AN INVESTIGATION IN THE CORRELATION OF TRAINING IN SEGMENTAL AND SUPRASEGMENTAL FEATURES OF ENGLISH AND THE STUDENTS' INTELLIGIBILITY AND COMPREHENSIBILITY

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Abstract

This research undertakes training in segmental and suprasegmental features of English in an attempt to find whether there is any correlation between the training and the students' intelligibility and comprehensibility of English. This quasi-experimental research was conducted for over 10 weeks in which 45 students were placed in the control group where training in segmental and suprasegmental features of English was not provided whereas the other 45 students in the experimental group received the training. The students were assessed on their listening ability, pronunciation, intelligibility and comprehensibility through an intelligibility test, the comprehensibility test and SDU-TEC test. After the training, an interview method was used to seek the students' attitudes towards learning pronunciation and the training. The results from the research are likely to help in teaching pronunciation to improve Thai students' intelligibility and comprehensibility.

การศึกษาความสัมพันธ์ของการฝึกอบรมในลักษณะ Segmental และ Suprasegmental ของ ภาษาอังกฤษและการสื่อความหมายอย่างถูกต้องและความเข้าใจของนักศึกษา

บทคัดย่อ

งานวิจัยชิ้นนี้เนื่องมาจากการสอนเรื่อง segmental and suprasegmental features of English เพื่อศึกษาความสัมพันธ์ของการสอนและความเข้าใจทั้งด้านการพูดและการฟังภาษาอังกฤษของ

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นักศึกษา โดยออกแบบเป็นการวิจัยกึ่งทดลอง ใช้เวลาทำการทดลอง ๑๐ สัปดาห์ มีการจัดนักศึกษา ๔๕
คน ไว้ในกลุ่มควบคุมซึ่งไม่มีการสอนเรื่อง segmental and suprasegmental features of
English และนักศึกษาอีก ๔๕ คนจัดไว้ในกลุ่มทดลองซึ่งได้รับการเรียนการสอนในเรื่องดังกล่าว ทั้งนี้
ระหว่างการทดลองนักศึกษาได้รับการประเมินศักยภาพด้านการฟัง การออกเสียง และด้านความเข้าใจ โดย
การใช้ข้อสอบหลากหลายรูปแบบ ได้แก่ ข้อสอบด้านความเข้าใจทั้งด้านการพูดและการฟัง และข้อสอบ
SDU-TEC หลังจากการทดลองเสร็จสิ้น มีการสัมภาษณ์เพื่อศึกษาทัศนคติของนักศึกษาเกี่ยวกับการ
เรียนการออกเสียงโดยใช้การเรียนการสอนในรูปแบบของงานวิจัยชิ้นนี้ ผลจากงานวิจัยนี้คาดว่าจะเป็น
ประโยชน์ต่อศาสตร์การสอนภาษาอังกฤษ โดยเฉพาะอย่างยิ่งการสอนการออกเสียงด้วยการสอนเรื่อง
segmental and suprasegmental features of English อันจะเป็นกลไกในการพัฒนา
ศักยภาพของนักศึกษาด้านความเข้าใจทั้งการพูดและการฟังภาษาอังกฤษต่อไป

Keywords: consonant segmental phonemes, suprasegmental features of
English, intelligibility, comprehensibility, teaching English pronunciation

Introduction

An area of problem for English teachers is teaching pronunciation, as to
which pronunciation models should be taught to create intelligibility and
comprehensibility among international speakers of English. Native speaker
of English models may no longer be appropriate compared with other
varieties of English (Kirkpatrick, 2007:28). Jenkins (2000:1) indicated that
the most threatening factor on intelligibility was pronunciation. This is
because the popular attitudes towards native accents were fundamental
entrenchment resulting in such attitudes being difficult to alter (Jenkins,
2000:4). This is applicable to Thailand as well. Previous findings
(Rasmusen and Zampini, 2012; Ghorbani, 2011) have found that to
improve intelligibility including listening proficiency, it could be done
through studying phonetics. Upon the completion of this research, the
researcher intends to answer the following research questions:

1. How does schematic knowledge through training in segmental and
   suprasegmental features of English help students improve their
   listening ability?

2. How does schematic knowledge through training in segmental and
   suprasegmental features of English help students improve their
   intelligibility?

3. How does schematic knowledge training in segmental and suprasegmental features of English affect students' comprehensibility of English?

Literature Review

The theoretical framework of this research is based on schema theory, which deals with how knowledge is represented in a person's memory and how the knowledge is used (Rumelhart, 1980 as cited in Yuehai, 2008:19). Schemata of a person can be activated (existing schemata) or it can be created (new schemata). It is also based on the work of Schmidt (1975) referred to as schema theory of discrete motor skill learning. Essentially, the training in segmental and suprasegmental features of English aims to activate existing schemata of the consonant segmental phonemes /s/, /f/, /l/, /r/, /tʃ/ and /dʒ/ as they are present in the Thai phonological system. The consonant segmental phonemes /z/, /v/, /ʃ/, and /ʒ/ do not exist in the Thai phonological system; therefore, they have to be created.

For the purpose of this research, it would be important to understand that English is no longer thought to belong only to the UK or the USA, but to the world (Smith, 1983:2; Brumfit, 1955:16). English is now referred to as a lingua franca. Seidlhofer (2001:143) (cited in O'Keeffe *et al.* (2007:28) defines it as an additional language acquired to serve as a means of communication for speakers for whom the language spoken is not the speakers' native language but this does not exclude native speakers. This means that according to the concept of English as a lingua franca, anyone could be considered as a native speaker of English.

The issue of native and non-native speaker dichotomy is also an important topic for this research. While many still thrive to sound like a native speaker of English, Jenkins (2000:1) stated that this was not only unnecessary but also unrealistic. Radwanska-Williams (2008:140) proposed an argument that the native speaker construct was simply a conceptual metaphor. She stated that careful non-native speakers of English could be linguistically as competent as native speakers of English. Further, from a sociological point of view, being a native speaker was primarily based on the attitudes of the members of each speech community. Therefore, anyone could be regarded as a native speaker should the majority of their speech community consider them to be native speakers.

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The term intelligibility has no agreed definition (Derwing and Munro, 2005). Kent (1992: 9) defined intelligibility as "the *sine qua non* of spoken English" and that an utterance pronounced inappropriately could have serious impact upon the intelligibility of communication. Smith (1992) believed that intelligibility, comprehensibility and interpretability are essential for acceptable speech. Regardless of other attempted definitions for the term intelligibility, in this research it means the students and the raters' ability to identify what they hear from speech sounds and the students' ability to pronounce speech sounds that are easy to understand to other speakers of English. Comprehensibility in this research means the scale of how the raters and the students can understand words from very easy to understand to very difficult to understand.

There are a number of factors affecting intelligibility. Yang (2012: 2) stated that listeners who were familiar with a variety of English would find that variety intelligible and easy to understand. Further, Lindemann (2002) found that attitudes of listeners towards non-native accents were found to affect intelligibility and comprehensibility.

Research factors regarding pronunciation could be found in various areas such as age, native language, exposure to the English language, attitude, motivation and identity. For example, Senel (2006: 114) explained that if a learner's second language pronunciation was almost native-like, such learners would have started learning that language since their childhood. Snow (1987:192) also discussed how young learners of pronunciation were believed to learn a second language "quickly, automatically, effortlessly, and to a level indistinguishable from that of native speakers". As for the native language factor, Zhang (2009: 43) suggested that the production of the target language derived from the first language factor, which played a significant role in accounting for foreign accents and influences of pronunciation. Avery and Ehrlich (1987:9) pointed out that "needless to say, learners of a language speak the target language in a different way: sometimes slightly different and sometimes highly different than the native speakers do, which we call foreign accent, the nature of which is determined to a large extent by a learner's native language". In relation to identity, Florez (1998) cited in Sharkey (2003: 14) reported that English learners who adhered to their identity norms, even though trying to seek acceptance, are to resist change. Therefore, it is important for teachers of English pronunciation to be aware of these factors for teaching pronunciation.

Lastly, Thai teachers of English pronunciation should possess the knowledge of contrastive analysis of English and Thai phonological systems (Yangklang. 2006:11). This is simply because the teachers will be able to point out the students the differences between the source language and the target language due to the fact that "when learning a foreign language, we tend to transfer our entire native language system in the process" (Lado, 1957:11). For example, in the study done by Boonruang, and Nantana (2001), they concluded that Thai learners found the consonant segmental phoneme /v/ to be difficult to pronounce as it did not exist in the Thai phonological system.

Methodology

This is a quasi-experimental research which consisted of 90 participants with 45 participants in the control group and the other 45 participants in the experimental group. All of the participants were first year students studying the Airline Business Program at Suan Dusit Rajabhat University. They had never had any training in segmental and suprasegmental features of English nor did they hold TOEIC scores of more than 500. The pre-test and post-test method was employed in this research as well as interviews. The training in segmental and suprasegmental features of English was conducted over the experimental group. The training focused on the English final consonant segmental phonemes including (/l/, /r/, (/v/, /f/), (/s/, /z/), (/ʃ/, /tʃ/), (/ʒ/, /dʒ/) as well as the suprasegmental feature stress. The training was designed to provide the participants in the experimental group with the schematic knowledge of problematic consonant segmental and suprasegmental features of English as well as opportunities for the participants to practise their speech organ muscles and movements. The training contained a number of interactive activities to keep the participants interested. The only difference between the experimental group and the control group was that the training was not provided to the participants in the control group.

The research instruments used for the pre-test and the post-test are:

1) The SDU-TEC test (listening part only) stands for Suan Dusit Rajabhat University Test of English for Communication. It was used to see if the participants' listening skill improved after the training.

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2) The intelligibility test contained two sections: the listening section and the speaking section. The test was employed to measure how intelligible the participants were in relation to their pronunciation and listening skills. The test was divided into two levels namely the word level and the sentence level. The vocabulary selection for the test was based on terms commonly found in the aviation and hospitality industry. The sentences used in the test contained five to nine words according to the "Magical Number Seven, Plus or Minus Two" (Miller, 1956) to assist the participants with memorising each sentence. In the listening section, the participants were asked to write down what they heard in the answer sheet.

In the speaking section, the participants were asked to read out the words and the sentences provided. The utterances of the participants were sent to ten raters to assess the participants' pronunciation ranging from very easy to understand to very difficult to understand. The raters were from the expanding circle countries (two Thais, one Chinese, and one Korean), the outer circle countries (one Filipino, one Singaporean, one Malaysian, and one Indian), and the inner circle countries (one British and an Australian).

3) The comprehensibility test was used to measure how the participants considered whether certain consonant segmental phonemes and the English stress were easy to understand or not. A Liker Scale was used to measure how the participants agreed or disagreed with the comprehensibility test of English. The Liker Scale ranged between one to five with one being 'very difficult to understand', two being 'difficult to understand', three being 'not sure', four being 'easy to understand' and 'five being 'very easy to understand'.

4) The attitude interview was used to gather participants' feedback on the training and how it helped them improve their intelligibility and comprehensibility of English.

Results

Based on Pallant (2005:209), the T-test was used as a statistical tool to analyse the data. I will provide the T-test results (Tables 1-13) of the study before answering the research questions.

Table 1: Statistical Analysis of SDU-TEC Test

	Control Group		Experimental Group	
	Pre-test	Post-test	Pre-test	Post-test
Mean	55.06	60.22	61.22	67.53
t Stat	-1.84		-2.13	
p Value	0.03		0.01	

Table 2: Statistical Analysis of the Intelligibility Test

	Control Group				Experimental Group			
	Word Level		Sentence Level		Word Level		Sentence Level	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Mean	9.62	13.22	1.08	1.57	14.80	20.40	1.02	4.60
t Stat	-3.36		-1.88		-4.16		-6.90	
p Value	0.0005		0.03		3.64E-05		3.76E-10	

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Task 3: Statistical Analysis of the Comprehensibility Test

| | Mean | | | | t Stat | | p Value | |
| | Control Group | | Experimental Group | | Control Group | Experimental Group | Control Group | Experimental Group |
	Pre	Post	Pre	Post				
WL	3.53	3.11	3.86	3.11	2.05	3.81	0.02	0.0001
SL	3.86	3.08	4.08	3.08	3.84	5.27	0.0001	4.8E-07
/l/	3.31	2.95	2.88	2.95	1.77	-0.31	0.03	0.37
/r/	3.42	2.95	2.82	2.95	2.33	-0.59	0.01	0.27
/v/	3.42	3.11	3.20	3.11	1.61	0.40	0.05	0.34
/f/	3.22	3.04	2.88	3.04	0.81	-0.65	0.20	0.25
/s/	3.26	2.95	2.97	2.95	1.46	0.09	0.07	0.46
/z/	3.64	3.13	3.64	3.13	2.51	2.32	0.006	0.01
/ʃ/	3.64	3.28	3.93	3.28	1.61	2.89	0.05	0.002
/tʃ/	3.64	3.24	4.06	3.24	1.81	3.87	0.03	0.0001
/ʒ/	3.68	3.35	4.35	3.35	1.45	5.01	0.07	1.35E-06
/dʒ/	3.75	3.42	4.31	3.42	1.50	4.35	0.06	1.82E-05

Table 4: Statistical Analysis of Thai Rater I

	Mean				t Stat		p Value	
	Control Group		Experimental Group		Control Group	Experimental Group	Control Group	Experimental Group
	Pre	Post	Pre	Post				
Overall	4.62	3.28	4.55	2.20	7.67	19.03	1.08E-11	2.95E-33
Stress	4.80	3.88	4.88	2.40	5.16	17.67	7.45E-07	5.26E-31
/l/	4.93	4.60	5.00	2.60	3.35	15.61	0.0005	2.18E-27
/r/	4.97	4.57	5.00	2.28	5.14	24.01	7.95E-07	1.06E-40
/v/	4.13	2.17	4.08	2.00	17.13	48.68	4.39E-30	IE-65
/f/	4.93	4.00	4.97	2.11	7.25	34.81	7.61E-11	1.52E-53
/s/	4.17	2.13	4.02	1.97	21.57	65.05	3.34E-37	1.69E-76
/z/	5.00	4.22	4.97	2.31	7.782	21.44	6.44E-12	5.28E-37
/ʃ/	5.00	3.60	4.80	2.42	7.73	16.69	7.89E-12	2.61E-29
/tʃ/	4.64	3.51	4.71	2.55	5.65	13.79	9.56E-08	5.12E-24
/ʒ/	4.77	3.53	4.77	2.51	6.23	15.03	7.77E-09	2.47E-26
/dʒ/	4.88	4.22	2.57	2.51	4.02	0.33	5.94E-05	0.37

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Table 5: Statistical Analysis of Thai Rater 2

	Mean				t Stat		p Value	
	Control Group		Experimental Group		Control Group	Experimental Group	Control Group	Experimental Group
	Pre	Post	Pre	Post				
Overall	3.62	2.88	3.42	2.53	5.36	6.57	3.27E-07	1.66E-09
Stress	3.62	3.17	3.60	2.77	3.244	7.37	0.0008	4.2E-11
/l/	3.51	2.51	3.02	2.11	7.57	8.75	1.68E-11	6.42E-14
/r/	3.51	2.75	3.04	2.33	5.34	6.21	3.51E-07	8.29E-09
/v/	3.68	2.55	3.26	2.26	8.55	8.17	1.7E-13	9.99E-13
/f/	3.66	2.55	3.20	2.15	8.34	8.92	4.58E-13	2.92E-14
/s/	3.71	2.71	3.33	2.22	8.05	10.13	1.76E-12	9.31E-17
/z/	3.75	2.88	3.28	2.40	7.75	6.77	7.46E-12	6.64E-10
/ʃ/	3.66	2.93	3.55	2.80	5.10	5.91	9.33E-07	3.11E-08
/tʃ/	3.66	2.86	3.53	2.77	5.41	5.68	2.62E-07	8.39E-08
/ʒ/	3.91	3.11	3.75	2.26	5.13	10.33	8.43E-07	3.74E-17
/dʒ/	4.13	3.37	3.84	2.74	5.20	7.83	6.38E-07	4.98E-12

Table 6: Statistical Analysis of the Chinese Rater

	Mean				t Stat		p Value	
	Control Group		Experimental Group		Control Group	Experimental Group	Control Group	Experimental Group
	Pre	Post	Pre	Post				
Overall	3.42	2.53	3.04	2.88	6.57	0.80	1.66E-09	0.21
Stress	3.60	2.77	2.68	2.71	7.37	-0.12	4.2E-11	0.44
/l/	3.02	2.11	2.24	2.11	8.75	1.03	6.42E-14	1.15
/r/	3.04	2.33	3.24	2.62	6.21	3.24	8.29E-09	0.0008
/v/	3.26	2.26	2.15	2.04	8.17	0.93	9.99E-13	0.17
/f/	3.20	2.15	2.15	1.97	8.92	1.73	2.92E-14	0.04
/s/	3.33	2.22	2.11	2.00	10.13	0.89	9.31E-17	0.18
/z/	3.28	2.40	3.15	3.22	6.77	-0.52	6.64E-10	0.29
/ʃ/	3.55	2.80	2.66	2.68	5.91	-0.10	3.11E-087	0.45
/tʃ/	3.53	2.77	3.57	3.13	5.68	2.13	8.39E-08	0.01
/ʒ/	3.75	2.26	2.91	2.88	10.33	0.12	3.74E-17	0.45
/dʒ/	3.84	2.75	2.66	2.13	7.83	3.13	4.98E-12	0.001

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Table 7: Statistical Analysis of the the Korean Rater

	Mean				t Stat		p Value	
	Control Group		Experimental Group		Control Group	Experimental Group	Control Group	Experimental Group
	Pre	Post	Pre	Post				
Overall	2.95	3.62	3.24	2.48	-4.09	4.51	4.68E-05	9.94E-06
Stress	3.06	3.71	3.28	2.80	-4.42	3.60	1.39E-05	0.0002
/l/	3.46	3.80	3.62	2.84	-1.97	4.44	0.02	1.25E-05
/r/	3.57	3.93	3.91	2.71	-2.04	7.63	0.02	1.27E-11
/v/	3.33	3.66	3.40	2.51	-1.88	5.10	0.03	9.49E-07
/f/	3.26	3.51	3.13	2.26	-1.21	5.15	0.11	7.77E-07
/s/	3.37	3.28	3.02	2.06	0.46	5.59	0.32	1.24E-07
/z/	3.55	4.02	3.62	2.84	-2.87	5.18	0.002	6.72E-07
/ʃ/	3.68	4.00	3.68	2.31	-1.46	6.63	0.07	1.25E-09
/tʃ/	3.82	4.08	3.80	2.40	-1.37	6.71	0.08	8.77E-10
/ʒ/	3.86	4.31	3.95	2.53	-2.72	7.61	0.003	1.42E-11
/dʒ/	3.73	4.37	3.75	2.08	-3.30	7.49	0.0006	2.48E-11

Table 8: Statistical Analysis of the Malaysian Rater

| | Mean | | | | t Stat | | p Value | |
| | Control Group | | Experimental Group | | Control Group | Experimental Group | Control Group | Experimental Group |
	Pre	Post	Pre	Post				
Overall	3.46	4.00	3.60	3.40	-3.31	0.98	0.0006	0.16
Stress	3.55	4.24	3.93	4.06	-4.19	-0.99	3.26E-05	0.16
/l/	3.00	3.20	3.06	3.57	-0.92	-2.37	0.17	0.009
/r/	3.75	3.95	3.73	3.86	-1.28	-0.83	0.10	0.20
/v/	3.15	3.84	3.17	3.46	-3.61	-1.42	0.0002	0.07
/f/	2.84	3.20	2.86	2.48	-1.62	1.87	0.05	0.03
/s/	2.15	2.57	2.22	2.04	-2.44	1.62	0.008	0.05
/z/	4.28	4.95	4.77	4.64	-6.77	1.01	6.67E-10	0.15
/ʃ/	4.28	4.40	3.88	4.00	-.62	-0.55	0.26	0.29
/tʃ/	4.28	4.80	4.66	4.35	-3.57	2.07	0.0002	0.02
/ʒ/	3.71	3.91	3.62	2.53	-1.02	5.97	0.15	2.4E-08
/dʒ/	3.84	4.71	4.51	3.68	-5.39	4.11	2.89E-07	4.28E-05

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Table 9: Statistical Analysis of the Singaporean Rater

| | Mean | | | | t Stat | | p Value | |
| | Control Group | | Experimental Group | | Control Group | Experimental Group | Control Group | Experimental Group |
	Pre	Post	Pre	Post				
Overall	4.33	4.33	4.15	4.17	0.00	-0.10	0.50	0.45
Stress	4.15	4.84	4.15	4.68	-4.34	-2.62	1.88E-05	0.005
/l/	3.08	4.02	3.57	3.86	-4.80	-1.21	3.13E-06	0.11
/r/	3.62	4.26	3.60	4.20	-2.90	-2.43	0.002	0.008
/v/	3.64	4.02	3.55	4.08	-1.99	-2.29	0.02	0.01
/f/	3.97	3.95	4.02	3.84	0.13	0.83	0.44	0.20
/s/	3.77	3.82	4.02	3.84	-0.22	0.84	0.41	0.19
/z/	4.04	5.00	4.00	4.91	-6.41	-4.38	3.4E-09	1.63E-05
/ʃ/	3.64	4.91	3.26	4.51	-6.94	-4.93	3.18E-10	1.9E-06
/tʃ/	3.82	4.93	3.64	4.60	-6.30	-4.14	5.45E-09	3.87E-05
/ʒ/	3.28	3.93	2.95	4.00	-3.09	-4.55	0.001	8.25E-06
/dʒ/	3.62	4.80	2.95	4.60	-6.02	-7.29	1.96E-08	6.33E-11

Table 10: Statistical Analysis of the Filipino Rater

	Mean				t Stat		p Value	
	Control Group		Experimental Group		Control Group	Experimental Group	Control Group	Experimental Group
	Pre	Post	Pre	Post				
Overall	3.95	2.91	4.06	2.13	6.23	12.68	7.62E-09	7.12E-22
Stress	4.04	3.40	4.06	2.40	4.73	14.11	4.2E-06	1.25E-24
/l/	2.66	2.53	2.44	2.13	0.67	2.18	0.25	0.01
/r/	3.24	2.62	3.44	2.15	3.04	8.19	0.001	9.42E-13
/v/	3.46	2.88	3.75	2.26	3.08	11.51	0.001	1.5E-19
/f/	2.66	2.28	2.77	2.04	2.18	5.05	0.01	1.17E-06
/s/	2.93	2.42	3.08	2.17	2.54	4.98	0.006	1.56E-06
/z/	3.60	2.93	3.68	2.46	4.83	10.91	2.77E-06	2.48E-18
/ʃ/	3.17	2.82	3.08	2.24	1.67	4.42	0.04	1.35E-05
/tʃ/	3.57	3.00	3.66	2.37	2.93	7.62	0.002	1.34E-11
/ʒ/	3.48	2.84	3.51	2.22	3.18	7.87	0.001	4.14E-12
/dʒ/	3.82	3.09	3.86	2.28	3.95	11.62	7.81E-05	8.79E-20

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Table II: Statistical Analysis of the Indian Rater

| | Mean | | | | t Stat | | p Value | |
| | Control Group | | Experimental Group | | Control Group | Experimental Group | Control Group | Experimental Group |
	Pre	Post	Pre	Post				
Overall	4.06	2.13	4.08	2.88	12.68	8.43	7.12E-22	3E-13
Stress	4.06	2.40	4.11	3.17	14.11	7.70	1.25E-24	9.06E-12
/l/	2.44	2.13	4.64	3.42	2.18	10.81	0.01	3.89E-18
/r/	3.44	2.15	4.73	3.22	8.19	12.159	9.42E-13	7.7E-21
/v/	3.75	2.26	2.82	2.35	11.51	2.96	1.5E-19	0.001
/f/	2.77	2.04	3.08	2.37	5.053	4.86	1.17E-06	2.44E-06
/s/	3.08	2.17	3.26	2.91	4.98	2.32	1.56E-06	0.01
/z/	3.68	2.46	3.88	3.17	10.91	5.06	2.48E-18	1.11E-06
/ʃ/	3.08	2.24	4.68	3.44	4.42	9.98	1.35E-05	1.93E-16
/tʃ/	3.66	2.37	4.80	3.44	7.62	12.23	1.34E-11	5.5E-21
/ʒ/	2.51	2.22	4.40	2.31	7.87	14.26	4.14E-12	6.5E-25
/dʒ/	2.28	2.22	4.24	2.73	0.59	9.05	0.27	1.56E-14

Table 12: Statistical Analysis of the British Rater

	Mean				t Stat		p Value	
	Control Group		Experimental Group		Control Group	Experimental Group	Control Group	Experimental Group
	Pre	Post	Pre	Post				
Overall	4.04	4.00	4.08	2.00	1.43	27.23	0.07	5.89E-45
Stress	4.04	4.00	4.08	2.00	1.43	27.23	0.07	5.89E-45
/l/	4.04	4.00	4.08	2.00	1.43	27.23	0.07	5.89E-45
/r/	4.04	4.00	4.08	2.00	1.43	27.23	0.07	5.89E-45
/v/	4.04	4.00	4.08	2.00	1.43	27.23	0.07	5.89E-45
/f/	4.04	4.00	4.08	2.00	1.43	27.23	0.07	5.89E-45
/s/	4.04	4.00	4.08	2.00	1.43	27.23	0.07	5.89E-45
/z/	4.04	4.00	4.08	2.00	1.43	27.23	0.07	5.89E-45
/ʃ/	4.04	4.00	4.08	2.00	1.43	27.23	0.07	5.89E-45
/tʃ/	4.04	4.00	4.08	2.00	1.43	27.23	0.07	5.89E-45
/ʒ/	4.04	4.00	4.08	2.00	1.43	27.23	0.07	5.89E-45
/dʒ/	4.04	4.00	4.08	2.00	1.43	27.23	0.07	5.89E-45

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Table 13: Statistical Analysis of the Australian Rater

| | Mean | | | | t Stat | | p Value | |
| | Control Group | | Experimental Group | | Control Group | Experimental Group | Control Group | Experimental Group |
	Pre	Post	Pre	Post				
Overall	4.80	3.51	4.95	2.51	9.77	20.14	5.28E-16	5.13E-35
Stress	4.68	2.51	4.84	2.02	14.15	21.26	1.07E-24	9.91E-37
/l/	4.53	3.64	4.88	2.22	6.45	25.17	2.83E-09	2.8E-42
/r/	4.88	3.80	4.75	2.55	7.17	13.65	1.1E-10	9.55E-24
/v/	4.88	4.40	5.00	2.73	4.16	15.06	3.59E-05	2.11E-26
/f/	4.17	3.11	4.8.00	1.64	5.03	26.77	1.28E-06	2.3E-44
/s/	3.75	2.62	4.11	1.44	5.02	17.97	1.33E-06	1.64E-31
/z/	4.88	4.75	5.00	2.97	1.66	13.72	0.05	6.89E-24
/ʃ/	4.73	3.57	4.66	2.13	6.54	14.17	1.94E-09	9.5E-25
/tʃ/	4.62	3.60	4.48	2.33	5.71	10.91	7.41E-08	2.45E-18
/ʒ/	5.00	4.55	5.00	2.97	4.52	12.36	9.45E-06	3.05E-21
/dʒ/	4.82	3.60	4.97	2.42	7.90	15.77	3.68E-12	1.09E-27

Discussion of the Research Questions

Research question I: "how does schematic knowledge through training in segmental and suprasegmental features of English help students improve their listening ability?"

As discussed earlier schematic knowledge in this research works at two levels I) knowledge of the consonant segmental phonemes, and 2) the learning of muscles movement. The training in segmental and suprasegmental features of English created by this research provided the participants with the knowledge of consonant segmental phonemes as well as suprasegmental features of English. This means that the participants' existing schematic knowledge (knowledge of the consonant segmental phonemes /s/, /f/, /l/, /r/, /dʒ/, and /tʃ/ and the ability to produce these phonemes) was activated. Further, the new schematic knowledge (knowledge of the consonant segmental phonemes /z/, /v/, /ʒ/, and /ʃ/) was created. With all this new schematic knowledge, the participants could identify all these consonant segmental phonemes in a word particularly in the final position. As a result, the participants were able to distinguish words with similar phonemes such as 'watch' and 'wash' after the training. This helped the participants with the SDU-TEC and the intelligibility test (listening part). For example, in the SDU-TEC if the participants came across a question as follows:

"Let's take a walk in the park

(A) Alright. I'll get my jacket.

(B) We parked the car over there.

(C) They talked until dark."

It is important to remember that in the SDU-TEC, this would be all spoken. Without the text for the participants to read, he or she would have to rely on his or her listening ability to decide which would be the best response to the main statement. After the training in segmental and suprasegmental features of English, the participants were able to distinguish the differences of the consonant segmental phoneme /k/ in the word 'park' and the consonant segmental phoneme /t/ in the word 'parked' so that they were be tricked into choosing statement (B). This is because most of the students would normally choose the statement that contained similar words to the main statement, which were 'park' and 'parked'. The statistical analysis of the SDU-TEC test in Table I confirmed that this was not the case for the participants in the experimental group. It can be seen from Table I that

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the mean for the SDU-TEC score in the post-test (67.53) improved compared to the mean in the pre-test (61.22). In addition, the p-value obtained for the experimental group was at the statistically significant level (0.01) as set up for this research.

Similarly, in the intelligibility test, after the training the participants were able to identify the differences between similar phonemes allowing them to distinguish words with similar phonemes in the intelligibility test such as 'catch' and 'cash'. Prior to the training, by simply listening to these two words, the participants did not know the differences between the two words they heard. After the training, the participants had gained the knowledge of the differences between the consonant segmental phonemes /tʃ/, and /ʃ/ which helped them to know that these two words were actually two words with different meanings. The statistical analysis in Table 2 revealed that the mean of the experimental group for the intelligibility test (listening part) significantly improved from 14.8/30 to 20.40/30 resulting in the p-value 3.76E-10, which was in the significant level for this research.

Not only in the word level that the training in segmental and suprasegmental features of English was useful in terms of their improvement in their listening ability, the training was also beneficial to the participants in a larger context. This was due to their learning of the suprasegmental features of English such as stress, intonation and connected speech. For example, in the sentence level statement number 6 "we'll have to some washing today", most of the participants wrote *"we have to some watching today"* in the pre-test. After the training most of the participants were able to identify the consonant segmental phoneme /ʃ/, which was different from the consonant segmental phoneme /tʃ/; therefore, they wrote *"we have to do some washing today"*. Further, in statement number 5 "Will I need a visa to travel to England?" prior to the training, a number of participants wrote *"We like need a visa to travel to England?"* This was because they had no knowledge of linking sound. After the training, they had learned about linking sounds as in *"We like"*. The mean score of the experimental group jumped from 1.02/10 to 4.60/10 as shown in Table 2. The p-value obtained, 3.76E-10, were also in the significant level. Training in segmental and suprasegmental features of English allowed the participants to improve their listening ability.

Research question 2: "How does schematic knowledge through training in segmental and suprasegmental features of English help students improve their intelligibility?"

This section will mostly deal with intelligible speech. Through the training in segmental and suprasegmental features of English, the goal of the participants was to be able to produce intelligible utterances to ordinary listeners. The training provided the participants with essential schematic knowledge they have about consonant segmental phonemes and suprasegmental features of English. Another important driving factor that the training provided was an exposure to a significant level of practice through activities in class.

In relation to the segmental phonemes known in the Thai phonological system, the schematic knowledge of the relevant information ($/s/$, $/f/$, $/l/$, $/r/$, $/t\int/$ and $/d\mathrm{3}/$), the training re-activated the existing schematic knowledge of the participants. It would be true to state that all of the participants were able to produce these consonant segmental phonemes as they had acquired the knowledge of doing so from the ability to speak Thai. Nevertheless, none of the participants had learned how these consonant segmental phonemes were actually produced as in what speech organs were used to create such phonemes. Nor did they have any actual schematic knowledge of places of articulation for the production of these consonant segmental phonemes. The training in segmental and suprasegmental features of English provided the participants with all this schematic knowledge. The training also allowed the participants to practise in class in which the schematic knowledge also activated the participants' memory about how to produce these consonant segmental phonemes.

As for the creation of the new schematic knowledge, the training in segmental and suprasegmental features of English provided new information to the participants in relation to the consonant segmental phonemes that were previously unknown to the them as well as the schematic knowledge of the suprasegmental features of English. In addition, the participants learned about a new fact that a number of consonant segmental phonemes were present in the final position of words. Through the training, the participants became aware that there was a difference in English between voiced and voiced phonemes allowing them to be able to distinguish the consonant segmental phonemes $/s/$ and $/z/$. Another obvious example was in the case of $/\mathrm{3}/$ in the word 'measure'. Prior to the training, without any schematic knowledge of this phoneme, all of the participants pronounced this word as 'major'. That was not a surprising finding as the consonant segmental phoneme $/d\mathrm{3}/$ in the word 'major' was present in the Thai phonological system; therefore, it would be normal for a Thai speaker of English to produce it instead of the consonant segmental phoneme $/\mathrm{3}/$. However, after

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the training, the participants became aware of the consonant segmental phoneme /ʒ/, which meant the participants' ability to produce the consonant segmental phoneme /dʒ/ improved after the training. This can be seen from the ratings produced by the ten speakers. Nine raters out of the ten thought that the ability of the participants in the experimental group improved after the training judging from the statistically significant p-value obtained from the results of the raters – the Thai rater 2 (4.98E-12), the Chinese (0.001), the Korean (2.48E-11), the Malaysian (4.28E-05), the Singaporean (6.33E-11), the Filipino (8.79E-20), the Indian (1.56E-14), the British (5.89E-45) and the Australian (1.09E-27). As for the consonant segmental phonemes at the final position of words, most participants were able to do so and they now remembered to do so. For example, many participants would pronounce the word "baggage" as "bagga" or "baggat". However, after the training most of the participants remembered to pronounce the consonant segmental phoneme /dʒ/ at the final position of the word "baggage".

The participants in the experimental group also benefited from the training in terms of their ability to employ the suprasegmental features of English. For example, English is a stressed language so prior to the training the participants had no existing schematic knowledge of this fact. After the training and the new schematic knowledge had been created, the participants in the experimental group became more capable of creating consonant segmental phonemes with stress. The statistical analysis from the raters showed that the participants in the experimental group improved their ability to use English stress. Seven speakers of English produced the p-value at the significant level for the participants in the experimental group in relation to their ability to use English stress – the Thai speaker 1 (5.26E-31), the Thai speaker 2 (4.2E-11), the Korean speaker (0.0002), the Philippine speaker (1.25E-24), the Indian speaker (9.06E-12), the British speaker (5.98E-45), and the Australian speaker (9.91E-37).

As a result, the training in segmental and suprasegmental features of English helped the participants with their intelligibility by activating and creating schematic knowledge of segmental and suprasegmental features of English. Further, the training activated and created schematic knowledge of speech organ muscles and movements, and the training allowed the participants to practise their muscles movements in class.

Research question 3: "How does schematic knowledge through training in segmental and suprasegmental features of English affect students' comprehensibility?"

The participants' existing schematic knowledge had been reactivated and they also created new schematic knowledge of segmental and suprasegmental features of English. This was done in both theory and practice. In theory, the participants in the experimental group were informed about how certain consonant segmental phonemes and suprasegmental features of English were made by using human speech organs. In practice, they were given opportunities to use their speech organ muscles. Because of existing and new schematic knowledge of the subject matter, this would help the participants to become more competent in their use of English. Knowing how consonant segmental phonemes and suprasegmental features of English were pronounced would allow them to become more confident and more comprehensible when compared to their ability prior to the training in segmental and suprasegmental features of English.

Nonetheless, the feeling about comprehensibility of English would vary depending on an individual. For many people, knowing how certain things were done would allow them to believe that such things were relatively easy or easier to comprehend compared with if they did not know. For some people, even though well versed with doing something would still be insufficient to believe that something was within his or her capacity to achieve. For example, the p-value in the comprehensibility test after the training for the experimental group only reached the statistically significant level in seven categories out of the twelve namely the word level (0.0001), the sentence level (4.8E-07), the consonant segmental phonemes /z/ (0.01), /ʃ/ (0.002), /tʃ/ (0.0001), /ʒ/ (1.35E-06), and /dʒ/ (1.82-E-05). The rest of the categories did not reach the significant level for this research.

On the other hand, the control group with the participants who did not receive any training in segmental and suprasegmental features of English rated their comprehensibility of English highly in three categories including the sentence level with the p-value 0.0001, the consonant segmental phoneme /r/ with the p-value 0.01, and the consonant segmental phoneme /z/ with the p-value 0.006. An interesting point to note is the statistically significant p-value in two of the three categories (/r/ and /z/) was the consonant segmental phonemes that did not exist in the Thai phonological system (note that the retroflex r does not exist in the Thai phonological system, but the r[+3] exists). Normally producing these two consonant

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segmental phonemes would be difficult for Thai speakers of English; yet, they were perceived to be easy for some participants in the control group.

Conclusion

The research successfully trained the participants in segmental and suprasegmental features of English. It also helped the participants improve their listening and pronunciation skills through schematic knowledge of segmental and suprasegmental features of English. Lastly, the training was found to have some correlation of improving listening skills in the SDU-TEC results due to the schematic knowledge, which helped the participants achieve better results in the SDU-TEC.

The results of the SDU-TEC, the intelligibility test, the comprehensibility test, and the results from the ten raters indicated that the training in segmental and suprasegmental features of English worked successfully as a teaching tool to help students improve their intelligibility and comprehensibility of English covering the listening skills and the speaking skills. The results in the SDU-TEC, the intelligibility test and the comprehensibility test for the experimental group in the post-test improved when compared with the results in the pre-test stage. Although not all of the raters agreed that the participants in the experimental group improved their pronunciation skills, the majority (more than 80%) of the raters were of the opinion that the participants in the experimental group were more intelligible after the training in segmental and suprasegmental features of English. It would be possible to conclude here that the training in segmental and suprasegmental features provided the participants with the schematic knowledge and practice of their speech organ muscles; therefore, the participants would probably become SOPHISTICATED/SUCCESSFUL THAI SPEAKERS OF ENGLISH..

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