รายงานวิจัยฉบับสมบูรณ์

โครงการ: ความสัมพันธ์ระหว่างการรับรู้และการออกเสียงพยัญชนะควบกล้ำเสียงท้ายของผู้เรียนชาวไทยที่เรียนภาษาอังกฤษเป็นภาษาต่างประเทศ

The relationship between the perception and production of English coda clusters by EFL Thai learners

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ดร. อภิชัย รุ่งเรือง

ธันวาคม 2557

สัญญาเลขที่ R2557C105

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สนับสนุนโดยกองทุนวิจัยมหาวิทยาลัยนเรศวร

บทคัดย่อ

ความสัมพันธ์ระหว่างการรับรู้ (perception) และการออกเสียง (production) ได้รับความสนใจอย่างต่อเนื่องในสัทศาสตร์และสรวิทยาทางการศึกษาภาษาอังกฤษในฐานะภาษาที่สองและภาษาต่างประเทศ (De Wilde. 2009; Peperkamp and Bouchon. 2011). การศึกษาครั้งนี้เพื่อศึกษาความสัมพันธ์ระหว่างการรับรู้ และการออกเสียงพยัญชนะควบกล้ำเสียงท้าย 120 เสียงของผู้เรียนชาวไทยที่เรียนภาษาอังกฤษเป็นภาษาต่างประเทศ โดยเน้นที่เสียงในตำแหน่งดังต่อไปนี้คือ 1. เสียงควบกล้ำที่มีพยัญชนะท้ายสองตัว (-CC) จำนวน 64 เสียง 2. เสียงควบกล้ำที่มีพยัญชนะท้ายสามตัว (-CCC) จำนวน 49 เสียง 3. เสียงควบกล้ำที่มีพยัญชนะท้ายสี่ตัว (-CCCC) จำนวน 7 เสียง จำนวนกลุ่มทดลองคือนิสิตเอกภาษาอังกฤษมีจำนวนทั้งสิ้น 35 คน ได้ทำแบบทดสอบ intelligibility test เพื่อวัดทักษะด้านการรับรู้และแบบทดสอบ word-list reading test เพื่อวัดทักษะด้านการออกเสียง การทดสอบครั้งนี้ใช้ชาวต่างชาติสองคนในการตรวจแบบทดสอบ word-list reading test กรอบทฤษฎีในการวิเคราะห์ข้อมูลได้แก่ แนวคิดความแปลกเด่น (markedness) ผลการวิจัยสะท้อนให้เห็นว่าไม่มีความสัมพันธ์ระหว่างการรับรู้และการออกเสียงพยัญชนะควบกล้ำเสียงต้นในทั้งสามตำแหน่งข้างต้น ($r = 0.18, 0.15$, and 0.06, $N = 35$, $p > .05$) ผลการวิจัยยังแสดงให้เห็นว่าผู้เรียนชาวไทยทำคะแนนในแบบทดสอบด้านการรับรู้ได้ดีกว่าแบบทดสอบการออกเสียงได้ถึง 70% ของคำทั้งหมดที่ทดสอบ เสียงที่มีโครงสร้างของเสียงที่มาจากจำนวนเสียงพยัญชนะสี่เสียง (-CCCC) เป็นเสียงที่รับรู้และออกเสียงยากที่สุดหรือมีลักษณะความแปลกเด่นสูง ซึ่งสอดคล้องกับแนวคิดความแปลกเด่นที่ว่าเสียงที่มีพยัญชะท้ายมากเท่าใด ก็จะเป็นเสียงที่ยากต่อการรับรู้และการออกเสียงมากขึ้นเท่านั้น

คำสำคัญ: เสียงควบกล้ำพยัญชนะท้าย การรับรู้และการออกเสียง แนวคิดความแปลกเด่น

Abstract

The interrelationship between perception and production is currently receiving an increasing amount of attention in the literature on second/foreign language phonetics and phonology (De Wilde. 2009; Peperkamp and Bouchon. 2011). This study has continued this trend by investigating whether there is an interrelationship between the perception and production of 120 English final consonant clusters by native Thai speakers who learn English as a foreign language (EFL). The clusters were divided into three major groups: namely 64 two-member, 49 three-member, and 7 four-member clusters. 35 second-year native Thai university students took part in this study by taking two tests. An intelligibility test measured perception performance; a word-list reading test reflected their production performance. Two native English speakers graded participants' speech production, and the framework to analyze the outputs was the markedness principle. The relationship between perception and production was examined by means of correlation analyses. The results revealed no relationship between their production and perception. However, two-member clusters showed a slightly stronger relationship than three and four-member clusters with level of statistically significant difference 0.05 ($r = 0.18$, 0.15, and 0.06, $N = 35$, $p > .05$).The findings also indicated that Thai participants did much better in the perception task than the production one, which covered 70 percent of all cluster tokens. Finally, the longest consonant margins or the four-member final consonant clusters posed the most difficulty perceiving and producing. This was compatible with the markedness principle in that the longer consonant margin, the more marked and difficult to perceive and produce.

Keywords: English coda clusters, speech production and perception, markedness principle

Table of contents

The Relationship between the Perception and Production of English Coda Clusters by EFL Thai Learners

Apichai Rungruang, Ph.D

Naresuan University

rapichai2002@yahoo.com

Abstract

The interrelationship between perception and production is currently receiving an increasing amount of attention in the literature on second/foreign language phonetics and phonology (De Wilde. 2009; Peperkamp and Bouchon. 2011). This study has continued this trend by investigating whether there is an interrelationship between the perception and production of 120 English final consonant clusters by native Thai speakers who learn English as a foreign language (EFL). The clusters were divided into three major groups: namely 64 two-member, 49 three-member, and 7 four-member clusters. 35 second-year native Thai university students took part in this study by taking two tests. An intelligibility test measured perception performance; a word-list reading test reflected their production performance. Two native English speakers graded participants' speech production, and the framework to analyze the outputs was the markedness principle. The relationship between perception and production was examined by means of correlation analyses. The results revealed no relationship between their production and perception. However, two-member clusters showed a slightly stronger relationship than three and four-member clusters with level of statistically significant difference 0.05 (r =0.18, 0.15, and 0.06, N =35, $p > .05$).The findings also indicated that Thai participants did much better in the perception task than the production one, which covered 70 percent of all cluster tokens. Finally, the longest consonant margins or the four-member final consonant clusters posed the most difficulty

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Chapter I

Introduction

Perception and production in L2 interlangauge phonology have gained attention from many researchers (De Wilde. 2009; Peperkamp and Bouchon. 2011). However, there is some controversy between the two. That is, some researchers state that both show interrelationship. Learners with good perception also have good production skill, poor perception skill corresponds with poor production skill. That means both skills develop interdependently (Bradlow et al., 1997; de Jonge, 1995). The next question is which skill develops first. In first language acquisition infants learn to perceive the sounds before being able to produce them. But there is no clear-cut agreement in L2 whether one precedes the other. Best (1995; Best et al., 2001) claims that perception precedes production. Flege (1995)'s Speech Learning Model states that speech perception influences speech production. An increase in speech production performance is necessarily preceded by one in perception. Nonetheless, Sheldon and Strange (1982) strengthen the hypothesis that production may also precede perception in relation to L2 acquisition. On the other side of the scale, some researchers claim that both perception and production have nothing to do with one another. In this study, the relationship between production and perception was investigated through English coda clusters by Thai learners. The focus of this study also was placed on the English coda clusters - all of which are not found in Thai to see how those had an impact on Thai learners' production and perception.

Objectives

The major objective of this study was to investigate the interrelationship between the students' production and perception in English coda clusters in the following two areas:

First, the relationship between speech perception and production in 120 English coda clusters to see the overall picture of student's performance;

Second, the relationship between speech perception and production in three sub-areas, namely two-member, three-member, and four-member coda clusters which were regarded as marked structures for EFL Thai speakers.

Hypotheses

The researcher hypothesized that there would be a relationship between the students' production and perception in English coda clusters. In other words, if the students could identify the speech sounds, they should be able to produce them and vice versa. Another hypothesis was that students would show a stronger relationship between their speech perception and production in two-member coda clusters than the three and four-member clusters.

Significance of the study

In pedagogical perspective, English teaching is gaining importance globally. Enough attention should be paid to the acquisition of none native pronunciation and teaching of pronunciation as an integral part of speaking skills. In the absence of direct interaction with the native speakers or sufficient exposure to spoken variety of English, the ability to produce and perceive English words can be a starting point before moving forward to a sentence level. The present study contributes to the identification of specific areas of difficulties, which have an impact on English pronunciation of individual phones and sound combinations. Awareness of the

problematic area of the learners provides the basis for the future material planning, designing and production. Whenever speakers have good background and practice through constant and conscious effort on English coda clusters in a word level, they can develop self-confidence to learn to produce and perceive sounds in the sentence level.

In research study perspective, from past to present, a number of research studies have dealt with English consonant clusters, particular English onset clusters. Surprisingly, not many studies have been conducted in final consonant clusters. Some are: Chusak (1990); Padibat and Cochran (1997); Mano-Im (1999); and Phoprai (2008). Nonetheless, no single extensive study on English complex codas by Thai learners of English has been done. Consequently, this study draws a complete picture of English coda cluster by Thai learners.

Scope and Limitation

Because the participants of this study are second-year English major students, the findings reflect only this group's perception and production competence. It cannot be generalized to other groups of students due to different English background, classroom language experience, etc. In addition, even though participants were tested their speech sound production and perception, it covered only words out of context. The findings would not reflect their speaking or communicative skill.

Definition of Terms

Coda clusters refer to an allowable combination between two or three consonants. They occur at the end of a syllable before vowels. Different languages have different patterns of coda clusters. Some samples of English coda clusters are /-st/, /-lpt /, /-ksts/, etc.

Production refers to the ability of speakers to produce speech sounds.

Perception refers to the ability of speakers to identify speech sounds.

Chapter II

Review of Related Literature

This part covers theoretical framework, English and Thai syllable structure, and previous research studies on English coda clusters by Thai learners.

Theoretical framework

This study employs the markedness principle to account for the findings. By and large, markedness is an abstract property of the no convention or unusualness, and difficulty of a sound. The unmarked elements are more basic, neutral, more universal, and first acquired; the marked elements are more specific, less frequent, and later acquired. It is claimed that all languages have CV syllable structure (C refers to a consonant; V refers to a vowel).In other words, CV is an unmarked form. So, any syllable structure that is more complex than the CV one is regarded as a marked structure. To be more precise, if the number of consonants (or the length of onset/coda) increases, the level of markedness increases. The longer consonant margin, the more marked and difficult to perceive and produce. For instance, CCV is more marked than CV; CCCV is more marked than CV and CCV. By the same token, VC is less marked than VCC, VCCC, etc. To put this notion into action, the researcher chose Markedness Differential Hypothesis (MDH) by Ekman (1977) to account for all perceptive and productive difficulty or ease from Thai speakers who learned English as a foreign language (EFL learners). MDH makes a prediction that whenever language A has marked structure at a particular point and language B has at this point unmarked or less marked structure, then speakers of A should more quickly acquire the unmarked structure in B than speakers of B should acquire the marked structure in A. To see a clearer picture of this approach, below are the MDH's claims.

1) Those target language (TL) structures that are both different and relatively more marked than the corresponding structures in the native language (NL) are predicted to be more difficult.

2) The degree of difficulty will correspond directly to the degree of markedness. That is, the more marked structure, the more difficult to acquire.

3) Those TL differences that are not more marked will not be more difficult.

Thus, the Markedness theory is employed to explain the problematic coda clusters and how well Thai speakers react to marked structures.

Thai and English final consonant structure

In Thai, only certain simplex codas are found. To be more specific, Thai has the following eight sounds in final position: voiceless stops /ptk/, voiced nasals /mnŋ/, and semivowels /jw/.In other words, coda clusters are not allowed. Unlike Thai, English has much more complex codas. The maximum number of final consonant in English is 4.[1]Below are some of them.

-CC			
1. gulp	/-lp/	3. jobs	/-bz/
2. eighth	/-tθ/	4. barb	/-ɹb/

[1]However, Shockey (2003) claims that in reality it is so common for native English speakers to reduce four-consonantal codas to tri-consonantal ones.

- **CCC**

5. sculpt	/-lpt/	7. world	/-ɹld/
6. exempt	/-mpt/	8. journalists	/-sts/

- **CCCC**

9. thousandths	/-ndθs/	11. texts	/-ksts/
10. sculpts	/-lpts/	12. prompts	/-mpts/

As mentioned above, Thai syllable structure is limited to single-consonant codas, but English has much more complex structure than Thai. Therefore, it is very possible that Thai speakers tend to have some difficulties pronouncing and perceiving English coda clusters. In other words, all type of English coda clusters are marked forms for Thai speakers. However, the level of difficulty to produce and perceive is different. Thus, it was hypothesized that Thai speakers would perform better in two-member consonants than three and four-member ones. In the present study, the total number of English coda cluster tokens was 120. The number of tokens in –CC, -CCC, and –CCCC was 64, 49, and 7, respectively.

Previous research studies on English consonant clusters by Thai learners

This part examines previous studies regarding to English final consonant clusters by Thai speakers.

Chusak (1990) studied English consonant pronunciation problems by Mathyom 3 students. 70 Thai students took the reading test with 508 tokens collected from three textbooks. However, the selected tokens covered not only coda clusters, but also simplex onset/coda consonants, and complex onset consonants. In terms of complex final consonants, he divided them on the basis of five level of the

pronunciation difficulty. The range from least to highest difficulty was: least problem, low problem, fair problem, more problem, and most problem. The findings showed that students had least problem with [-mp], low problems with [-ft, -pt, ŋk], fair problems with [-nt∫, -ft(gift), -lp, -sk], more problems with [-rld, -nt∫(ranch),-lt], and most problems with [-rt∫,-rt, -rm, -rd, -lm, -kt, -nt, -ns]. His work was very nice to investigate coda clusters on the level of difficulty basis. Nonetheless, he did not go too far since he only brought up the problematic consonant clusters with no explanation why some were more problematic than others. Put it another way, no theoretical framework was employed to explain why certain coda clusters were difficult. In addition, only a certain number of two-member cluster were the major focus of his study. Still, Chusak's study was a stepping stone for next research studies to investigate how Thai speakers handle English final consonant clusters. Some of the following studies are Mano-Im (1999) and Phoprai (2008).

Like Chusak, Mano-Im (1999) conducted a study on English two-member final consonant clusters by Thai speakers. Her three purposes of the research were: to analyze the pronunciation of double final consonants, specifically (-nt), (-ns), (-nt), (-ks), (-sk), and (-lt), to study the relationship between degrees of difficulty in pronouncing final consonant clusters according to the theory of contrastive studies and correctness in pronunciation, and to compare the ability to pronounce the clusters correctly between male and female students. 60 Thai high school students (30 male students and 30 female students) participated in this study by reading a 40-item wordlist. The results were divided into five groups: (1) correct pronunciation of both sounds, (2) deletion of one of the two sounds, (3) replacement of one or both sounds, (4) deletion of one sound and replacement of the other, and (5) insertion of an extra

sound. Her findings also included the degrees of difficulty in pronouncing correctly. The results showed that from the easiest to the most difficult cluster were: a nasal followed by a stop, a nasal followed by a fricative, a lateral followed by a stop, a nasal followed by an affricate, a stop followed by a fricative, and a fricative followed by a stop. She claimed that the order was not compatible with the hypothesis in the sense that the lateral followed by the stop should be in the third rather than the last. However if this variable was ignored, the ranking of the rest of the variables agreed with the hypothesis. In terms of gender difference, the findings revealed female students pronounced more correctly than male students with statistically significant difference. In addition, female students employed more prestigious variants than male with no statistically significant difference. Compare to the previous study, her work step forward to another level because she had a theoretical framework (theory of contrastive studies) to account for the difficulty of certain coda clusters. However, like a previous study, her study focuses on 6 two-member coda clusters. A number of two-member clusters have not been investigated yet. Furthermore, in reality, English has three and four-member clusters. So, there is still more room to expand.

Padibat and Cochran (1997) employed Clements (1992)'s sonority dispersion model to study Thai coda clusters. Based on this model, a consonant sequencing pattern from least marked to most marked was VGL followed by VLN/VGN, then VNO/VGO and finally VLO (V= vowel; G= glide; L=liquid; N= nasal; O = obstruent). However, they modified the model by adding a VOO as the most marked form or the hardest cluster. Seven subjects (5 native Thai speakers as an experimental group; 2 native English speakers as a control group) took three reading tests with 60 coda cluster tokens. The findings revealed that Clements' model was too broad since he did not separate a fricative and a stop, but he combined both as an obstruent. The

subjects treated them differently. That is, VFF was harder than VSS or VFS. But VSF was the easiest one. When facing difficult coda clusters, Thai speakers employed some repair strategies. The most popular repair strategy was to devoice certain sounds to make it fit their native phonological inventory. Deletion was another strategy; insertion was very rare; and metathesis was found in a few cases. In terms of deletion, the researcher found that the less sonorous members were always eliminated. One of the prominent aspects of this study was the researchers paid close attention to two-member clusters and how both members had an impact on the speakers' production and what kind of repair strategy was employed to fix the foreign sounds for the Thai speakers. Unlike previous literature, Padibat and Cochran's study shares certain point with the current study in that phonological perspectives are investigated. In addition, markedness theory helps to clarify the difficulty of certain types of two-member clusters.

Phoprai (2008) was rather different from others in the sense that his study was rather pedagogical-oriented one. To be precise, he employed language games to solve pronunciation problem in certain English consonant clusters, namely /-sp/, /-st/, and /-sk/. Each type of consonant clusters consisted of 5 terms; the total number of tokens was 15. Some of them were: *wasp, crisp, most, guest, ask, risk*, etc. 45 junior high school students took part in three language games (Minimal, Bingo and "*Ajarn I made it!*"). As expected, the findings revealed some language improvement after students went through all three language games. Before the games, students always deleted the final [p, t, k] from words. Some deleted the [-s], but retained the final [p, t, k]. A few could not even pronounce a word. After going through three games, the number of students who deleted those consonants and the [-s] decreased. Students could

pronounce words correctly. Like all other previous studies, his study focused on only certain two-member coda clusters.

As a result, no single research study has gone far beyond two-member coda clusters. The present study will fill the gap to complete the picture of English final consonant clusters with two-three-four member coda clusters. Why certain coda clusters are difficult than other will be examined and the markedness theory is employed to account for the findings.

Chapter III

Research methodology

This part copes with research methodology. How participants were chosen, what research instruments and research procedure were employed, and finally how research validity and reliability were establish will be discussed.

Participants

The study was carried out from July to August 2012. 35 second year English major students took two required English courses (*Fundamental English* and *Developmental English*) and a basic writing course when they were in their first year of BA study. They had learned English for at least 10 years and usually used English only in classroom. Their mother tongue, Thai, was used outside the classroom and in everyday conversation. None of them had studied abroad, nor spent extended periods of time in English speaking countries.

Research instruments

There were two major tools: an intelligibility test and a word-list reading test. The intelligibility test was to examine how well the participants were able to identify coda clusters. The researcher made 120 items from selected 120 coda clusters and also made four choices (a, b, c, and d) for each item (See Appendix C). Before the test was carried out, the sounds from a native speaker of English was recorded. The researcher asked an American native speaker to pronounce each word twice. The pause between each word was approximately 4-5 seconds. The native speaker reading was recorded in a sound-proof room through a phonetic computer software named 'Praat'. In this test, the participants were asked to indicate which English word they had just heard.

The second tool was a word-list reading test. Since this study also examined participant's production, all 120 coda clusters from the intelligibility test were listed on a sheet (See Appendix D). Unlike the first tool, the second tool did not have any choices. What the participants had to do was to read out words twice from items 1 to 120. Each participant was tape-recorded in a face-to-face manner with the researcher. All their speech sounds were recorded by a phonetic computer software 'Praat'.

Data Collection Procedure

The researcher ran the intelligibility test first by scheduling all 35 participants to sit in a sound-proof room. They were not informed of the real purpose of the study but were instead told to listen to the record of 120 words as a part of some research. Each word was read twice. A slight pause between words marked the end of the preceding word. They listened carefully to each word, and circled the best choice (a, b, c, and d). It took them 5 minutes to complete this task.

To ensure that the participants did not have a clue what the researcher would do to them in the next task, the researcher waited 4 weeks before recoding individual participants' speech sounds. They had to pronounce 120 target words. Individual participants used a microphone to pronounce each word. During the tape recording the researcher raised a finger as a signal to have the participant pronounce the next word. It took approximately 18 minutes to record all 120 words for each participant. Below are all the tokens used in this study.

Two-member clusters or -CC

1. gulp
2. belt
3. bulb
4. bald
5. belch
6. wolf
7. delve
8. filth
9. else
10. walls
11. sharp
12. bark
13. barb

14. cord
15. morgue
16. dwarf
17. carve
18. worth
19. marsh
20. march
21. purge
22. film
23. kiln
24. arm
25. turn
26. curl
27. pimp
28. seemed
29. hand
30. cent
31. link
32. longed (v)
33. month
34. bronze
35. bunch
36. lounge
37. strength
38. breathed
39. lisp
40. disk
41. refused
42. left
43. proved
44. finished
45. depth
46. taps
47. eighth
48. bats
49. tax
50. jobs
51. width
52. adze
53. eggs
54. laughs
55. fifth
56. drives
57. baths
58. clothes
59. stopped
60. act
61. robbed
62. begged
63. watched
64. judged

Three-member clusters or -CCC

1. sculpt
2. helps
3. waltz
4. milked
5. milks (v)
6. bulbs
7. holds
8. twelfth
9. wealth's
10. gulfs
11. whilst
12. solves
13. delved
14. bulged
15. kilns
16. filmed
17. elms
18. excerpt
19. corpse
20. quartz
21. first

22. warmth
23. world
24. Charles
25. exempt
26. camps
27. ants
28. ends
29. thousandth
30. distinct
31. sphinx
32. accepts
33. depths
34. conflicts
35. next
36. sixth
37. midst
38. clasped
39. gasps
40. journalists
41. asked
42. masks
43. gifts
44. fifths
45. triumphed
46. sevenths
47. against
48. punched
49. amongst

Four-member clusters or -CCCC

1. prompts
2. glimpsed
3. sculpts
4. twelfths
5. texts
6. sixths
7. thousandths

Research validity and reliability

To establish content validity in the intelligibility test, all tokens were collected from different textbooks and previous studies, and then had them check by three phonetics course instructors. Two of the experts held a doctoral degree and one held a master's degree. All tokens reflected possible types of English complex codas. Another measure used to set up content validity was through two English native speaker raters, both of whom hold Bachelor's degrees from accredited universities in the United States and Australia. Before doing the rating, the two raters were informed in order to understand what the study aimed to investigate and how to investigate them. Both raters independently rated the participants' speech sounds. The other measure to establish validity is the researcher assessed the appropriateness

of the test by running a pilot test with 10 students. Based on the pilot test outcomes, a few changes were made to the test. In its final form, the test was printed on two (double-sided) A 4 pages; the average time to complete the test was 10 minutes. In terms of reliability, to ensure that two raters agreed on their judgment or to confirm that the coding was reliable, interrater correlations were calculated through Pearson Product Moment Correlation (r). A computer software was utilized to find the inter-rater reliability score (r). It turned out that the r value was 0.933, which referred to a very strong relationship between the two raters (Salkind 2010).

Chapter IV

Findings and Discussion

This chapter covers the results of the study. Tables and figures are presented to provide a better understanding. In addition, research hypotheses are tested whether the finding are congruent with the researcher's expectation or not.

Overall picture

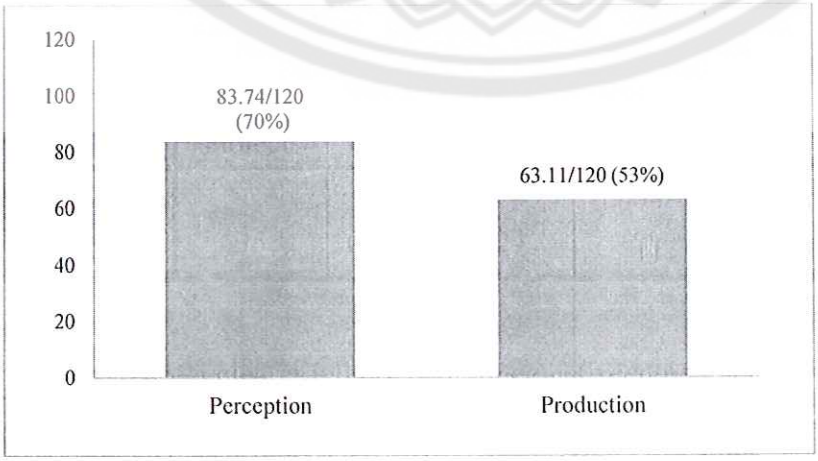
After the 35 subjects completed an intelligibility test to measure their perception performance and a word-list reading test to assess their production performance, it turns out that they did much better in the intelligibility test. See Table I below.

Table I: Descriptive Statistics (all 120 tokens)

	No of subjects	r	p-value	min	max	Mean	Std. Deviation
Perception	35	0.20	0.24	54	101	83.74	10.74
Production				11	100	63.11	20.87

To see a clearer picture difference between perception and production performance, see Figure I below.

Figure I: perception and production mean scores in all tokens



In Figure I, the numbers on the top of the bar chart refer to raw scores from the total score of 120 (from 120 tokens). The numbers in parentheses indicate the percentages of students' performance in both tests. That is, from the total score of 120 the average scores in perception and production were 83.74 (70%) and 63.11(53%), respectively. Obviously, students performed much better in the perception test than the production one. Not surprisingly, when Pearson correlation coefficients (r) was calculated to see the relationship between both performances, it showed no relationship at level of statistical difference 0.05 ($r= 0.20$; $p>0.05$). That means if students could identify the speech sounds, they were unable to produce them and vice versa. Besides the difference of mean scores between the two performances, it probably did not reach significance due to the large standard deviation (SD) which reflected the amount of score variation or dispersion from the average mean. Students showed a better score variation in perception than production (10.74 and 20.87, respectively). In principle, the lower SD, the better it is. Let's narrow it down to individual type of coda clusters from two-member, three-member, and four-member codas, respectively.

Two-member codas

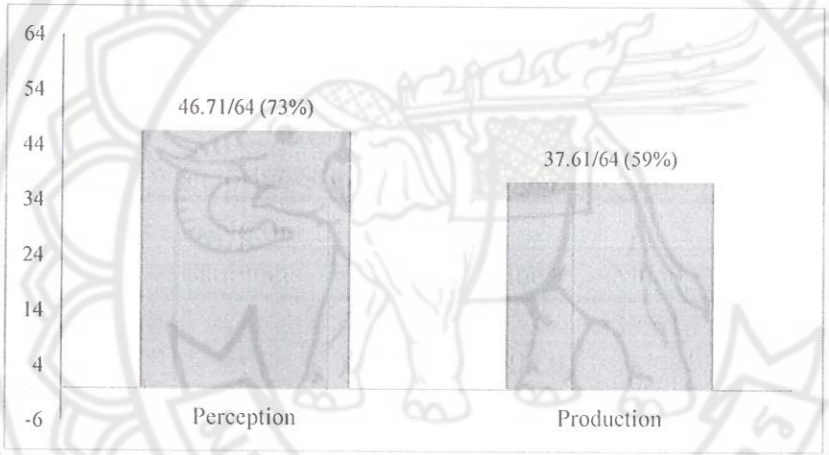
Table II and Figure II show that the mean score in perception was higher than that in production (46.71 or 73% and 37.61 or 59%, respectively). Notice that students performed two-member clusters better than in the overall member clusters. This is not surprising since the two-member clusters is in the lowest level of marked structure scale among the three types of English coda clusters for Thai speakers whose native language do not have complex final consonants. However, some two-member tokens posed a challenge to the Thai speakers as well (this will be discussed later). Like mean scores, SD in perception less dispersed from the mean score than that in

production (6.60 and11.68, respectively). In terms of the relationship between their perception and production, there is a very low interrelationship with no statistical difference (r=0.18; p>0.05).

Table II: Descriptive Statistics (two-member codas) –64 tokens

	No of subjects	r	p-value	Mean	Std. Deviation
Perception	35	0.18	0.30	37.61	11.68
Production				46.71	6.60

Figure II: perception and production mean scores and percentages in two-member codas



Three-member codas

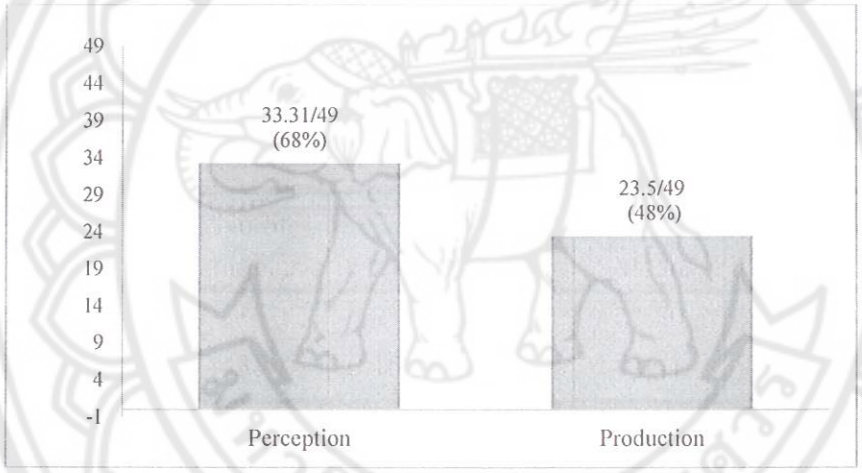
49 three-member codas were examined. The mean score in perception was still higher than that in production (33.31 and 23.50, respectively). Like mean scores, SD in perception was less dispersed from the mean score than that in production (4.68 and8.86, respectively). However, compared to the two-member codas, the three-member ones showed better SD. Students seemed to perceive and produce speech sounds close to the mean score. To see the relationship between the two tasks, the r value was calculated (r= 0.15; p>0.05) which showed a very low interrelation with no

statistically significant difference. Again to see the clearer picture, see Table III and Figure III below.

Table III: Descriptive Statistics (three-member codas)—49 tokens

	No of subjects	r	p-value	Mean	Std. Deviation
Perception	35	0.15	0.36	23.50	8.86
Production				33.31	4.68

Figure III: perception and production mean scores and percentages in three-member codas



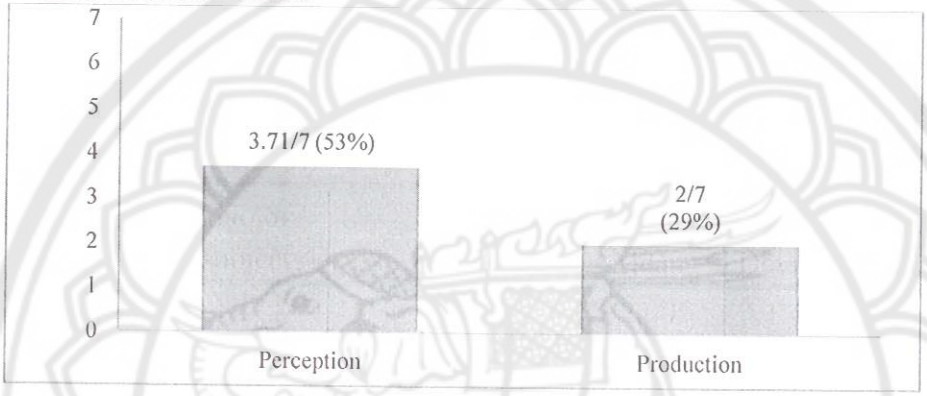
Four-member codas

7 four-member codas were tested. Compared to the previous two types of codas, the mean scores in perception was still higher than that in production (3.71 and 2, respectively). Like mean scores, SD in perception was slightly less dispersed from the mean score than that in production (1.20 and 1.43, respectively). However, compared to the two-member codas, the three-member ones showed better SD. The findings also revealed very low or no interrelationship with no statistically significant difference between two performances ($r= 0.06$; $p>0.05$). Once again, to see a clearer picture, see Table IV and Figure IV.

Table IV: Descriptive Statistics (four-member codas)—7 tokens

	No of subjects	r	p-value	Mean	Std. Deviation
Perception	35	0.06	0.73	2.00	1.430
Production				3.71	1.202

Figure IV: perception and production mean scores and percentages in four-member codas



Discussion

As mentioned in Chapter I, the researcher hypothesized that there would be a relationship between the students' production and perception in English coda clusters. Another hypothesis was that students would show a stronger relationship between their speech perception and production in two-member coda clusters than the three and four-member clusters.

To test the first hypothesis, Pearson correlation coefficient was run to find the r value. It turns out that the r was 0.20 and the p-value was 0.24 ($p>0.05$) , which reflects no relationship with statistically significant difference at level 0.05. Therefore, the first hypothesis was rejected. Table 1 and Figure 1 reveal that perception score is higher than the production one. An interesting question is posed: why did the Thai subjects perform better in the perception task than the production task? It is very

possible that production performance requires a much more great deal of practice and dedication than perception performance. When speech sounds are produced, they are modified through active articulators (lower lips, lower teeth, and tongue) and passive ones (upper lip, upper teeth, alveolar ridge, hard and soft palate). Before turned into a speech sound, the airflow is modified through the place of articulation or where the speech sounds are changed and the manner of articulation or how speech sounds are produced to a particular speech sound correctly. To reach the level of speech sound accuracy, students need a great deal of practice and understand how airstream mechanism work.

Since no statistically significant difference at level 0.05 was found in three types of coda clusters, this brings us to the second hypothesis stating that students would show a stronger relationship between their speech perception and production in two-member coda clusters than the three and four-member clusters. However, the r value in the two-member codas was slightly higher than the three-member ones (0.18 and 0.15, respectively). But it revealed a rather obvious difference between two-member and four-member codas (0.18 and 0.06, respectively). In light of the data obtained, this hypothesis was confirmed.

The findings also showed that the subjects had some difficulty perceiving and producing the sounds that contrast much more from the sounds of their native phonological inventory. The notion of perceiving sounds between nonnative and native sounds plays a crucial role accounting for the subject's performance. MDH's claims, as a major theoretical framework in this study, provide a good reason for this. That is, the ease or difficulty of a nonnative contrast depends on the similarity to the corresponding sounds of the native phonology. In principle, L2 learners tend to do well if the particular sounds in L2 are very close to those in their native language.

Based on the current results, Thai students, as mentioned earlier, did not have coda clusters in their native language. They did poorer when they faced long consonant margins, particularly the four-member codas. Therefore, the difficulty predicted on the basis of markedness principle was fully supported. The more marked (the long margin) pose the most difficulty for Thai speakers. Interestingly, when paying close attention to some of the tokens in the two-three- and four-member codas, the researcher found that most of the very low score coda clusters were related to English plural and past forms. Here are some examples.

Two-member codas	Three-member codas	Four-member codas
march/-ɹʃ/(3/19)	depths /-pθs/(7/10)	texts /-ksts/(16/2)
breathed/-ðd/(25/6)	midst /-dst/7/3)	thousandths/-ndθs/(10/22)
clothes/-θs/(5/20)	sevenths /-nθs/ (6/10)	begged/-gd/(8/16)

Phonetic symbols are in slanted brackets. In parenthesis, the first number refers to the number of participant who did correctly in perception; the other refers to the number of participants who did correctly in the production. For example, in the term 'march' /-ɹʃ/(3/19) only 3 subjects (out of 35) were able to perceive it correctly and 19 subjects (out of 35) could pronounce it accurately. It is very possible that the low use of regular past and plural form by Thai speakers reflects a strong L1 constraint against final consonant clusters. These findings were compatible with what Lardiere (2003) found when she studied native speakers of Mandarin and Hokkien who used English as a second language. Without coda clusters in their Chinese phonological system, her subjects faced the same situation and had some difficulties producing and perceiving the English regular past. Besides English plural and past forms, some other terms posed a tremendous challenge to the Thai speakers. They

are: '*march*' and '*midst*'. For the former term, students were confused with the term "marsh". They perceived them as the same term, but some were able to pronounce it correctly. The worst score went to the latter one. In the term "midst", not many Thai speakers could perceive and produce it correctly. Only three students could pronounce this word accurately. They dropped a fricative /s/ since their phonological inventory did not have this sound.

Chapter V

Conclusion and Suggestion for Future Studies

This chapter deals with the summary of the study. The key findings are drawn and evaluation of study's conclusion is made. Finally, recommendations for further research studies are provided.

The major objective of this study was to investigate the relationship between the students' production and perception in English coda clusters in the following two areas:

First, the relationship between speech perception and production in 120 English coda clusters to see the overall picture of student's performance. In 120 tokens, the mean scores were 83.74 (70%) and 63.11 (53%) in perception and production, respectively. Students had a better performance in perception than production. In other words, students perceived better than produced English coda clusters.

Second, the relationship between speech perception and production in three sub-areas, namely two-member, three-member, and four-member codas which were regarded as marked structures for EFL Thai speakers. Below are the statistical findings.

In two-member clusters, the relationship between speech perception and production was still weak ($r = 0.18$). In 64 tokens, the mean scores were 46.71 (73%) and 37.61 (59%) in perception and production, respectively. The percentages were higher than those in120 tokens. Again, students perceived better than produced English coda clusters.

Like two-member clusters, three-member clusters show a very similar result. That is, the relationship between speech perception and production was still weak ($r =$

0.15). In 49 tokens, the mean scores were 33.31 (68%) and 23.50 (48%) in perception and production, respectively. The percentages were lower than those in120 tokens. Once again, students perceived better than produced English coda clusters.

In four-member clusters, students did worse than the other two types of coda clusters. The relationship between speech perception and production was extremely weak (r = 0.06). In 7 tokens, the mean scores were 3.71 (53%) and 2.00 (29%) in perception and production, respectively. The percentages were much lower than the other two types of coda cluster. Again, students perceived better than produced English coda clusters.

The researcher hypothesized that there would be a relationship between the students' production and perception in English coda clusters. In other words, if the students could identify the speech sounds, they should be able to produce them and vice versa. A Pearson's correlation was run to determine the relationship between speech perception and production. The statistical findings show that Pearson's correlation coefficient (r) was 0.20, and the p-value is over 0.05, reflecting no relationship.

Therefore, the first hypothesis is rejected. Here are the r and the p values in the study.

	r	p-value
Overall picture (120 tokens)	0.20	0.24
Two-member (64 tokens)	0.18	0.30
Three –member (49 tokens)	0.15	0.36
Four-member (7 tokens)	0.06	0.73

Another hypothesis was that students would show a stronger relationship between their speech perception and production in two-member coda clusters than the

three and four-member clusters. From the r values above[2], this hypothesis is accepted. That is, four-member clusters reveal a very weak or no relationship, and two-member clusters which reflect less marked syllable structure for Thai speakers show a stronger relationship than three and four-member clusters. Below is Table V to summarize the present study.

Table V: perception and production performance

Types of coda clusters	Type of performance	Mean	Std. Deviation	r	No of Tokens	No of subjects
Overall (2-3-4 member)	Perception	83.74	10.74	0.20 (weak)	120	35
	Production	63.11	20.87			
Two-member	Perception	46.71	6.60	0.18 (weak)	64	
	Production	37.61	11.68			
Three-member	Perception	33.31	4.68	0.15 (weak)	49	
	Production	23.50	8.86			
Four-member	Perception	3.71	1.20	0.06 (very weak)	7	
	Production	2.00	1.43			

Finally, this research has presented some preliminary evidence on the relationship between speech perception and production. It was conducted when the subjects were second-year students. This evidence shows that there was no correlation between perception and production. However, it is too soon to claim that a relationship between perception and production does not exist. A follow-up study will be carried out when the students, as advanced learners, are in the final year of their study. Therefore, a complete picture will be drawn and will reflect changes after

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[2] Salkind (2010) provides the absolute value of r as below:

0.00-0.19 "very weak or no relationship"
0.20-0.39 "weak relationship"
0.40-0.59 "moderate relationship"
0.60-0.79 "strong relationship"
0.80-1.0 "very strong relationship

they have gone through a number of English courses, namely phonetics, speaking, or conversation courses, etc. As a result, it will be very interesting to find out how much change they have made in their speech perception and production performances and whether the relationship between speech perception and production truly exists.

Recommendations for Further Research Studies

Below is what could be done in the future.

1. More tasks should be provided to see a better picture of students' performance. For instance, a reading test elicits their production competence; a short conversation reflects their natural speech production and perception.
2. An interview should be conducted to elicit in-depth information as to which coda clusters cause difficulty for them to perceive and produce, what the causes of difficulty are, and what can be done to improve their speech perception and production.
3. It is very interesting to find out when these subjects are fourth year students. After they have gone through the different English courses, do their perception and production show a strong relationship? What types of coda clusters are still problematic for them?

Acknowledgements

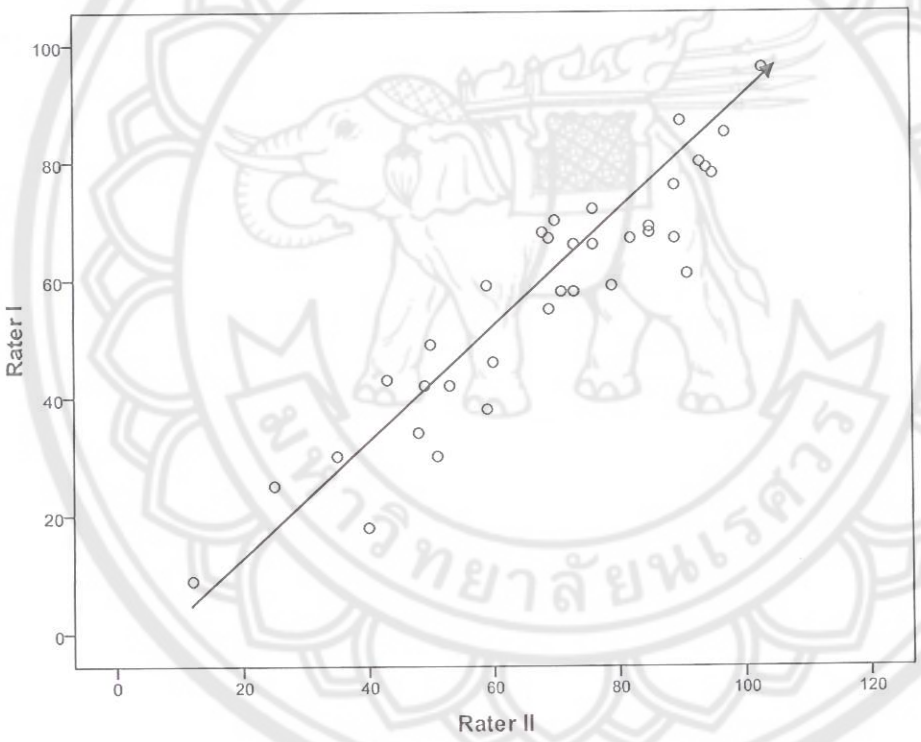
This study was financially supported by a research grant No R2557C105 from Division of Research Administration, Naresuan University, Thailand. I also would like to thank all students who volunteered to participate in and take perception and production tests in this study.

Appendices

Appendix A: Interrater correlation between raters I and II

Pearson Correlation	.933**
Sig. (2-tailed)	.000
N	35

The Pearson correlation coefficient reflects a very strong positive correlation. It can be drawn in a line graph below.



Appendix B: Tokens and perception and production scores

(Slanted brackets refer to phonetic symbols. In parenthesis, the first number is average perception scores; the second one is average production scores)

-CC

1. gulp/-lp/ (22/8)
2. belt/-lt/ (34/28)
3. bulb /-lb/ (12/17)
4. bald/-ld/ (17/9)
5. belch-ltʃ (34/15)
6. wolf/-lf/ (7/25)
7. delve/-lv/ (26/26)
8. filth/-lθ/ (27/25)
9. else/-ls/ (35/30)
10. walls/-lz/ (30/19)
11. sharp/-ɹp/ (6/30)
12. bark/-ɹk/ (33/30)
13. barb/-ɹb/ (20/21)
14. cord/-ɹd/ (34/24)
15. morgue/-ɹg/ (11/13)
16. dwarf/-ɹf/ (33/17)
17. carve/-ɹv/ (31/19)
18. worth/-ɹθ/ (21/23)
19. marsh/-ɹʃ/ (3/19)
20. march /-ɹtʃ/ (6/12)
21. purge/-ɹdʒ/ (30/13)
22. film/-lm/ (22/15)
23. kiln/-ln/ (16/10)
24. arm/-ɹm/ (35/20)
25. turn/-ɹn/ (33/34)
26. curl/-ɹl/ (24/20)
27. pimp/-mp/ (23/22)
28. seemed/-md/ (18/25)
29. hand/-nd/ (34/29)
30. cent/-nt/ (29/30)
31. link/-ŋk/ (31/34)
32. longed/-ŋd/ (v) (32/25)
33. month/-nθ/ (34/29)
34. bronze/-nz/ (28/28)
35. bunch/-ntʃ/ (35/25)
36. lounge/-ndʒ/ (30/6)
37. strength/-ŋθ/ (31/24)
38. breathed/-ðd/(25/6)
39. lisp/-sp/ (21/14)
40. disk/-sk/ (32/30)
41. refused/-zd/ (31/15)

42. left/-ft/ (35/33)

43. proved/-vd/ (33/16)

44. finished/-ʃt/ (27/14)

45. depth/-pθ/ (26/15)

46. taps/-ps/ (14/29)

47. eighth/-tθ/ (33/21)

48. bats/-ts/ (32/21)

49. tax/-ks/ (35/27)

50. jobs/-bz/ (35/33)

51. width/-dθ/ (12/14)

52. adze/-dz/ (20/15)

53. eggs/-gz/ (29/32)

54. laughs/-fs/ (30/18)

55. fifth/-fθ/ (26/26)

56. drives/-vz/ (28/23)

57. baths/-ðz/ (25/15)

58. clothes/-θs/ (5/20)

59. stopped/-pt/ (28/25)

60. act/-kt/ (34/26)

61. robbed/-bd/ (27/22)

62. begged/-gd/ (8/16)

63. watched/-tʃt/(27/8)

64. judged/-dʒd/ (26/4)

-CCC

1. sculpt/-lpt/ (14/14)

2. helps/-lps/ (33/11)

3. waltz/-lts/ (10/20)

4. milked/-lkt/ (35/18)

5. milks (v)/-lks/ (18/9)

6. bulbs/-lbz/ (29/7)

7. holds/-ldz/ (15/4)

8. twelfth/-lfθ/ (22/21)

9. wealth's/-lθs/ (10/11)

10. gulfs/-lfs/ (31/10)

11. whilst/-lst/ (34/4)

12. solves/-lvz/ (15/25)

13. delved/-lvd/ (25/19)

14. bulged/-ldʒd/ (23/2)

15. kilns/-lnz/ (10/6)

16. filmed/-lmd/ (12/16)

17. elms/-lmz/ (31/17)

18. excerpt/-ɹpt/ (21/18)

19. corpse/-ɹps/ (26/16)

20. quartz/-ɹts/ (23/18)

21. first/-ɹst/ (35/30)

22. warmth/-ɹmθ/ (33/27)

23. world/-ɹld/ (31/23)

24. Charles/-ɹlz/ (17/15)

25. exempt/-mpt/ (26/32)

26. camps/-mps/ (13/23)

27. ants/-nts/ (19/31)

28. ends/-ndz/ (34/34)

29. thousandth/-ndθ/(15/16)

30. distinct/-ŋkt/ (24/12)

31. sphinx/-ŋks/ (31/23)

32. accepts/-pts/ (24/25)

33. depths/-pθs/ (7/10)

34. conflicts/-kts/(32/25)

35. next/-kst/ (34/23)

36. sixth/-ksθ/ (17/22)

37. midst/-dst/ (7/3)

38. clasped/-spt/ (25/7)

39. gasps/-sps/ (32/9)

40. journalists/-sts/ (29/19)

41. asked/-skt/ (31/15)

42. masks-sks (23/15)

43. gifts-fts (22/20)

44. fifths-fθs (24/18)

45. triumphed /-mft/ (32/15)

46. sevenths/-nθs/ (6/10)

47. against/-nst/ (35/29)

48. punched/-ntʃt/ (33/8)

49. amongst/-ŋst/ (35/30)

-CCCC

1. prompts/-mpts/ (11/12)
2. glimpsed/-mpst/ (33/12)
3. sculpts/-lpts/ (19/9)
4. twelfths/-lfθs/ (21/12)
5. texts/-ksts/ (16/2)
6. sixths/-ksθs/ (22/3)
7. thousandths/-ndθs/ (10/22)

Appendix C: Perception Test (Intelligibility test)

Subject No: .....

Date: .....

Instructions: Listen and choose the best choice.

Test 1

1.	a. gall	b. cup	c. gulp	d. cult	e.....
2.	a. bell	b. bet	c. belt	d. beat	e.....
3.	a. bulk	b. Bob	c. bun	d. bulb	e.....
4.	a. ball	b. board	c. bald	d. balls	e.....
5.	a. belch	b. bell	c. Beth	d. bells	e.....
6.	a. impulse	b. in Dutch	c. in doubt	d. insults	e.....
7.	a. wolf	b. woof	c. wool	d. whoops	e.....
8.	a. dealt	b. deaf	c. Dell	d. delve	e.....
9.	a. fill	b. fills	c. filth	d. fifth	e.....
10.	a. else	b. elf	c. S	d. ace	e.....
11.	a. wall	b. was	c. waltz	d. walls	e.....
12.	a. well	b. wedge	c. Welch	d. will	e.....
13.	a. shark	b. charge	c. sharp	d. shard	e.....
14.	a. bark	b. barb	c. bar	d. barge	e.....
15.	a. bark	b. barb	c. bar	d. barge	e.....
16.	a. cause	b. cord	c. cod	d. court	e.....

17.	a. mock	b. moss	c. morgue	d. more	e.....
18.	a. doff	b. dwarf	c. door	d. dwarves	e.....
19.	a. card	b. car	c. carve	d. carp	e.....
20.	a. worse	b. worth	c. words	d. word	e.....
21.	a. march	b. Mars	c. marsh	d. much	e.....
22.	a. march	b. Mars	c. marsh	d. much	e.....
23.	a. purr	b. purge	c. Perth	d. pert	e.....
24.	a. fill	b. filled	c. fin	d. film	e.....
25.	a. kin	b. kill	c. kiln	d. clint	e.....
26.	a. alm	b. I'm	c. arm	d. um	e.....
27.	a. turn	b. term	c. urn	d. earn	e.....
28.	a. curd	b. curl	c. curb	d. curve	e.....
29.	a. pin	b. Pym	c. pimp	d. peak	e.....
30.	a. seed	b. seen	c. seem	d. seemed	e.....
31.	a. hand	b. had	c. ham	d. hank	e.....
32.	a. send	b. Zen	c. cent	d. set	e.....
33.	a. link	b. lint	c. lit	d. lick	e.....
34.	a. long	b. lord	c. longed	d. wronged	e.....
35.	a. monk	b. munch	c. much	d. month	e.....

36.
a. bronze b. blond c. blonds d. broth e.....

37.
a. bunch b. bumps c. bump d. bun e.....

38.
a. loud b. Laos c. lusts d. lounge e.....

39.
a. strength b. stretch c. straight d. strange e.....

40.
a. breed b. breathed c. breathe d. breached e.....

41.
a. Liz b. lips c. lip d. lisp e.....

42.
a. bets b. bet c. base d. Beth e.....

43.
a. Dick b. Dick's c. disk d. discs e.....

44.
a. refute b. refuse c. refused d. refilled e.....

45.
a. left b. letch c. let d. led e.....

46.
a. proof b. prove c. proved d. prude e.....

47.
a. finished b. finish c. finishes d. finite e.....

48.
a. depth b. debt c. dealt d. deft e.....

49.
a. tacks b. tap c. taps d. tabs e.....

50.
a. egg b. eights c. eggs d. eighth e.....

51.
a. bat b. backs c. bad d. bats e.....

52.
a. tax b. tack c. tact d. tag e.....

53.
a. job b. jots c. jobs d. jot e.....

54.
a. with b. width c. wits d. wit e.....

55.
a. adze b. AIDS c. eighth d. ate e.....

56.
a. eights b. egg c. eggs d. ache e.....

57.
a. laugh b. large c. Lars d. laughs e.....

58.
a. fibs b. fits c. filth d. fifth e.....

59.
a. dries b. drives c. dikes d. drive e.....

60.
a. baths b. bath c. bars d. Baht e.....

61.
a. close b. cloaks c. clothe d. clothes e.....

62.
a. stopped b. stop c. stocked d. stock e.....

63.
a. at b. axe c. act d. as e.....

64.
a. robbed b. rob c. lobbed d. rod e.....

65.
a. best b. bed c. begged d. beg e.....

66.
a. watch b. what c. watched d. washed e.....

67.
a. judge b. judged c. Judd d. just e.....

Test 2

1.
a. scout b. scrub c. sculpt d. skull e.....

2.
a. hells b. held c. helps d. help e.....

3.
a. waltz b. walls c. what d. wars e.....

4.
a. milked b. mint c. mill d. milled e.....

5.
a. miss b. milks c. mills d. milled e.....

6.
a. buds b. bulps c. bulbs d. buds e.....

7.
a. holes b. hose c. hold d. holds e.....

8.
a. twelve b. twelfth c. twelve's d. twelfths e.....

9.
a. wells b. wealth c. wealth's d. west e.....

10.
a. gulfs b. gulf c. gull d. gulls e.....

11.
a. whilst b. wills c. with d. width e.....

12.
a. soaps b. soaks c. soap d. solves e.....

13.
a. dealt b. delved c. dead d. deaf e.....

14.
a. bulged b. bulge c. bald d. bunged e.....

15.
a. kin b. kills c. kilns d. kilts e.....

16.
a. filled b. feed c. film d. filmed e.....

17.
a. m b. elms c. else d. elf e.....

18.
a. excerpt b. except c. assert d. exert e.....

19.
a. cops b. cords c. cobs d. corpse e.....

20.
a. course b. quartz c. cause d. quash e.....

21.
a. first b. fur's c. fur d. ferns e.....

22.
a. warn b. warmth c. wards d. was e.....

23.
a. world b. whirl c. word d. were e.....

24.
a. charge b. chance c. Charles d. shawls e.....

25.
a. asset b. except c. exempt d. exams e.....

26.
a. champ b. cam's c. caps d. camps e.....

27.
a. triumph b. Trump c. Trump's d. triumph's e.....

28.
a. and b. as c. at d. ants e.....

29.
a. ten b. tense c. temp d. tenth e.....

30.
a. n b. end c. ends d. Ed's e.....

31.
a. thousandth b. thousand c. thousandths d. thousands e.....

32.
a. district b. this stink c. distinct d. this sting e.....

33.
a. sphere's b. spring c. sting d. sphinx e.....

34.
a. lend b. length c. lens d. lent's e.....

35.
a. except b. accept c. accepts d. assets e.....

36.
a. debts b. death c. depth d. depths e.....

37.
a. AIDS b. eggs c. eight d. eights e.....

38.
a. comfit b. conflict c. conflicts d. conflicted e.....

39.
a. neck b. next c. necks d. nets e.....

40.
a. sixth b. six c. sick d. SIG's e.....

41.
a. mid b. mist c. missed d. midst e.....

42.
a. class b. clap c. clasp d. clasped e.....

43.
a. gas b. gasps c. gap d. gaps e.....

44.
a. journalists b. journal risks c. journalist d. journal risk e.....

45.
a. ask b. ant c. axe d. asked e.....

46.
a. math b. mad c. mass d. masks e.....

47.
a. gives b. gift c. give d. gifts e.....

48.
a. filth b. fifth c. fifths d. filths e.....

49.
a. triumph b. triumphs c. triumphed d. tryout e.....

50.
a. seven b. seventh c. sevenths d. sevens e.....

51.
a. against b. again c. a gate d. a guest e.....

52.
a. bronze b. blonds c. blond d. bronzed e.....

53.
a. punch b. punched c. puns d. punned e.....

54.
a. hinge b. hint c. hinged d. hid e.....

55.
a. among b. amongst c. a monk d. Hmong e.....

Test 3

1.
a. prompts b. prompt c. prom d. proms e.....

2.
a. glimpsed b. glimpse c. glean d. gleaned e.....

3.
a. sculpt b. scout c. scouts d. sculpts e.....

4.
a. twelve b. twelfths c. twelve's d. twelfth e.....

5.
a. takes b. tests c. text d. texts e.....

6.
a. sick b. sixth c. seeks d. sixths e.....

7.
a. thousand b. thousandths c. thousandth d. thousands e.....

Appendix D: Production Test (a word-list reading test)

Instruction: Read each word twice. Do have a 4 or 5 second-pause before pronouncing the next word. Do not skip, but try your best to read it.

Test 1 -CC

1. gulp
2. belt
3. bulb
4. bald
5. belch
6. wolf
7. delve
8. filth
9. else
10. walls
11. sharp
12. bark
13. barb
14. cord
15. morgue
16. dwarf
17. carve
18. worth
19. marsh
20. march
21. purge
22. film
23. kiln
24. arm
25. turn
26. curl
27. pimp
28. seemed
29. hand
30. cent
31. link
32. longed (v)
33. month
34. bronze
35. bunch
36. lounge
37. strength
38. breathed
39. lisp
40. disk
41. refused
42. left
43. proved
44. finished
45. depth
46. taps
47. eighth
48. bats
49. tax
50. jobs
51. width
52. adze
53. eggs
54. laughs
55. fifth
56. drives
57. baths
58. clothes
59. stopped
60. act
61. robbed
62. begged
63. watched
64. judged

Test 2 -CCC

1. sculpt
2. helps
3. waltz
4. milked
5. milks (v)
6. bulbs
7. holds
8. twelfth
9. wealth's
10. gulfs

11. whilst
12. solves
13. delved
14. bulged
15. kilns
16. filmed
17. elms
18. excerpt
19. corpse
20. quartz
21. first
22. warmth
23. world
24. Charles
25. exempt
26. camps
27. ants
28. ends
29. thousandth
30. distinct
31. sphinx
32. accepts
33. depths
34. conflicts
35. next
36. sixth
37. midst
38. clasped
39. gasps
40. journalists
41. asked
42. masks
43. gifts
44. fifths
45. triumphed
46. sevenths
47. against
48. punched
49. amongst

Test 3 -CCCC

1. prompts
2. glimpsed
3. sculpts
4. twelfths
5. texts
6. sixths
7. thousandths

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