An examination of Korean students' pronunciation of English consonants: The relationship between perception and production

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Abstract
This study examined the relationship between perception and production difficulties in English pronunciation. The participants were 24 Korean students at California State University, Los Angeles, in the English Language Program. First, the participants were given a listening test, evaluating their ability to discriminate consonants at word, sentence, and passage levels. Second, the participants took a read-aloud test, also at word, sentence and passage levels while they were being recorded. Using binary scoring, the recordings were rated by two raters. The means of perception and production errors observed were then correlated, and the resulting correlation coefficient indicated the kind and degree of relationship between the perception and production errors. The findings showed that although there seem to be differences between the number of perception and production errors, a significant relationship exists between the perception and production difficulties of English pronunciation. The findings of this study inform the ESL teachers and material developers about certain issues that they should consider when planning and designing teaching as well as assessment activities of English pronunciation. Even though this study only focused on perception and production difficulties experienced by Korean students, it can also be used as a reference for our Namibian ESL community in teaching and assessing ESL students.

Introduction

Research on second language (L2) learners' pronunciation difficulties has attributed pronunciation difficulties to the phonological differences that exist between the L2 speaker's first language (L1) and the target language (Avery & Ehrlich, 1996; Chan 2010). It is well documented that English consonants which do not exist in the L1 are a challenge for speakers of these languages (Aoyama, Flege, Yamada, & Akahane-Yamada, 2008; Avery, & Ehrlich, 1996; Chan, 2010). As a result, pronunciation difficulties present serious threats to effective communication, especially when pronunciation errors occur in minimal pairs, which lead to unintended altered meaning (Aoyama et al., 2008).

In addition, research has found a significant relationship between perception and production in pronunciation instruction (Reed & Michaud, 2011). To this end, pronunciation difficulties have been assessed in isolation, without knowledge of whether certain

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Volume 2, Number 1, June 2013 - ISSN 2026-7215

difficulties co-exist in both perception and production. However, to the knowledge of the researcher after doing searches on available databases (e.g., ERIC, Google Scholar, and Linguistics and Language Behaviour Abstracts), there are no studies that have examined the relationship between perception and production difficulties in English pronunciation assessment. Considering these findings, there remains a gap in pronunciation research about the perception-production relationship as well as on reporting consistency across multiple elicitation levels. Therefore, this study examines whether there is a relationship between students' perception and production difficulties of English pronunciation, focusing on difficulties that affect intelligibility and not necessarily native-like pronunciation.

The findings of this study can influence some of the decisions that teachers and material developers have to make when designing diagnostic assessments as well as when drawing conclusions based on their test results. Thus, Luoma (2004) warns that teachers should take precautions when selecting features of pronunciation to be tested in a specific assessment because all features cannot be equally tested against one rating criterion. In response to the need for reliable diagnostic assessments for pronunciation, the study aims to answer the following questions:

Which English consonants present difficulties of perception and production for Korean English as Second Language (ESL) students?

Is there a significant relationship between perception and production difficulties of pronunciation of English consonants? In other words, is there a positive or negative correlation between perception and production errors made with specific consonants?

The design of this study is based on three assumptions. First, the L1 has a strong influence on ESL students' pronunciation difficulties. Therefore, the participants in this study will be from the same linguistic background, Korean. Second, there is a relationship between perception and production in pronunciation learning, hence, this study hypothesises that the same relationship may also exist in pronunciation assessment. Third, students' errors in the perception (listening) test will be mainly influenced by their perception abilities, but not by the non-native features of the reader of the texts - because a native speaker of American English has to read the texts for them.

Literature review

Korean ESL students' pronunciation difficulties

Based on the structural linguistics paradigm, the Contrastive Analysis (CA) hypothesis has been used to predict the likelihood of certain sounds in L1 being difficult for L2 students from a given linguistic background (Lado, 1957). Lado (1957; Yang, 1992) reported that in CA, the analyst takes two languages (L1 and L2), contrasts the description of the two language features, and makes predictions about the type of difficulty students may have when learning the L2. The CA was useful in that it yielded practical instructional and assessment materials (Avery & Ehrlich, 1996; Cho & Park, 2006; Lado, 1957; Yang, 1992).

A contrastive phonological statement of Korean and English can be drawn from Cho and Park's (2006) CA of Korean-English phonological structures and processes for pronunciation pedagogy in interpretation schools. Cho and Park (2006) presented the differences in Korean-English phonetic inventories in Tables 1 and 2 below. Cho and Park's (2006) classifications help one to identify the Korean phonemic consonants non-existent in English (/pʰ/ /p'/ /th/ /tʰ/ /kʰ/ /k'/ /s'/ /tʃʰ/ /ɾ/). Additionally, the tables also indicate the English phonemic consonants which are non-existent in Korean (/b/, /d/, /g/ /f/ /v/ /θ/ /ð/ /z/ /ʃ/ /ʒ/ / dʒ/ /r/)

Table 1
Inventory of English phonemic consonants (Cho & Park, 2006)

	Bi-Labial	**Labio-dental**	**Dental**	**Alveolar**	**Palato-alveolar**	**Palata**	Labio-velar	Velar	**Glot.**
Stop	p b			t d				k ɡ	ʔ
Fricative		f v	θ ð	s z	ʃ ʒ				
Affricate					tʃ dʒ				
Nasal	m			n				ŋ	
Approx.				l r		j	w		

Note. Approx. = Approximant. Glot. = Glottal

Table 2
Inventory of Korean phonemic consonants (Cho & Park, 2006)

	Bi-labial	Alveolar	Palato-alveolar	Palata	Velar	Labio- velar	**Glottal**
Stop	p'p p^h	t t^h t'			k k^h k'		
Fricative		s s'					
Affricate			tʃ $tʃ^h$ tʃ'				
Nasal	m	n				ŋ	
Approx.				j	ɯ	w	
Flap		ɾ					

Note. ^{h} = Aspirated obstruents are produced with strong aspiration (stronger than English aspirated sounds). ' = Tensed obstruents which are produced with glottal tension, but they are not glottal sounds or ejectives (Kim, 2012). Approx. = Approximant

In the early 70s, the transformational linguistics paradigm replaced the structural linguistics paradigm on which the CA hypothesis was based (Ortega, 2009; Yang, 1992). Research shifted its methodologies from relying on CA results only, to integrating CA results with Error Analysis (EA) results which (the latter) are based on experimental studies. EA is a type of linguistic analysis that looks at errors that students make when learning a language (Gass & Selinker, 2008). The shift from CA to EA was in response to the criticism of CA mentioned in the previous section, that CA results alone are inadequate for researchers to make assumptions about the students' areas of difficulty in learning the target language. EA findings show that students errors are not only brought on by the students' native language, but they also reflect some universal learning strategies. Therefore, as a reaction to CA theory which considered language transfer as the basic process of second language learning according to behaviourist theory, a primary focus of EA is on the evidence that students' errors provide about the underlying process of second language acquisition (Corder, 1987). It seems CA and EA results do support each other, but only to certain extents in various studies (Yang, 1992). This shows that CA and EA are complementary rather than mutually exclusive; hence, both CA and EA should be used jointly to analyse students' areas of difficulty in the target language.

Focus of current pronunciation assessment

Most work on pronunciation has been focused more on content, teaching strategies, and materials development than on assessment (Celce-Murcia, Brinton, & Goodwin, 2010). Celce-Murcia, Brinton, and Goodwin (2010) argue that pronunciation assessment has been focused on measuring attainment of native-like goals when evaluating students' pronunciation abilities. However, notions like fossilization and the critical period hypotheses have shown that a reaching native-like goal in pronunciation can be challenging and almost impossible for adults ESL learners (Ortega, 2009). As a result, approaches to pronunciation assessment in ESL instruction have shifted from the goals of native-like proficiency to intelligibility goals as well as communicative effectiveness (Luoma, 2004). Therefore, students' pronunciation abilities should be assessed on the basis of how much the listener can understand what the students say (Reed & Michaud, 2011).

Reed and Michaud (2011) found that there is a significant relationship between perception and production in pronunciation learning. They also suggested an integrated model of pronunciation which encourages teacher-learner partnership and the development of metacognitive awareness of learners' pronunciation difficulties. If the same relationship (perception-production) is found in pronunciation assessment, then their model can be also applied in planning of pronunciation assessment activities.

Methodology

This study used correlational research to measure whether there was a relationship between learners' perception and production errors in English pronunciation (Fraenkel & Wallen, 2009). The means of errors observed from the perception and production diagnostic tests were then correlated, and the resulting correlation coefficient was used to indicate the kind and degree of relationship between perception and production errors observed in the tests. All the computations were conducted using the data analysis software, the Statistical Package for the Social Sciences (SPSS, Version 20).

Participants

The participants in this study were Korean ESL students at California State University Los Angeles (CSULA), in the English Language Program (ELP). The participants were all at the intermediate proficiency level in English. Therefore, this study used a convenience sampling method where all the 30 available students were asked to take part in the study. However, only 24 students - 16 males and 8 females - showed interest in participating in this study. The participants had an average age of 24.5 years and an age range of 20 to 29 years. The participants originated from different regions of South Korea. In addition, all the participants received English language instruction for more than 12 months in a foreign language setting.

Instrumentation

First, a bio data questionnaire was administered to the participants, to collect additional characteristics, because at times, convenience samples as well as samples of less than 30 participants for a correlational study, may not be considered representative enough of the population (Fraenkel & Wallen, 2009). Second, the participants took diagnostic tests of perception which tested their perception of consonant sounds at the word, sentence, and passage levels. Third, participants took a production test where they were asked to read aloud texts that tested their production of consonant sounds at word, sentence, and passage levels. The target sounds in the test were English consonants non-existent in Korean language: /b/, /g/, /f/, /v/, /θ/, /**ð**/, /z/, /s/ and /r/. The minimal pair wordlist which was

used consistently in both the perception and production tests at the word, sentence, and passage levels (in initial, medial, and final position) is summarised in Table 3 below.

Table 3

Minimal pairs used in the perception and production tests, in various positions

Phonemic sounds	Initial	Medial	Final
/f/ and /p/	fan/pan	defendant/ dependent	brief/*briep
/v/ and /b/	boat/vote	travellers/ *trabelers	curb/curve
/z/ and /tʃ/	zoos/chews	posing/ poaching	tease/teach
/z/ and /dʒ/	jealous/zealous	reason/ region	chains/ change
/b/ and /p/	back/pack	clubbing/*clupping	cap/cab
/ɡ/ and /k/	goats/coats	disagreement/ *disacreament	bag/back
/s/ and /ʃ/	save/shave	leases/leashes	lease/leash
/r/ and /l/	reader/leader	correct/collect	tour/ tool
/ϴ/ and /t/	thinker/ tinker	breathing/ *breating	teeth/teet
/ð/ and /t/	those/tose	northern/*norten	breathe/*breat

Note. *Nonsense words

Raters

Two raters were used in this study to rate the production tests. Rater 1 was the researcher of this study, and a student in the Masters of Teaching English to Speakers of Languages (MA TESOL) program at CSULA. He is a second language speaker of English who learned English since the first grade of schooling up until graduate level study. Rater 2 was also a student in the MA TESOL program at CSULA, and a native speaker of Standard American English. Only one rater (Rater 1) was used to rate the perception tests.

Reliability

The study used the multiple elicitation technique to test each item in both the perception and production tests. Thus, this technique helped the researcher to have more confidence in making appropriate generalizations about the errors made by the participants, considering the consistency of errors across the three levels (word, sentence, and passage level). In addition, the researcher consistently used the same minimal pair contrasts across the different levels of elicitations in order to account for various challenges observed at different levels of language, as well as at different positions. The researcher also chose a native speaker of Standard American English (Rater 2) to read the listening texts to the student because it is likely that students may have difficulty understanding other varieties of English, like the one spoken by the researcher, the Namibian English accent.

Although research on spoken language assessment recommends that more than one rater be used in order to ensure greater rater reliability (Brown & Abeywickrama, 2010; Underhill, 1987), Weir (1993) warns that using too many raters could also create difficulties when different raters are used for rating different tests. Therefore, this study used two raters in the production tests as a more practical way of ensuring inter-rater reliability. At the same time, intra-rater reliability was also ensured by providing training to the raters, and allowing them an opportunity to compare their ratings and make their way to a common agreed-upon score. In the perception test, only one rater was used because the tests consisted of closed question (multiple choice items), which do not necessarily compromise rater reliability.

Administrative procedures

The data collection process took the researcher a period of two days. Each participant was assigned an identification number that had to be recorded on each participant's recording (production tests), worksheet (perception tests), and bio-data questionnaire. The identification number technique was used as a means to protect the participants' identity, as it is required by research ethics to treat data with confidentiality as well as break the link between the data and participants by ensuring their anonymity. Therefore, the identification numbers enabled identification of subjects' responses during data analysis, without using their real identity.

On day one (session 1), the data for the variable on perception were collected. This was also the time when the participants were asked to complete a one page bio-data questionnaire. In the perception tests, a native speaker of Standard American English read the texts (twice) to the participants in a classroom while they completed the worksheets provided to them. Participants were given an hour break before they were called in for the production tests (session 2). A voice recorder was used to record the participants during the production tests. This enabled playback for data analysis purposes. However, the researcher did not have enough recorders and human resources to enable recording of all the participants in one day or at the same time. As a result, the data collection process for production required more than one day.

Even though some students took the production test first, there was not necessarily any risk of information leakage since all the subjects were given a chance to read the texts in advance, and ask questions in case there was a word they could not read. The test was testing the subjects' pronunciation rather than testing reading, hence there was not a need to hide the texts from the students or to make sure that they see the texts for the first time when they take the text.

Scoring procedures

On the perception tests, the rater rated the responses of the participants, using binary scoring, right or wrong categories, which were recorded on matrix sheets. According to Brown and Abeywickrama (2010), closed questions that requires binary scoring, like the bi-choice questions used in the perception tests, do not compromise inter-rater and intra-rater reliability. Therefore, only one rater scored the perception tests. Similarly, binary scoring was also used to rate the production tests, using a correct or wrong category, which were recorded in matrix sheets. However, two raters rated the production tests on the assumption that inter-rater reliability could be achieved. Before the raters begin with rating the production tests, the researcher conducted a rating training so that the raters had a common understanding of how to rate the tests. The main goal of the tests was not

necessarily for participants to achieve a native-like level, but raters' intelligibility. The raters were expected to reach agreement on all the tests items. There were instances where they differed in their rating. Eventually, they had to arrange a meeting where they listened to the recording again and came to an agreement on a similar score for each item.

Data analysis procedures

Using SPSS (Version 20), the means of perception and production errors of each item (consonant) at different position were correlated. The analysis produced a correlation coefficient which determined the nature and degree of relationship between perception and production difficulties of Korean ELS students' pronunciation of a particular English consonant. Overall, the means of perception and production errors observed in all items were also correlated as a whole, and the analysis produced correlation coefficient which also determined the degree and kind of relationship that existed between the two variables.

Results

Summary of perception and production errors of the consonant sounds

A summary of the means of errors of each consonant at initial (I), medial (M) and final (F) positions is presented in the graph below (Figure 1).

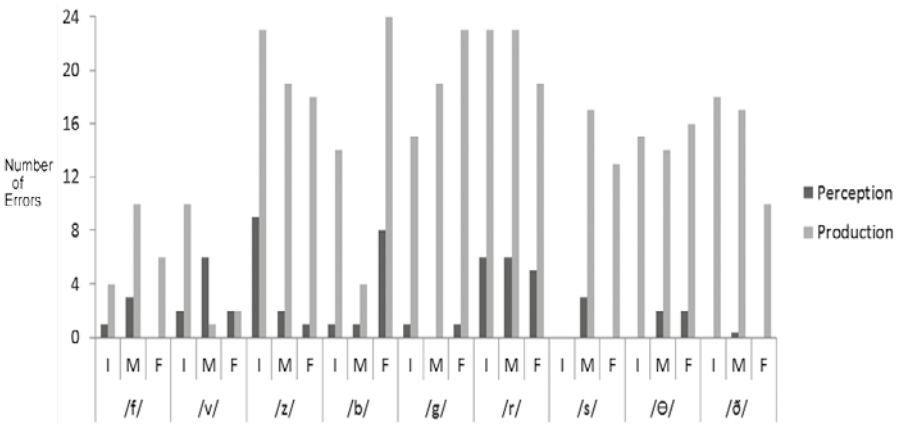

Figure 1. **Korean students' perception and production errors with consonants**

The results of the inferential statistical test (paired sample t-test) show that the mean differences between perception and production observed above (see Figure 1) are statistically significant at the .05 level. Hence, on average participants made more production errors (M = 13.96, SE = 1.401) than perception errors (M = 2.31, SE = .504, $t(26) = -9.025$, $p < r = .39$).

Estimates of the relationship between Korean students' perception and production errors of English pronunciation: Research question 2

The research question for this section sought to measure whether there is any kind of

relationship between Korean ESL students' perception and production errors of English consonants. Using bivariate correlations coefficients, statistical tests were conducted on the means of the two variables, perception and production errors. The test results show that there were significant relationships between perception and production errors of some consonants, while other relationships were not significant. However, the relationship between the overall means of perception and production errors of all the consonants was statistically significant at the .05 level.

Significant relationships

The test results indicated that the relationships between perception and production errors of /z/, as well as those of /r/, were significant. A positive correlation between means of perception and production errors of /z/ indicated that when there were more perception errors, there were also more production errors, $\underline{r}(1) = .99$, $\underline{p} < .05$. In addition, a positive correlation between means of perception and production errors of /r/ indicated that when there were more perception errors, there were also more production errors, $\underline{r}(1) = 1.00$, $\underline{p} < .001$.

Not significant relationships

The test results indicated that the relationships between perception and production errors of /f/, /v/, /b/, /g/, /s/, /θ/, and /ð/ were not significant. A positive correlation between means of perception and production errors of /f/ indicated that when there were more perception errors, there were also more production errors, $r(1) = .79$, n.s. A positive correlation between means of perception and production errors of /b/ indicated that when there were more perception errors, there were also more production errors, $r(1) = .89$, n.s. A positive correlation between means of perception and production errors of /s/ indicates that when there were more perception errors, there were also more production errors, $r(1) = .68$, n.s. A positive correlation between means of perception and production errors of /ð/ indicated that there were more perception errors, there were also more production errors, $r(1) = .79$, n.s.

On the other hand, a negative correlation between means of perception and production errors of /v/ indicates that when there were more perception errors, there were fewer production errors and vice versa, $r(1) = -.59$, n.s. In addition, a correlation between means of perception and production errors of /g/ indicated indicates a complete absence of relationship between the two variables, $r(1) = .00$, n.s. Likewise, a correlation between means of perception and production errors of /θ/ indicates a complete absence of relationship between the two variables, $r(1) = .00$, n.s.

Correlation of the overall means of perception and production errors

The test results indicated that the relationship between means of perception and production errors of all the consonants (/f/, /v/, /z/, /b/, /g/, /s/, /r/, /θ/, and /ð/) in this study was statistically significant. A positive correlation between means of perception and production errors of the consonants indicated that as there were more perception errors, there were also more production errors, $r(22) = .39$, $p < .05$. A summary of the bivariate correlations are presented in Table 4.

Table 4 **Summary of bivariate correlations (r)**

Consonants	Bivariate correlations
Significant relationships	
/r/	r(1)= 1.00, p < .001
/z/	r(22)= .99, p < .05
Not significant relationship	
/f/	r(1)= .79, n.s
/v/	r(1)= -.59, n.s
/b/	r(1)= .89, n.s
/g/	r(1)= .00, n.s
/s/	r(1)= .68, n.s
/Θ/	r(1)= .00, n.s
/ð/	r(1)= .79, n.s
Correlations of Overall Means	r(1)= .39, p < .05

Note. n.s. = not significant

Discussions

The relationship between perception and production difficulties observed in the current study

The results of this study show that there was a significant, perfect, positive relationship between perception and production errors in two (/z/ and /r/) out of nine consonants in this study (see Table 4). In contrast, there were no significant relationships observed between perception and production errors of the consonants /f/, /z/, /b/, /g/, /s/, /θ/, and /ð/ (see Table 4).

However, when the overall perception and production errors were correlated, the results of this study show that there was a significant positive relation between perception and production errors made by native speakers of Korean (see Table 4). In other words, the results show that although the production errors seem to be higher than the perception errors, the overall trend shows that the more there were production errors, the more there were perception errors, $r(23) = .39$, $p < .05$. Even though this is a weak relationship, it is important to note that, apart from pronunciation assessment, other positive relationships were also found between perception and production in pronunciation learning (Reed & Michaud, 2011). Hence, the presence of such relationships is an indication that when ESL students experience production difficulties of a given phonological feature, they are also likely to experience perception difficulties with the same phonological feature. As a result, there is a need to address the same types of perception and production difficulties in the design and planning of perception and production assessment (Celce-Murcia, Brinton, & Goodwin, 2010), and learning activities (Reed & Michaud, 2011).

However, this relationship does not necessarily mean students would have the same degree of perception and production difficulties with a particular phonological feature. Thus, even though the results of this study indicate that a significant relationship does exist between perception and production, overall, students still had more production than perception difficulties with the consonants sounds.

Conclusions

Drawing from the discussion of the current study and the findings of the previous research reviewed in this study, one can draw conclusions about the relationship between ESL students' perception and production difficulty with English pronunciation. Overall, the results of this study show that students seem to have more production difficulties than perception difficulties. Nevertheless, the results of this study also show that there is a significant relationship between perception and production difficulties, in that the more there are production difficulties the more there are perception difficulties with English pronunciation.

Implications for pedagogy and assessment

Even though this study only focused on perception and production difficulties experienced by Korean students, it can also be used as a reference in our Namibian community in teaching and assessing ESL students. The findings of this study inform the EFL/ESL teacher and material developer about certain issues they should consider when planning and designing pronunciation activities. The diagnoses and treatment of errors is one of the fundamental skills of the language teacher (Cho & Park, 2006; Luoma, 2004). By using tests and examinations, the errors that learners make are a major element in the feedback system of the teaching-learning process. Therefore, teachers of pronunciation should be able to not only identify and describe the students' pronunciation errors, but it is also important that teachers understand the psychological reasons for the occurrences of the errors. As it is evident in the findings of this study, students experienced various pronunciation difficulties in English consonants, in different positions. Hence, it is important that teachers have an understanding of the nature of students' errors so that they can plan appropriate teaching and learning materials for pronunciation classes.

Teachers and assessors need to take into consideration that pronunciation involves listening and speaking; hence, pronunciation assessment should also involve perception and production (Celce-Murcia, Brinton, & Goodwin, 2010; Rooy, 2009). Thus, the relationships that exist between perception and production make it necessary to design learning and assessment activities that address both the perception and production difficulties of a given phonological feature. In addition, the findings of this study contribute to the body of research about pronunciation teaching and assessment, more particularly diagnostic assessments. The results of this study show that the CA hypothesis can still be useful in diagnostic assessments because its predictions still parallel the EA results as was evident in this study. Teachers' knowledge of CA related to phonological structures and processes, as well as of the patterns of their students' difficulties, can enable them to give students daily practice following the given tips, hence, improving the students' English pronunciation (Cho & Park, 2006).

Possible areas of future research

This study used a convenience sample. As a result, it may not be possible to generalise whether these pronunciation errors are really representative of a wide range of Korean students of English. Further research studies involving larger or matched samples are needed to uncover the pronunciation difficulties of Korean ESL students or any other languages such as the Namibian indigenous languages.

Finally, there was an oversight when the voiced alveolar stop /d/ was not included in the test items which were used to collect data for this study. Further research studies should, therefore, include the stop /d/ in the assessment, since it can also be problematic

for Korean speakers, in the same way as other voiced obstruents that do not exist in the Korean language (Cho & Park, 2006; Lee, 1999).

Acknowledgement

I would like to thank my thesis chair, advisor, and professor, Dr Ann Snow, my thesis committee members, advisors, and professors, Dr Antony Kunnan, Dr Namhee Lee, and Dr Suchitra Sadanandan, for being part of the advisory team of this project, despite their busy schedules. My greatest thanks also go to my Mother and Father for believing in me and for being there for me throughout the completion of this project.

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