram (1995) discussed the controversy over the relative importance of L1 transfer (Language-specific) and acoustic/phonetic effects (Language-universal) with reference to /l/ and /r/ perception by Korean and Japanese speakers learning English. Park & Ingram conducted identification and discrimination test with the research question that L1 interference effects or the effect of prior phonological learning of the first language may be more likely to manifest themselves in L2 phoneme identification than in a discrimination task. The conclusion of this study is that Korean subjects might have received some advantage in identifying /l/ and/r/

in initial position by means of the application of [r] and [l] borrowed from cluster or medial position respectively. And there could be the possibility of the application of perceptually corresponding templates flap and geminate to English /r/ and /l/ to initial position in the case of the Korean listeners. This conclusion generalizes that language-specific L1 phonological constraints prevailed over language-universal acoustic/phonetic effects for both Korean and Japanese subjects. The two tests support that the idiosyncratic acoustic attributes of respective native speakers can affect the perception of problematic L2 sounds such as /l/ and /r/ of L2 learners who do not possess firm and clear perceptual target of the L2 sounds in question. With these perspectives tracked of, it could be readily said that most previous studies have focused on either English liquids or glides separately. In other words, studies on English approximants including both liquids and glides together were hardly found. This study focuses on the perception of English approximants by Korean learners of English. More specifically, it may be assumed that Korean learners of English with low proficiency level may have more difficulties in detecting [r] and [w] sounds clearly than high proficiency level students. This could be supposedly believed that because low proficiency-level students may less detect F3 acoustic value of the sound which plays a significant role in discriminating the two sounds than high proficiency-level students. Also, Korean learners of English may perceive the [r]-[l] pair with more efforts than other pairs of approximants due to the lack of distinction between [r]-[l] sounds in the Korean inventory irrespective of their proficiency. In order to investigate these issues, this paper conducted two experiments which are an identification test and discrimination test. Thus, this paper examines the following research questions:
1) Are [r] and [w] more difficult sounds to perceive for Korean learners of English with low proficiency than the learners with high proficiency?
2) Are the word pairs which begin with [r], [l] (*rap-lap, lap-rap*) more difficult to be perceived than the word pairs with glide initial (*wap-yap, yap-wap*) regardless of the participants' English proficiency level?

3. Method

3.1 Identification test

3.1.1 Subjects

61 college students participated in this identification test. The participants are currently enrolled students in a university located at Kyunggi province in Korea. The subjects are currently taking Academic English, in particular, English language and composition. In order to categorize the subjects in accordance with their English proficiency level, institutional TOEIC score was used due to the fact that most of the subjects have taken the institutional TOEIC test between September and October this year. Only 57 students have taken the institutional TOEIC test so that 57 data is eligible for this research among 61 data drawn from the experiment. The eligible 57 subjects with data were categorized into two groups, which are HP (high proficiency level group) and LP (low proficiency level group), and more importantly, according to their TOEIC score range such as 100-200, 200-300. Here is a simplified table:

TABLE 1. The number of participants according to institutional TOEIC score

TOEIC score range	HP (High Proficiency)	TOEIC score range	LP (Low Proficiency)
800-899	5	400-499	9
700-799	6	300-399	9
600-699	9	200-299	6
Eligible Subjects Total	20 (out of 26)	Eligible Subjects Total	24 (out of 31)

In HP, six females out of 20 eligible subjects, and two females out of 24 in LP participated in the experiment. The age range is from 20-28 and most of the subjects have little experience of living or staying in English-speaking environment, except one in HP. He (subject number 07 in HP) has stayed in Australia for three years in secondary education period, however, his English proficiency level was not that much distinctive from other participants. The

total mean TOEIC score of all the 57 subjects is 512 out of 990 so that the data of the subjects with TOEIC score around 500-600 and below 199 were not counted as meaningful data set in order to maximize and draw meaningful results. To sum up, out of sixty one subjects who voluntarily participated in the experiment, the data from only forty four participants with TOEIC score was analyzed in order to make the result more legitimate.

3.1.2 Stimuli

Four English words were selected: *rap, lap, wap, yap*. All of the selected words are currently listed in dictionaries. Most consonant reductions and neutralizations occur word-finally, which means word initial position is universally stronger than word final position in phonological contexts (Jun, 2003) so that the selected word starts with four different approximants word-initially. The stimuli words end with stop sound [p] and have low vowel [a] between the front approximant and final stop sound. The reasons why this structure was chosen are: 1) in Korean language, word-initial lateral is deleted when it is followed by [i] or [j] so that low vowel [a] is inserted to help listeners recognize lateral sound more vividly, 2) voiceless bilabial stop [p] was added at the word-final position due to the fact that Korean has CVC structure phonologically and English [p] and Korean [p] is phonetically different. In other words, the participants were asked to distinguish phonetic difference perceptually and the stop was used as a cue for the last of the given word set. The reason why the number of the stimuli is only four is explained by the fact that the experiments in this paper employed the stimuli in the way of minimal pairs with repetition. In addition, word familiarity as in the subjects was considered when this experiment was designed. The recording of the given word set was implemented by text-to-speech program (http://www.oddcast.com/home/demos/tts/tts_example.php) using male American speaker voice. The interval time between each word out of 40 was 1 second. The machine-generated speech is widely used with a view to testing for listening

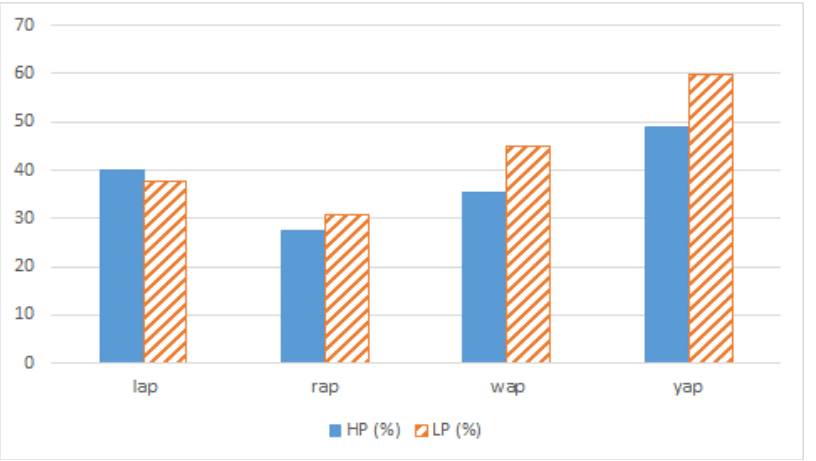
3.1.3 Procedure

All participants had taken the institutional TOEIC test previously and they were asked to fill out the multiple-choiced answer paper while listening to the sound file in the classroom. The identification test was executed first. In the identification test, the word set [*rap, lap, wap, yap*] were not only multiplied ten times but randomized. In other words, all 40 words were played in total as in the sound files. Before the identification test, the participants were given a practice with four items which are different from the test items to ease themselves. All trial items were selected from sibilant sounds.

3.1.4 Result

In order to find out whether the sounds [r] and [w] are more difficult sounds to discern, in particular, for LP group listeners than HP group listeners, an identification test was performed. The results from the identification test in both HP and LP groups are firstly, glides are less problematic to perceive than liquids, secondly [r] was the least detectable sound, and of the two liquids, [l] is better perceived than [r]. Firstly, liquid sounds do not exist as separate phonemes in the Korean inventory whereas phonemes of glides [w], [j] are found in the Korean inventory. This may cause the result that English glides were perceived better than English liquids by Korean learners of English. Secondly, out of the two liquids, [r] is less perceived than [l]. [w] is more difficult to detect between the two glide sounds. The thing that [r] and [w] sounds have in common is F3 acoustic value which represents lip rounding feature. This feature may cause the listeners a confusion of [r] and [w]. The F3 acoustic feature even affects native speakers of English as Jamieson & Yu (1996) reported that [r] and [w] are the sounds for native speakers of English to perceive interchangeably. Jun (2003)'s assertion that [l] is more perceivable than [r] in both HP and LP groups is also confirmed in this experiment. According to Jun (2003), [l] is more unmarked than [r] and listeners tend to perceive unmarked ones better than marked ones. Korean has alveolar-lateral which is less marked than flap sound and located word-finally, therefore, it can be remarked that [l] was recognized more effectively for the listeners than [r] in this experiment.

TABLE 2. Identification Test Result



In order to obtain statistical results, the data collected was analyzed by SPSS 17.0. Firstly, an independent t-test was conducted in order to investigate if the total percentage of the perception varies according to the subjects' English proficiency levels.

TABLE 3. Descriptive Statistics on Total Percentage

	Group	N	Mean	Std. Deviation
Total_percent	high	20	89.93	4.88
	low	24	89.20	6.93

TABLE 4. Independent t-test

	t	df	Sig.(2-tailed)	Mean Difference	Std. Error Difference
Total_percent	-.185	42	.854	-.52083	2.81707

$p>0.05$

The result of independent t-test claimed that the total percentage between the two subject groups is not statistically meaningful with the p value of .854. And the result from ANOVA test also did not approve of statistical

significance with all the p value over .05.

TABLE 5. one-way ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
lap*Group	5.473	1	5.473	1.014	.320
	226.771	42	5.399		
	232.244	43			
rap*Group	.232	1	.232	.031	.861
	315.677	42	7.516		
	315.909	43			
wap*Group	4.261	1	4.261	.939	.338
	190.625	42	4.539		
	194.886	43			
yap*Group	.005	1	.005	.008	.929
	24.427	42	.582		
	24.432	43			

$p>0.05$

The result from ANOVA test asserted that no interaction between groups and sound categories was found. In other words, both groups showed a similar pattern as well as the target sounds were perceived not differently from the groups. Accordingly, another statistical method was facilitated in order to find out whether the four target sounds have any interaction in both groups collapsed.

TABLE 6. ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	107.777	3	35.926	8.051	0
Within Groups	767.472	172	4.462		
Total	875.249	175			

$p<0.05$

In contrast with the result from ANOVA test between total percentage and groups, some statistical interactions between each target sound were found by the result from ANOVA test according to table 6. Additionally, Post hoc Tukey test was conducted in order to investigate whether any interactions among the target sounds were statistically meaningful. The Tukey test revealed that some target words were statistically related, however, [r] and [w] sounds were not.

TABLE 7. Multiple Comparisons

	(I)category	(J)category	Mean Difference(I-J)	Std. Error	Sig.
Tukey HSD	lap	rap	1.30682*	0.45036	0.022
		wap	2.10227*	0.45036	0
		yap	1.64773*	0.45036	0.002
	rap	lap	-1.30682*	0.45036	0.022
		wap	0.79545	0.45036	**0.293**
		yap	0.34091	0.45036	0.874
	wap	lap	-2.10227*	0.45036	0
		rap	-0.79545	0.45036	**0.293**
		yap	-0.45455	0.45036	0.744
	yap	lap	-1.64773*	0.45036	0.002
		rap	-0.34091	0.45036	0.874
		wap	0.45455	0.45036	0.744

In summary, the research question whether Korean learners of English with low proficiency level would have more difficulty in detecting [r] and [w] sounds than high level students was not supported by the identification test.

3.2 Discrimination test

3.2.1 Subjects

The participants engaged in the discrimination test are the same as the ones from the identification test.

3.2.2 Stimuli

The stimuli used in the discrimination test are the same as the previous test: *rap, lap, wap, yap,* the four word items. The stimuli were made into word-pairs. The word-pairs were made from two words randomly selected from the four word items and it gives sixteen pairs of words. The word set of 16 pairs was multiplied four times and it resulted in 64 word pairs in total (out of 64 word pairs, 16 pairs are the completely same word-pairs).

3.2.3 Procedure

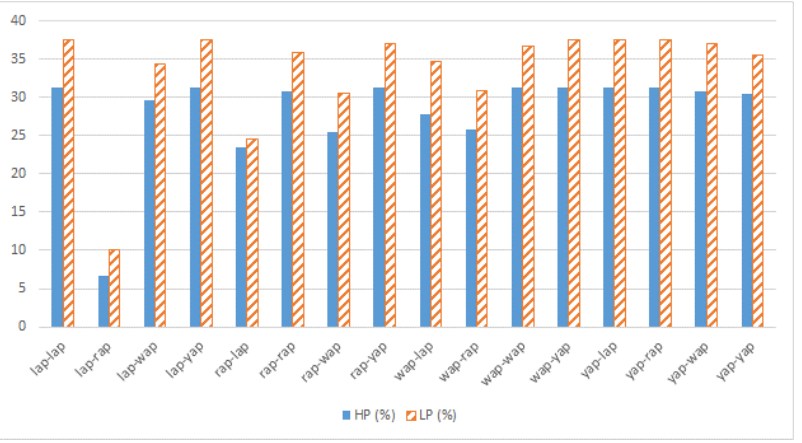
An interval of five minutes after the identification test was given to the participants in order not to get distracted by the first test having the following test ahead. A practice session was given to make the subjects feel adjustable to the new-formatted test. The practice items were the same as the ones used in the identification test; all sibilant sounds in word-initial position. The sound files were previously recorded by the same process as used in the identification test, which means via the text-to-speech website mentioned earlier in this paper. The interval time between the two words of the pairs is only 500 m/s and that of each pair is 1 second. The sound files were played and the participants were asked to write down o if the word pair they're listening to is referring the same word pair on the test material or x if it doesn't sound identical.

3.2.4 Result

The results from the discrimination are 1) both groups perceived the English approximants less than 40% in total, 2) the listeners with low proficiency level perceived better than the listeners with high proficiency level, and 3) most importantly, English liquids are less discerned than English glides for Korean-speaking listeners. Firstly, the participants in both groups had difficulty in discriminating the target sounds as less than 40% in total which could mean English approximants are challenging sounds for Korean learners of English. According to the table 8, the listeners with low proficiency had a better

recognition on discriminating the target sounds than the listeners with high proficiency by and large. The total percentage of the perception of the target sounds is 28% in HP group students and 33% in LP group students. This can be restated that both level listeners scarcely recognize the target sounds. Last but not least, one of the most distinguishable results from the discrimination test is that liquid sound pairs such as *lap-rap*, and *rap-lap* were the least detectable by both high and low proficiency groups. It is also intriguing that the order of [l] and [r] is relatively harder for the subjects to perceive than [r] and [l]. In other words, the word pair *lap-rap* was much less perceived than *rap-lap* though these word pairs all started with liquid sounds. This may be based upon the fact that Korean alveolar-lateral sound is only found in word-final position whereas Korean flap sound is found word-initially.

TABLE 8. Discrimination test result



Statistical analysis was carried out via SPSS 17.0 in order to examine any significant consequences in the result of discrimination test. Firstly, independent t-test was conducted to find out if any relation between the total percentage and groups is found.

TABLE 9. Independent t-test

	t	df	Sig.(2-tailed)	Mean Difference	Std. Error Difference
Total_percent	-.185	42	.854	-.52083	2.81707

p>0.05

Since differences between the total percentage and groups represented no meaningful relation by the independent t-test, an ANOVA test was carried out to investigate which sound pair was the most difficult for the listeners to perceive. The ANOVA test indicated statistical significance of each sound pair and groups.

TABLE 10. ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	249885.476	15	16659.032	68.028	.000
Within Groups	168480.114	688	244.884		
Total	418365.589	703			

Of Post hoc Tukey test results, the results with only liquid sound pairs were presented in this study. It may be asserted that the perception of liquid sound for the participants was statistically significant with most of the p value of .000.

TABLE 11. Multiple Comparisons

	(I) category	(J) category	Mean Difference (I-J)	Std. Error	Sig.
Tukey HSD	lap-rap	lap-lap	-75.5682*	3.3363	.000
		lap-wap	-68.7500*	3.3363	.000
		lap-yap	-75.5682*	3.3363	.000
		rap-lap	-45.4545*	3.3363	.000
		rap-rap	-72.7273*	3.3363	.000
		rap-wap	-56.8182*	3.3363	.000
		rap-yap	-75.0000*	3.3363	.000
		wap-lap	-66.4773*	3.3363	.000
		wap-rap	-57.9545*	3.3363	.000
		wap-wap	-74.4318*	3.3363	.000
		wap-yap	-75.5682*	3.3363	.000
		yap-rap	-75.5682*	3.3363	.000
		yap-lap	-75.5682*	3.3363	.000
		yap-wap	-74.4318*	3.3363	.000
		yap-yap	-71.5909*	3.3363	.000
	rap-lap	lap-lap	-30.1136*	3.3363	.000
		lap-rap	45.4545*	3.3363	.000
		lap-wap	-23.2955*	3.3363	.000
		lap-yap	-30.1136*	3.3363	.000
		rap-rap	-27.2727*	3.3363	.000
		rap-wap	-11.3636	3.3363	.055
		rap-yap	-29.5455*	3.3363	.000
		wap-lap	-21.0227*	3.3363	.000
		wap-rap	-12.5000*	3.3363	.018
		wap-wap	-28.9773*	3.3363	.000
		wap-yap	-30.1136*	3.3363	.000
		yap-rap	-30.1136*	3.3363	.000
		yap-lap	-30.1136*	3.3363	.000
		yap-wap	-28.9773*	3.3363	.000
		yap-yap	-26.1364*	3.3363	.000

In summary, the result of the discrimination test supported that English liquids which are [l] and [r] sounds are more difficult to perceive than English glide sounds. This result is sufficiently possible to answer the second research question. In the statistical analysis, no relation between groups and total percentage was found. However, liquid sound pairs were significantly relevant.

4. Discussion and Conclusion

4.1. Discussion

This paper examined perception of English approximants by Korean-speaking college students. In order to investigate how well or differently the subjects recognize the given sounds, two different tests which were an identification test and discrimination test were executed. The two predictions were drawn from other researchers' findings: the first one was that low level Korean students would have more difficulty in perceiving [r] and [w] sounds compared to high level students since low level students would not correctly be aware of the idea that both [r] and [w] has lip rounding feature in common and this denotes decreasing F3 value together. This idea was not supported by the identification test in this paper; rather, high-level students did not recognize [r] and [w] less distinctly. For the future research, exposure or degree of exposure to second language, more specifically, how much the subjects are educated second language should be investigated prior to further study. Also, learner effects and individuality should be considered and more details on how to stipulate them should be examined scientifically. The second research question that [l] and [r] distinction would be the most challengeable among other approximant pairs was supported by the discrimination test. In the discrimination test, *lap-rap* pair was the most difficult to detect for both subject groups regardless of their English proficiency levels. Interestingly, the order of the pair was worth of attention. Korean inventory does not allow lateral sound to be positioned word-initially so that it could be predicted that *lap* in word-initial position is not eligible for Korean students to detect,

however, this paper haven't investigated the comparison between *lap-rap* and *rap-lap* pair in more sophisticated ways. For the further research, more cross-linguistic research on Korean and English approximants should be performed. Another intriguing result from the discrimination test was that the better score the participants obtain on the institutional TOEIC, the less perception he participants obtain on the approximant sounds in total. This relationship part is totally opposite from the identification test. For the future research, why Korean listeners perceive English [l] and [r] contrariwise with their English proficiency should be analyzed.

4.2. Limitations

This study entails some limitations. First of all, the sounds used for the experiments were recorded by online text-to-speech program. The machine-generated speech has occasionally been used for listening tests when necessary. In this study, the speech was made from the male voice with North American accent. It should not be disregarded that the machine-generated speech could be differently perceived from natural speech by listeners. The participants weren't informed that the stimuli were synthetic speech, however, no participants reported differences from natural speech. In the future research, the differences of perception should be considered when natural speech and synthetic speech was given. Another limitation that could be raised in this study is whether institutional TOEIC score could be a yardstick to classify the two groups. The participants who were currently enrolled in classes were asked to take institutional TOEIC test before taking the classes. The proficiency level was categorized by the overall institutional score. However, the result of the two experiments displayed that low proficiency level students had a better recognition on the target sounds by and large. This could be caused by a hypothesis that the categorization by the proficiency level test was not sufficient. TOEIC is a comprehensive test which has two subset of listening comprehension (LC) and reading comprehension (RC). The participants in this experiments should have been categorized with the LC scores out of the total TOEIC scores since this paper only focuses on recognition of certain target sounds. The result that LP group had better recognition than HP group might

be due to the fact that the criterion to divide the subject groups is the total TOEIC scores, not LC scores. It would have caused more relevant and meaningful result as long as the subject groups were categorized more specifically. That the groups were categorized by the total TOEIC score seems to cause the fact that one subject(number 07) doesn't show more salient total TOEIC score than other subjects even with his personal experience of staying on English-speaking environment. This could mean that his RC score (out of the total score) would be poor though his LC score was higher than other subjects. For the future research, more explicit criterion needs to be considered in experiments.

4.3. Conclusion

In this paper, two experiments were implemented in order to figure out how Korean-speaking learners of English would recognize English approximants. The 44 college students participated in both experiments with four words starting with approximant sounds: *lap, rap, wap, yap.* The result from the identification test did not support the first research question. The first research question was that students with low English proficiency levels would make more efforts to perceive [r] and [w] than high level students since [r] and [w] in English both has the F3 acoustical value feature which represents lip rounding features. The identification test, on the contrary, revealed that low proficiency listeners had better recognition on [r], [w] than high proficiency level listeners. The discrimination test was performed to examine the second research question which is word pairs with English liquid sounds are more difficult for the Korean learners of English to perceive than word pairs with glide sounds. The result of discrimination test supported the second research question. There was a noticeable distinction of perception between the word pair *lap-rap* and *rap-lap.* This might result from the listeners' L1, Korean. The language of Korean has alveolar lateral sound as in word-final position whereas flap sound occurs would-initially such as in loanwords.

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Appendix A
Identification Word List

No	Word	No	Word	No	Word	No	Word
1	wap	11	lap	21	rap	31	rap
2	yap	12	rap	22	rap	32	wap
3	wap	13	yap	23	lap	33	lap
4	lap	14	wap	24	wap	34	rap
5	yap	15	lap	25	yap	35	wap
6	wap	16	rap	26	yap	36	rap
7	yap	17	wap	27	lap	37	lap
8	yap	18	rap	28	lap	38	yap
9	rap	19	wap	29	lap	39	wap
10	yap	20	lap	30	rap	40	yap

Appendix B
Discrimination Word Pair

No	Word pair	No	Word pair	No	Word pair	No	Word pair
1	yap-lap	17	yap-yap	33	wap-rap	49	yap-wap
2	yap-rap	18	lap-lap	34	rap-rap	50	yap-wap
3	yap-rap	19	yap-wap	35	lap-rap	51	wap-wap
4	wap-wap	20	lap-yap	36	rap-lap	52	rap-wap
5	lap-wap	21	wap-lap	37	lap-rap	53	lap-wap
6	lap-rap	22	wap-wap	38	rap-yap	54	rap-yap
7	wap-yap	23	rap-rap	39	lap-wap	55	lap-lap
8	yap-lap	24	lap-lap	40	yap-yap	56	rap-lap
9	yap-lap	25	wap-yap	41	wap-rap	57	yap-rap
10	lap-yap	26	yap-lap	42	rap-lap	58	yap-yap
11	wap-wap	27	wap-rap	43	rap-wap	59	lap-lap
12	yap-rap	28	lap-rap	44	rap-yap	60	rap-lap
13	lap-yap	29	rap-yap	45	lap-wap	61	wap-lap
14	wap-yap	30	rap-wap	46	wap-yap	62	yap-yap
15	rap-wap	31	wap-lap	47	rap-rap	63	yap-wap
16	rap-rap	32	wap-lap	48	lap-yap	64	wap-rap

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