SPEECH ENTRAINMENT IN ACCENT MODIFICATION OF ADULT ENGLISH LANGUAGE LEARNERS

by
Laura Suzanne Cizek

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Chair of Committee: Dr. Jacqueline Hawkins

Committee Member: Dr. Kristi L. Santi

Committee Member: Dr. Ashwini Joshi

Committee Member: Dr. Farideh Nekoobahr

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Abstract

Background: Quality candidates for education programs and employment must express their knowledge clearly. If they are unclear, accent modification training provided by speech-language pathologists can help individuals to change the way they speak. To maximize communicative effectiveness, speech that is perceived to be different or accented is targeted in this study. Researchers and practitioners agree that participation in accent modification is beneficial to individuals who seek these elective services as they strive to assimilate both socially and economically. Modifying pronunciation alters brain pathways; thus, motor learning research has investigated the processes involved. Speech entrainment, or providing a speech model for individuals to mimic in unison, is one successful technique used to treat motor speech disorders and is the focus of this study of accent modification. **Research Questions:** The study investigated the effect of speech entrainment on accentedness and intelligibility of advanced English-language learners seeking accent modification. The participants' rate of speech in conversation was also examined. **Methods:** A single-subject experimental study was conducted using a range-bound changing criterion (RBCC) design to examine the effects of the entrainment technique. The application of the technique could change the participants' pronunciation. The design allows changes to occur over time and within a range between lower and upper criteria. The length of the phases and the magnitude of criterion changes were adjusted during the study based on each of the participants' performances. Using RBCC allowed for flexibility in performance, which is a necessity when learning to speak differently. Five participants were selected from a university speech-language-hearing clinic where they were enrolled in accent modification services. In the study, they attended one-hour sessions regularly for approximately three

months. In the sessions, graduate student clinicians, supervised by a licensed and certified speech-language pathologist, addressed the participants' goals using speech entrainment techniques. Verbal feedback regarding the participants' pronunciation was also provided after the application of speech entrainment. **Results:** The use of speech entrainment yielded significant positive results in accent modification. Together, the overall results showed a decrease in perceived accented speech, a slight increase in the rate of speech, and a slight increase in intelligible speech. Individual performances also showed improvement in pronunciation as the result of using speech entrainment in accent modification sessions. The results of this study provide initial data to suggest that speech entrainment, a technique used to treat motor speech disorders in individuals with brain injury, also facilitates improvement in the pronunciation of individuals with speech differences. **Conclusion:** The study demonstrated that speech entrainment is an effective technique to use with individuals enrolled in accent modification. The use of speech entrainment played a pivotal role in promoting positive pronunciation changes, reducing perceived accented speech, and increasing communication effectiveness. This study expands evidence in the area of accent modification and gives speech-language pathologists additional techniques with which to teach pronunciation.

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Chapter I

Clear Speech Using Entrainment

Teaching an individual to change the way they speak can help them to become more employable and overall better employees. Quality candidates for education programs and employment must be able to express the knowledge and skills they possess clearly. Accent modification training provided by speech-language pathologists assists individuals seeking to change their accent or pronunciation from a regional or foreign accent to General American English (GAE; ASHA, 2017). Modifying pronunciation "entails changing the neural circuitry in the brain and how it functions" (Ojakangas, 2013, p. 102); thus, motor learning research is needed to investigate the processes involved. Speech entrainment, or providing a speech model for an individual to mimic in unison, is a successful technique used to treat motor speech disorders (Fridriksson et al., 2012) and a potential technique to be used in accent modification. The three-step, "I do-we do-you do" technique may give clinicians an additional tool to promote positive pronunciation changes that, ultimately, contributes to individuals' success in school or at work.

Gaps in Research and Training

The use of stronger empirical evidence and more precise identification of effective teaching practices is emphasized over the reliance on intuitions and anecdotes in accent modification (Derwing & Munro, 2009). Jolanta Szpyra-Kozlowska (2015) stressed the use of informed and supported decisions in pronunciation instruction. The American Speech-Language-Hearing Association (2017) stated that research continues to be limited in accent modification. Studying the effect of speech entrainment in

individuals seeking to change their pronunciation contributes to the needed empirical evidence and may provide a specific technique to use in accent modification.

Training future speech-language pathologists about pronunciation instruction also meets the projected demand for accent modification. According to the U.S. Census Bureau (2016), the number of foreign-born individuals living in the United States continues to increase in size and in percent of the population. Twenty-one percent of individuals in the United States age five and older speak a language other than English (U.S. Census Bureau, 2016). However, while these data suggest a growing need for accent modification, speech-language pathologists may not be prepared to deliver that support due to lack of training. Specifically, Schmidt and Sullivan's national survey (2003), as well as a state website search of Texas' schools in 2018, both revealed that not all graduate programs provide training in accent modification, despite accent modification being listed in the speech-language pathologists' scope of practice (ASHA, 2016).

Purpose

The study was completed to determine the viability of speech entrainment as a tool in pronunciation instruction, and, in the process, add empirical evidence to the research literature in accent modification. By providing efficient and practical techniques, speech-language pathologists can better serve individuals seeking to change the way they speak and accommodate the growing need for accent modification.

The Consequences of Speaking Differently

Increased globalization, migration, and diversity place individuals across the world in contact with each other, whether virtually, side-by-side, or face-to-face. Close

contact makes differences among people more apparent, and those differences must be embraced; however, sometimes, differences result in avoidance, miscommunication, or discrimination. When individuals speak differently because of their regional or foreign accent, listeners may stereotype or fail to comprehend, which can lead to potential problems related to academic success and employment (Terui, 2012; Carlson & McHenry, 2006). Terui (2012) studied second language learners' coping strategies in conversation with native speakers. Individuals who do not participate in conversations because of their lack of English proficiency and pronunciation become disengaged and avoid further communication thought to have unpleasant outcomes (Terui, 2012). Carlson and McHenry (2006) studied how ethnicity, the amount of accentedness, and comprehensibility affected the employability of individuals who spoke differently. Results revealed that all speakers with maximally perceived accents or dialects were given a lower employability rating (Carlson & McHenry, 2006). Derwing and Munro (2009) echoed these results and reported that there are substantial social, psychological, and communicative consequences of speaking with an accent. Furthermore, miscommunications due to pronunciation and lack of comprehension create social and emotional burden (Terui, 2012) and might serve as a "cover-up for racism" and discrimination through stereotyping, harassment, and employment denial (Derwing & Munro, 2009, p. 476).

Fortunately, protection against employment discrimination exists. The Civil Rights Act of 1964 “prohibits discrimination on the basis of race, color, and national origin in programs and activities receiving federal financial assistance” (U.S. Department of Justice, 2016). This means that individuals cannot be denied an employment

opportunity because of their accent (U.S. Equal Employment Opportunity Commission, 2008). Specific information about accent discrimination reveals that "an employer may not base a decision on an employee's foreign accent unless the accent materially interferes with job performance" (U.S. Equal Employment Opportunity Commission, 2008, p. 1). In Texas, only legitimate, nondiscriminatory reasons may be used to deny employment (Texas Workforce Commission, 2017). If an investigation is warranted, the focus is on whether the individual's accent hurt job performance.

Whether required by academic or workplace standards or not, accent modification plays a role in facilitating intelligible and effective communication. Individuals need to fulfill school or work responsibilities using comprehensible communication, as it is essential for the effective sharing of concepts and ideas.

Comprehensible and Competent Communication is Essential

Derwing and Munro (1998) defined comprehensibility as "the listener's judgment of how difficult it is to understand speech production" (p. 396). Participation in accent modification helps individuals to change their pronunciation and to use comprehensible communication. This goal is supported by a study that revealed that employability was not affected by individuals if their accent was only minimally perceived (Carlson & McHenry, 2006).

In addition to employability, improving pronunciation can contribute to academic success. Rubin and Graham (1988) showed that college success was positively correlated with individuals with communication competence. As a result of a 12-week group training program for students in nursing and health care administration, communication competence was acheived (Freysteingson et al., 2016). Apprehension in communication

was a negative factor in the perception of communication competence (Rubin & Graham, 1998). Terui (2012) explained that English language learners often conceal miscommunications by avoiding further communication. Put together, apprehension is common among English language learners (Terui, 2012) and negatively influences the perception of communication competence, which then could affect academic success (Rubin & Graham, 1998).

Comprehensible and competent communication facilitates the success of individuals and contributes to their success in school or at work. Oral communication is at the top of the list of basic skills in the workplace (Texas Workforce Commission, 2009/2015). Oral communication refers to "expressing ideas and messages to others in a clear, concise and effective manner, including explaining and justifying actions convincingly" (Texas Workforce Commission, 2009/2015, p. 4). This was reinforced by a study that showed that effective communication is correlated with success. Michelman (2009) says that developing effective communication facilitates success as a leader and advances careers.

Speech that is easily understood is vital for effective sharing of concepts and ideas. Major et al. (2002) showed that both native and nonnative listeners scored significantly lower on listening comprehension tests when they listened to nonnative speakers of English whose speech was characterized as moderately accented. The study used a trial version of the listening comprehension section of the Test of English as a Foreign Language (TOEFL) using lectures delivered in English by native speakers of four languages. Additionally, Hahn (2004) showed that students' processing and comprehension of information in an oral presentation varies based on the spoken

production of stress in words. When word stress was correct, students recalled more content. Further, students evaluated speakers more favorably when word stress was accurate than when stress was missing in the orally presented message. Accent modification plays a critical role in facilitating intelligible and effective communication so that listeners can comprehend and recall information presented verbally.

Whether a work requirement, school standard, or personal goal, clear and coherent communication is essential for listeners' comprehension. It is important to facilitate the desired pronunciation through accent modification for individuals who seek to change the way that they speak.

The Growing Need for Accent Modification

National need. According to the U.S. Census Bureau, the number of foreign-born individuals living in the United States continues to increase in size, and in percent of the population (2016). As illustrated in Figure 1, about 21% of individuals in the United States age 5 and older speak a language other than English (U.S. Census Bureau, 2016). The other language most frequently spoken is Spanish, followed by Asian and Pacific Island languages, then Indo-European languages, as shown in Figure 2.

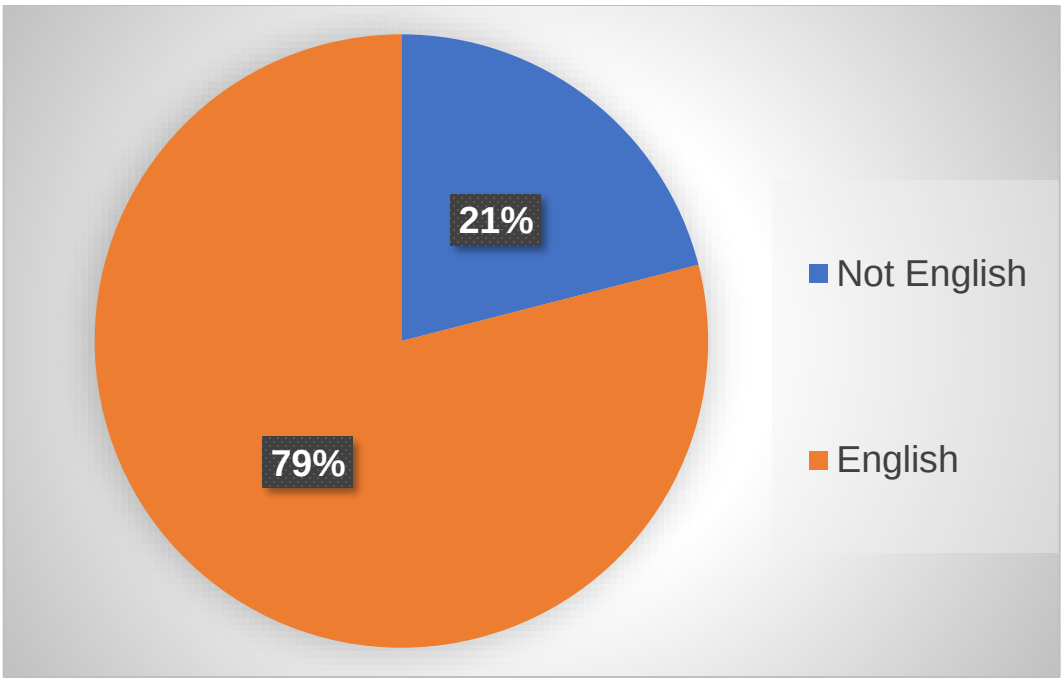

Figure 1. Use of English in the United States. This figure illustrates the percentage of individuals who speak English or a language other than English in the United States (U.S. Census Bureau, 2016).

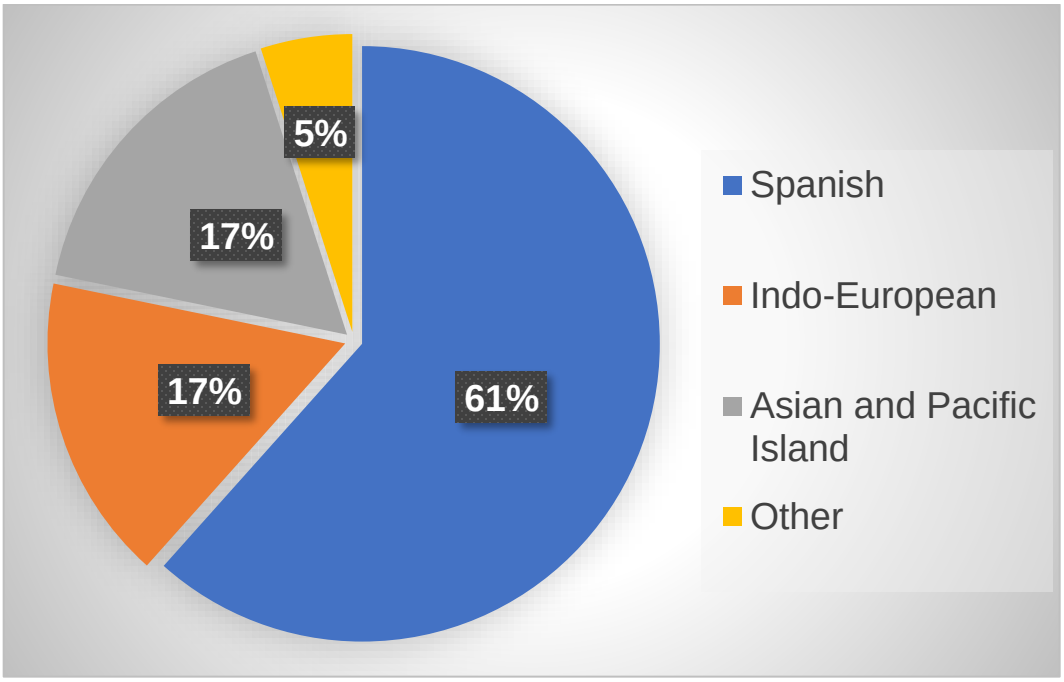

Figure 2. Languages spoken other than English in the United States. This figure illustrates the percentage of foreign-born individuals who are 18 to 64 years old who speak a language other than English in the United States (U.S. Census Bureau, 2016).

Of the 60 million individuals in the United States who speak a language other than English, about 60% report speaking only English or speaking English "very well," while the remaining 40% report speaking English less than "very well" (U.S. Census Bureau, 2016). To succeed in school or employment opportunities, these 24 million individuals, currently living in the United States, may seek pronunciation instruction to improve their spoken English.

State need. As depicted in Figure 3, Texas has a substantially larger percentage of immigrants or foreign-born individuals when compared to statistical data from the United States (U.S. Census Bureau, 2016). Second to California, which had 10.7 million immigrants, the number of immigrants in Texas was 4.7 million (Zong et al., 2018).

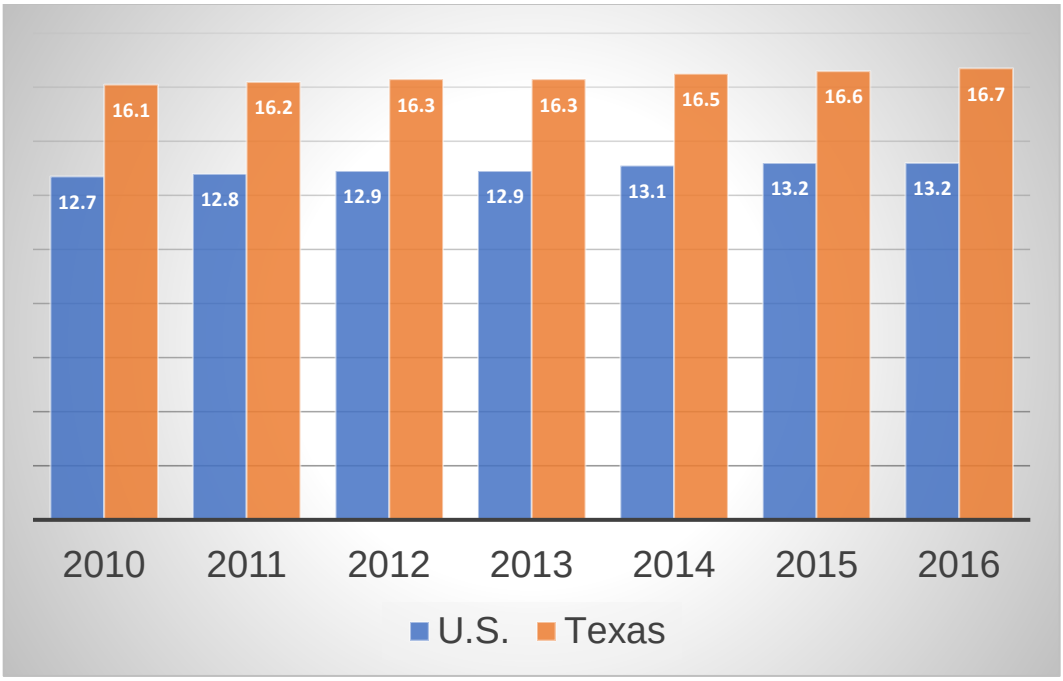

Figure 3. Foreign-born individuals in the United States and Texas. The figure compares the proportion of foreign-born individuals in the United States and Texas from 2010 to 2016 (U.S. Census Bureau, 2016).

As expected due to the proximity to Mexico and other Spanish-speaking countries, Spanish is the dominant other language spoken by immigrants in Texas. As

shown in Figure 4, similar to the statistics of other languages in the United States, Asian and Pacific Island languages (e.g., Mandarin, Hindi, Russian, Indonesian, Bengali, Japanese, Samoan, Maori, Fijian, Tahitian) are the next most common languages in Texas, followed by Indo-European languages (e.g., Urdu, Punjabi, Marathi, German, French, Italian, Persian) (U.S. Census Bureau, 2016).

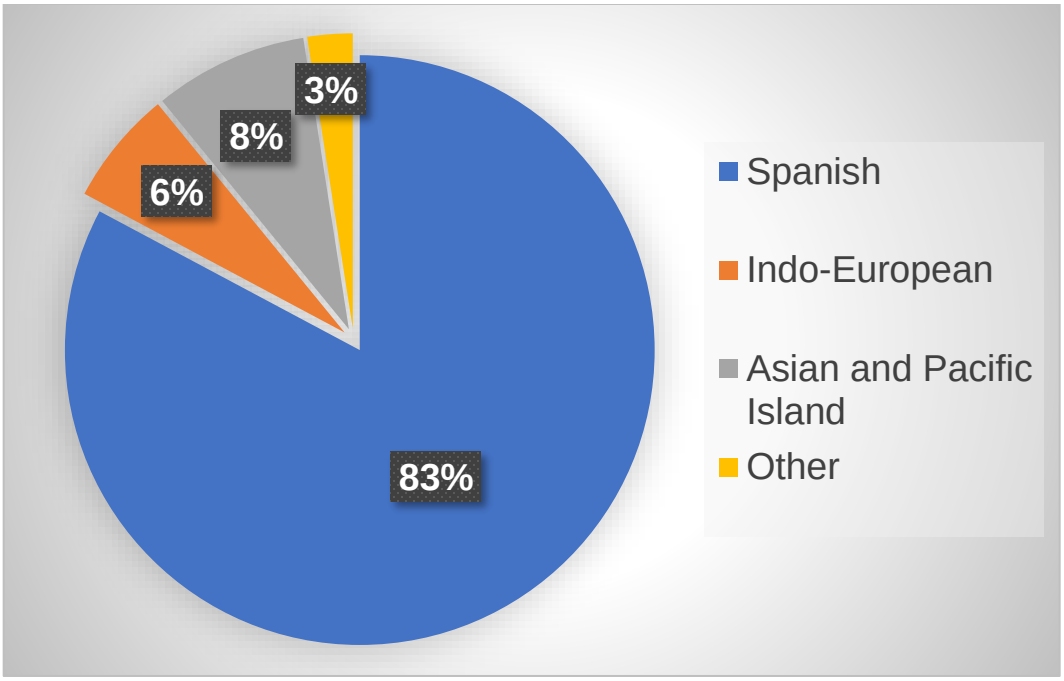

Figure 4. Languages spoken other than English in Texas. The figure illustrates the percentage of foreign-born individuals who are 18 to 64 years old who speak a language other than English in Texas (U.S. Census Bureau, 2016).

Similar to national data, a large number of individuals in Texas also reported speaking English less than "very well" (U.S. Census Bureau, 2016). As can be seen in Figure 5, over 3 million individuals, currently living in Texas, may seek pronunciation instruction to improve their spoken English in order to have better chances to success in school or employment.

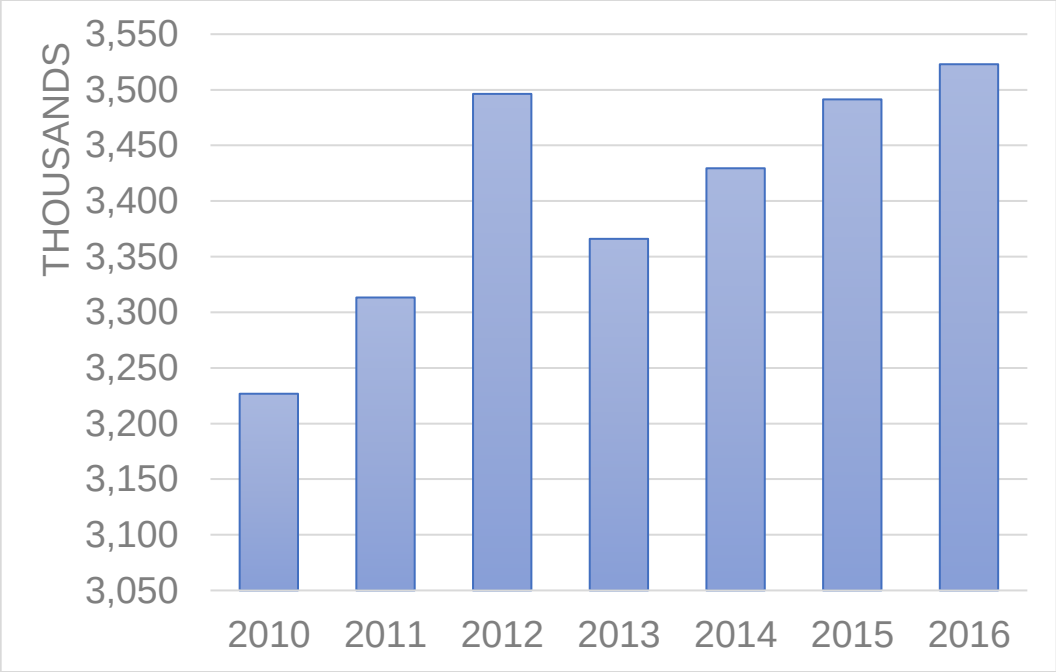

Figure 5. Individuals who speak English less than "very well" in Texas. The illustration shows the number of individuals who live in Texas and report speaking English less than "very well" from 2010 to 2016 (U.S. Census Bureau, 2016). In 2016, over 3,500,000 individuals living in Texas reported speaking English less than "very well".

Local need. Within Texas, the city of Houston continues to grow, and the numbers of foreign-born individuals or immigrants choosing Houston as a place to live and work also continues to grow. In 2016, the total number of foreign-born individuals in the Houston metropolitan area was 649,834 or 29% of the Houston population. Furthermore, between 2011 and 2016 there was a 10% increase (City of Houston, Planning and Development Department, 2017). This increase in the number of foreign-born individuals in Houston correlates to the increase in the state's population of immigrants in 2016.

Houstonians' perspectives on immigrants are increasingly positive, making Houston a desirable destination. In the Kinder Houston Area Survey (Klineberg, 2017), it was reported that the majority of Houstonians (65%) agree that immigration into the

country “mostly strengthens, rather than threatens, American culture” (p. 25); this percentage increased by 19% from 2011 when only 46% of Houstonians shared the idea (Klineberg, 2017). Aligned with the increase in positive thoughts associated with immigrants, the ability of U.S. citizens to assimilate immigrants into mainstream America continues to be a strength (Klineberg, 2017). Klineberg’s Kinder study provides information that may explain the continued increase in numbers of immigrants moving to Houston. The statistics indicate that Houston has a large number of individuals that may benefit from accent modification services as they assimilate into their new city.

Accent Modification Training

Researchers and practitioners agree that participation in accent modification training is beneficial to individuals who seek these elective services as they strive to assimilate both socially and economically (Lee et al., 2015). Participation in pronunciation instruction helps with the process of acculturation because it supports "overall communicative power" (Florez, 1998, p.4). Lee et al. (2015) completed a review of 86 studies, which revealed medium-to-large and statistically significant effects of pronunciation instruction. However, before instruction, a determination must be made about the individual's pronunciation – is it a difference or a disorder?

Differences vs. Disorders

Everyone has an accent and a dialect. The determination of whether or not the accent/dialect is a difference or a disorder is critical to success moving forward. For speech-language pathologists and their clients, evaluation recommendations and the selection of appropriate approaches is based on an understanding of differences versus disorders. Accents and dialects are differences, whereas speech sound disorders are not.

Differences are noticed when speaking outside of family or community. Accent refers to the pronunciation of language (i.e., speech), while a dialect is broader and encompasses differences in language, including grammar, vocabulary, and even the way language is used socially. Adger et al. (2007) define dialect as a reference to a variety of languages associated with a regional or social group of people. Further, they reported that the development of dialects within a language is a natural phenomenon, and unlike slang or errors, dialects are systematic and rule-governed. They stressed that "dialect" is often used to describe stigmatized language varieties, that is, language varieties which may call negative attention to individuals who use them. Individuals informally labeled with a dialect may seek accent modification to change the way they speak.

The goal of accent modification is to produce speech that is consistent with GAE. The American Heritage Dictionary defines GAE as "the speech of native speakers of American English that many consider to be typical of the United States, noted for its exclusion of phonological forms readily recognized as regional or limited to particular social groups" (2011). GAE is most often used in education, media, and government.

A speech sound disorder is characterized by difficulty producing sounds or sound patterns due to an anatomical or physiological problem. Individuals with a different accent only vary the pronunciation of English and individuals with a different dialect express language differently. Whereas, individuals with a disorder pronounce words differently due to an underlying deficit. Saying the word *route* by pronouncing it as "root" /rʊt/ or "r-out" /raʊt/ varies based on the accent of the individual. Using *y'all* or *you guys* is an example of a dialectical difference because it involves different vocabulary, just as is the use of *coke* or *pop* to refer to soda. Saying "wabbit" /wæbɪt/

for *rabbit* /ræbɪt/ illustrates the speaker's difficulty with the placement and movement of the lip and tongue, which is more consistent with a speech sound disorder.

Due to the similarities between accents, dialects, and disorders, techniques for addressing differences and disorders can overlap. Franklin and McDaniel (2016) completed a pilot study showing that two adult Japanese speakers, who were learning to speak English, demonstrated phonological patterns similar to those of typically developing children in English. Therefore, because of the similarity, it may be plausible to use similar techniques that yield positive results. Additionally, Brady et al. (2016) showed that visual feedback from spectrograms combined with traditional articulation training strategies (i.e., instruction about placement and manner of movement of articulators as well as the voicing of sounds) was effective in targeting vowels in non-native speakers of English. Elicitation techniques in the treatment of speech sound disorders may help in pronunciation instruction; thus, speech-language pathologists are well-equipped to provide accent modification training to individuals who elect to participate. Even though accent modification is not a disorder, the benefits of applying same techniques as those used with individuals with speech disorders can carry over and be applicable in training individuals with differences. However, empirical evidence about the application of techniques used with cases of disorders to cases of differences is needed and the purpose of this present study.

Speech Entrainment as a Training Technique

Speech entrainment will be investigated as a worthwhile technique for use with individuals enrolled in accent modification training. Entrainment occurs when brains and bodies synchronize to the environment (Ross & Balasubramaniam, 2014, p. 1), that is,

unconscious mirroring of surrounding behaviors, such as the accents of people speaking nearby. Auditory stimuli are provided in speech, which can be imitated using this neural mechanism. In alignment with the timekeeper theory, evidence exists showing functional connections between the auditory and motor systems (Ross & Balasubramaniam, 2014). Neuroanatomy that correlates with verified neurophysiology shows that motor commands sent from the motor complex use feedforward and feedback mechanisms for speech production. Feedforward (i.e., predictive input) information from mirror neurons in the frontal operculum are compared with feedback (i.e., actual input) using auditory and somatosensory signals which then adjust speech mapping (Guenther, 2006). Since the auditory and motor systems are coupled, this may mean that using an auditory model when speaking makes speech more automatic and less volitional because the systems work together.

A possible benefit of entrainment may be less effort or cognitive demand on the individual because there is no need to decipher a verbal explanation of where articulators (i.e., lips, tongue) should be placed or manner of movement in speech or to overtly plan motor movements. It was concluded by Weidman et al. (2016) that entrainment was a fast process, which was another promising benefit of using this neurophysiological motor skill learning technique.

The Use of Entrainment by Others

There has been a growing interest in the use of speech entrainment. For example, desired outcomes have been seen in patients with Broca's aphasia, a language disorder characterized by difficulty producing fluent speech and usually the result of a stroke. Fridriksson et al. (2012, p. 3815) reported that "despite profound impairments, some

patients [with Broca's aphasia] can mimic audiovisual speech stimuli enabling them to produce fluent speech in real time." Specifically, speech entrainment allows patients with Broca's aphasia to double their speech output compared with spontaneous speech. The positive effects of speech entrainment on patients with a speech disorder were apparent and supported by neuroimaging (Fridriksson et al., 2012).

Speech entrainment has also been studied in the context of romantic relationships. Weidman et al. (2016) reported that couples demonstrated speech entrainment for features of pitch, intensity, voice quality, and speech rate during discussions. Entrainment varied based on the content of the conversation and could predict healthy relationships (Weidman et al., 2016).

Aspects of entrainment, or synchronization of speech, have been studied in other areas as well. Hashemian and Fadaei (2011) reported that when English language learners were taught using an intuitive-imitative approach, they had better pronunciation of diphthongs, which are vowels comprised of two sounds. The imitative nature of this approach incorporates aspects of speech entrainment by providing visual and verbal speech models.

While speech entrainment has not yet been comprehensively studied, existing evidence from different areas indicates that entrainment or aspects of entrainment may benefit individuals seeking to change their pronunciation. The present study will answer questions about the effectiveness of speech entrainment on the pronunciation of advanced English-language learners seeking accent modification training.

Questions

1. What is the effect of speech entrainment on accentedness of advanced English-language learners seeking accent modification training?
2. What is the effect of speech entrainment on the intelligibility level of speech of advanced English-language learners seeking accent modification training?
3. What is the rate of speech of advanced English-language learners seeking accent modification training?

Chapter II

Literature Review

Accent Modification

More than half of the world's population is bilingual (Ansaldo et al., 2008). Historically, bilingualism has been a natural result of social, geographical, and political factors as people adapt their communication to changing environments (Bhatia, 2017). Given the large number of languages and dialects spoken around the world, and considering the vast amount of people who are migrating from one place to another as the result of globalization, it seems clear that bilingualism will continue to increase (Ansaldo et al., 2008). Additionally, bilingual individuals have an accent in one or more of their spoken languages (Grosjean, 2011). Whether bilingual or not, individuals' accents may be noticed when speaking outside of the community. Since bilingualism is the norm and globalization results in increased interactions and communication throughout the world, there is an increasing need for accent modification services to facilitate intelligible, easily understood speech. Individuals may seek accent modification services, provided by speech-language pathologists, to learn how to adjust their pronunciation when speaking outside their usual community.

Modifying an accent is driven by the individuals seeking the service. Individuals pursue outcomes that are considered to impact verbal communication in the new community. Promoting positive pronunciation changes may be accomplished with the use of speech entrainment, a technique used to treat motor speech disorders. Speech entrainment has not yet been studied in individuals who speak with an accent; however, existing evidence indicates that entrainment or aspects of entrainment may facilitate

changes in pronunciation. This may expand evidence and efficacy in the area of accent modification and give clinicians additional techniques in pronunciation instruction.

To accommodate the growing demand for accent modification, future speech-language pathologists need to be trained to provide pronunciation instruction to English language learners. However, according to a national survey by Schmidt and Sullivan (2003), not all accredited communication sciences and disorder graduate programs offer training in it being despite accent modification listed in the speech-language pathologists' scope of practice (ASHA, 2016). In addition to efforts in meeting the high demand, speech-language pathologists increase their ability to assess all clients using a more in-depth differential diagnosis (Schmidt & Sullivan, 2003). Training in accent modification not only fulfills a need for an increasing population, but it also expands speech-language pathologists' skills that benefit overall clinical practice.

Adults learning English as a Second Language (ESL) strive to speak in "real life contexts with native and other non-native speakers" (Derwing & Rossiter, 2003, p. 14). The desire to be understood and speak with native pronunciation is echoed by clients enrolled in training. Further, there are substantial social, emotional, and communicative consequences of speaking with an accent (Derwing & Munro, 2009). It is important to facilitate the desired pronunciation through accent modification for individuals who seek to change the way that they speak.

Components that Contribute to an Individual's Pronunciation or Accent

Pronunciation is influenced by several components, including age, exposure, perception, and explicit pronunciation instruction. The degree of difficulty of changing pronunciation relates to the age of learning English and exposure to English. Those with

a younger age of acquisition and those with more exposure to English showed significantly more improvement in English pronunciation (Flege, 1995). Another factor that leads to greater improvement in pronunciation is perception. There is a relationship between speech perception and speech production. With some individuals, increasing perception (i.e., how speech is heard) automatically leads to changes in speech production. Bradlow et al. (1997) showed that when Japanese speakers were trained to perceive the /r/ and /l/ sound distinction, their productions of those phonemes improved. Generally, speech productions improve with perceptual training (Bradlow et al., 1997).

Speech-language pathologists utilize effective evidence-based techniques in sessions to evoke positive pronunciation changes. Researchers and practitioners agree that participation in accent modification is beneficial to the individuals who seek the elective service. Lee et al. (2015) completed a review of 86 studies, which revealed medium-to-large and statistically significant effects of pronunciation instruction. Furthermore, the impact of pronunciation instruction is greater when it is explicit, that is, directly taught (Derwing & Rossiter, 2003; Saito, 2012).

Not only does accent modification produce positive pronunciation changes, but it also improves communication skills of non-native English speakers. As a result of participation in accent modification, individuals learn to pronounce words distinctly, emphasize words, and use body language and facial expressions appropriately (Khurana & Huang, 2013). Additionally, focusing on vowels, consonants, and prosodic features of English facilitates “communicative pronunciation” (Sikorski, 2005, p. 118).

Age of acquisition, exposure to English, the ability to perceive differences, and participation in accent modification are independent variables that contribute to an

individual's pronunciation. The dependent variable, the individual's clarity when speaking or the approximation of GAE, is the result of the aforementioned influences.

Participation in accent modification is an option for individuals seeking to change their pronunciation; whereas, the age of acquisition, exposure to English, and, to some degree, the ability to perceive differences are not variables that are subject to change. Because pronunciation instruction is a pathway that can lead to the attainment of clear speech, it is valuable to understand its development.

Previous Pronunciation Teaching

Celce-Murcia et al. (2010) described the evolution of pronunciation teaching from the late 1800s when second language (L2) teaching began. Initially, a direct method was used, and teachers provided a model for learners to imitate. In the 1960s, instead of pronunciation, grammar and vocabulary were emphasized, and a cognitive approach was used. In the 1970s and 1980s, attention focused again on pronunciation through community language learning and a communicative approach. Teaching in the twentieth-first century focused on grammar, and listeners were tolerant of L2 learners' errors; however, teaching has shifted, and efforts are being made to promote fluent and accurate speaking.

Present Pronunciation Instruction

Despite confirmation that accent modification is beneficial, more research is needed to "identify effective teaching approaches" (Derwing & Munro, 2009, p. 487). Current literature in accent modification, albeit limited, provides efficacy for different ways to teach individuals to change their pronunciation. Conceptual frameworks are aligned with training approaches and techniques. Selecting a framework guides the use

of techniques and the focus of activities in training sessions for accent modification. Targeting auditory perception, speech sounds, speech patterns, or focusing on a combination of goals can be described using a top-down, bottom-up, or interactive frameworks. An approach is selected in collaboration with the individual after evaluating the individual's pronunciation of sounds and use of stress, intonation, and rhythm when speaking.

Utilizing accent modification techniques to achieve the individual's goals is the focus of the study. The individual's background (e.g., the age of English acquisition) cannot be altered; however, the techniques used in a session influence the ability to change pronunciation. Speech entrainment is a technique that has been successfully utilized by speech-language pathologists with patients with motor speech disorders (i.e., individuals recovering from a stroke). It is hypothesized that speech entrainment will also be a viable technique to use with individuals seeking to change their pronunciation.

Approaches, Methods, and Techniques

There are different ways to provide accent modification. Conceptual frameworks are aligned with approaches, methods, and techniques; thus, selecting a framework, an approach, a method, and techniques guides the types of activities performed in a session.

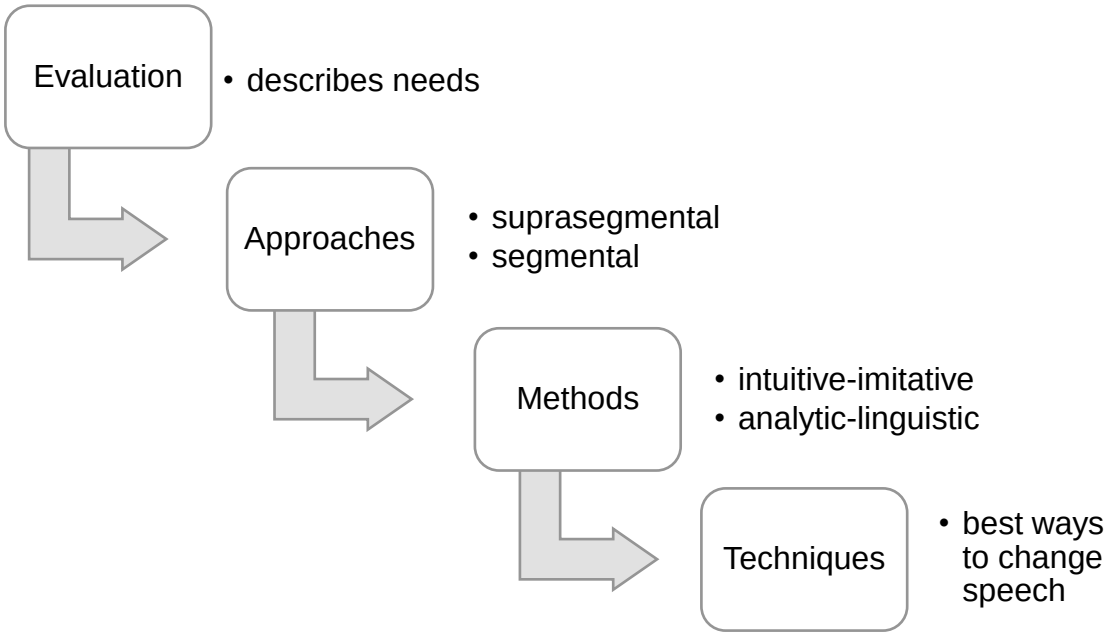

Figure 6. Decisions in accent modification. The decision-making process in accent modification training is illustrated. Information is gathered during the evaluation. Approaches, methods, and techniques are selected, individualized, and culminate in a plan to meet the individual's goals.

Evaluation results and the individual's goals and circumstances are used to help determine an appropriate approach to implement. ASHA (2017) provides an overview of accent modification services and informs speech-language pathologists about key issues. Clinical judgment is used in multifactorial decisions. The skills in understanding the impact of second language acquisition on linguistic and dialectal variations in English language learners are fundamental requirements of speech-language pathologists (ASHA, 2017). Equally as important, speech-language pathologists should possess an ability to differentially diagnose a communication disorder and a communication difference (Sikorski, 2005). Whether through graduate school training or professional development,

speech-language pathologists must possess a critical ability to match the individual's needs and desires with evidence of what works in accent modification.

The individual's needs are determined from an accent evaluation, which compares the individual's performance against a native speaker's performance. The results of testing reveal the individual's speaking differences and the degree of accentedness. Accentedness refers to the examiner's perception of the pronunciation differences in the individual's speech. During the evaluation, the examiner is listening for speech that is produced using GAE. The American Heritage Dictionary defines GAE as "the speech of native speakers of American English that many consider to be typical of the United States, noted for its exclusion of phonological forms readily recognized as regional or limited to particular social groups" (2011). As a result of the evaluation, the individual's pronunciation strengths and weaknesses are revealed and the process of determining the individual's training plan begins.

Approaches

Accent modification includes three frameworks that guide the provision of service: top-down, bottom-up, or interactive.

Top-down framework. A top-down framework targets global or suprasegmental aspects of speech production. Selecting a top-down framework is synonymous with using a suprasegmental approach. A suprasegmental approach often focuses on speech in a conversational context or a more complex level. Suprasegmentals are features of speech related to the melody of speech; specifically, these features are rate, rhythm, and intonation and are addressed in conversational speech. Often the use of suprasegmentals makes speech more effective and meaningful. For example, "The puppy is so cute!" is

more meaningful when said with suprasegmentals than said without suprasegmentals. Changes in speech at a complex level will trickle down and generalize to less complex levels.

Bottom-up framework. A bottom-up framework is synonymous with a segmental approach which targets segmental aspects of speech production. Segments of speech are parts of speech, so the focus is on individual sounds or phonemes. A segmental approach often targets speech in words or at a less complex level. This could mean that just the sound or individual phoneme is targeted in session. Addressing segmental speech involves more traditional articulation methods, such as auditory discrimination and phoneme (i.e., individual sound) production. Visual and verbal instructions are usually given to the individual to facilitate adjustments in their tongue or lip placement, the manner of movement, or voicing of the sounds. For example, the word *cute* may be cued by showing that the beginning of the word begins with a /k/ sound, which is produced at the back of the mouth with a burst of air. Changes in speech production at less complex levels will build up and generalize to more complex levels.

Interactive framework. An interactive approach involves a focus on both suprasegmentals as well as segmental components. For example, "She's cute!" may be targeted by priming the individual with reminders about the back of mouth placement for the /k/ sound as well as an emphasis on elongating the vowel *u* (i.e., changing the rate of speech) as a signal of genuine admiration of the adorable puppy.

Historically, the focus of most training has been on phonemes (i.e., segmental or bottom-up approach); however, evidence exists that using a combination approach (i.e., segmental and suprasegmental or interactive approach) is beneficial in overall changes in

pronunciation. Derwing et al. (1998) stated that attention should be given to both global (i.e., suprasegmental) and segmental aspects of pronunciation. Further, Khurana and Huang (2013) suggested improving communication skills, not just pronunciation. Behrman (2014) also proved that a combination of segmental and prosodic (i.e., suprasegmental) approaches provided benefit.

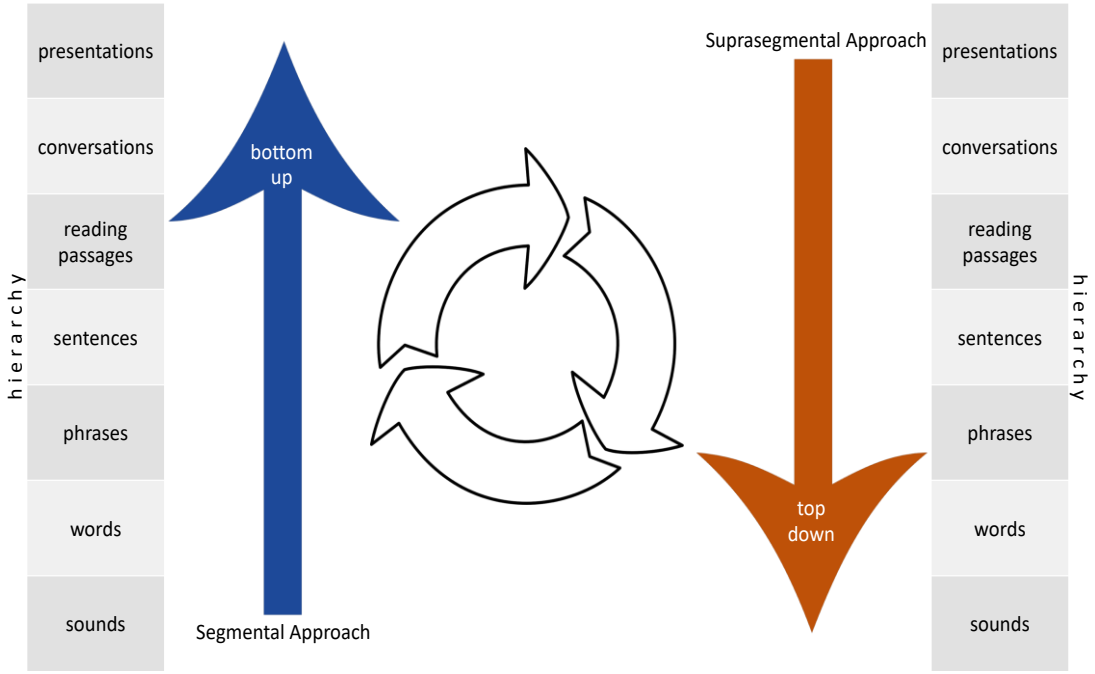

Figure 7. Accent modification approaches with speech complexity hierarchy. The frameworks of bottom-up, interactive, and top-down, are shown with the segmental and suprasegmental approaches. The needs of the individual will help determine what approach is used and what level in the hierarchy will be targeted first.

Methods

Two overarching methods drive the techniques used in a session. The methods are intuitive-imitative and analytic-linguistic (Celce et al., 2010). An intuitive-imitative method is implicit and involves repetition of the model, whereas an analytic-linguistic method provides explicit instructions where the individual learns mouth movements and

phonetic transcriptions necessary for production differences (Celce et al., 2010; Hashemian & Fadaei, 2011).

Most practitioners use an intuitive-imitative method to start, then rely on an analytic-linguistic method to ensure pronunciation changes (Jam & Adibpour, 2014). It is efficient if the individual can modify his or her speech from a model. Fast progress and quick changes in speech are desired. Changing pronunciation may require prompts and instructions to adjust articulator placement, the manner of production, and changes in rate and rhythm of speech to support a different way of speaking.

Techniques

Techniques are the procedures and tools used when eliciting desired pronunciation changes. Techniques must be selected and must align with the approach and method. Evidence from previous studies in accent modification provides clinically relevant information about how to modify an accent. In 2010, Celce et al. explained several training techniques that are effective in changing pronunciation (p. 10). Based on descriptions, they were categorized by the method and listed in Tables 1 and 2.

Table 1

Techniques Considered to Use an Intuitive-Imitative Method

Technique	Description
Listen and imitate	The individual listens to a model of speech and repeats or imitates the word or sentences. Closely approximating the sounds and intonation is the goal.
Reading aloud or recitation	The individual will practice a script, then read it aloud. Memorization may or may not be used.
Tongue twisters	The individual produces tongue twisters, such as “clean clams crammed in clean cans," emphasizes that differences in productions can produce differences in meaning.
Developmental approximation drills	The individual will read lists of words with similar sounds. Celce et al. suggested practicing an earlier acquired sound in a word, then shifting to a later acquired sound. Developmentally, the /w/ sound is acquired before the /r/ sound. For example, the individual should first pronounce *wed*, then shift to pronouncing *red*. This would continue with other words: *wag* to *rag, wipe* to *ripe*.

Note. The techniques listed are more implicit in practice. The individual often repeats or recites information as a way to learn to pronounce speech differently (Celce et al., 2010).

Table 2

Techniques Considered to Use an Analytic-Linguistic Method

Technique	Description
Phonetic training	The individual is taught articulatory descriptions and the phonetic alphabet (i.e., symbols for sounds).
Visual aids	The individual is provided with visual aids in the form of pictures, diagrams, and charts may be used as well as animations, mirrors, and props.
Minimal-pair drills	The individual is provided with pairs of words (e.g., cat-bat, kit-bit, cot-bot) or pairs of sentences to say. The individual will hear and feel differences in pronunciation between the words using paradigmatic and syntagmatic methods.
Contextualized minimal pairs	A pair of words is embedded in a sentence, and the individual must say the correct word. For example, "The blacksmith (hits/heats) the horseshoe."
Vowel & stress shifts	The individual practices vowel and stress shifts related to affixation. Sentences are provided that contain the pair of words with different vowel production and stress. An example of a vowel shift is "Street *mimes* often *mimic* the gestures of passersby." An example of a stress shift is "I can tell from those *photographs* that you are very good at *photography*."
Recording of learners' production	The individual's speeches and conversations are recorded and played back for feedback and self-evaluation.

Note. The techniques listed are more explicit in practice. The individual is taught specific information to learn to pronounce speech differently. Often, these techniques are used in combination with each other. For example, phonetic training may be taught using visual aids. Many of these techniques rely on perceptual skills to detect differences in productions (Celce et al., 2010).

Speech Entrainment: A Potential Technique. Modifying pronunciation involves changes in neural circuitry and physiology (Ojakangas, 2013); thus, motor learning research is needed to investigate the processes involved. Speech entrainment, or providing a speech model for an individual to mimic in unison, is a successful technique

used to treat motor speech disorders and a potential technique to be used in accent modification.

The synchronism phenomenon observed in speech entrainment allowed patients with Broca's aphasia to double their speech output compared with spontaneous speech (Fridriksson et al., 2012). Borrie and Liss (2014) also explored speech entrainment and showed that individuals modified their speaking rate and pitch to align with a model of speech that was disordered. Additionally, Weidman et al. (2016) reported that couples demonstrated speech entrainment for features of pitch, intensity, voice quality, and speech rate during discussions. The studies showed that stimuli provided in speech can be precisely imitated using the neural mechanism of speech entrainment. Altogether, it is plausible that speech entrainment can provide a way for individuals to produce the speech that they desire. When an individual can produce speech with precision then their overall speaking performance improves as well as their communicative effectiveness.

When individuals practice using speech entrainment, they have a greater ability to produce desired pronunciation. In the brain, a layer of myelin forms around nerves and allows electrical impulses to transmit information quickly and efficiently. The thickness of the myelin coating relates to ability. It appears that practice increases the thickness of myelin along the pathways involved, which, in turn, increases the strength and speed of the signals, thus improving performance (Fields, 2008). Over time, the desired pronunciation becomes a habit from widespread practice and repetition. The motor skills needed for pronunciation are recoded, allowing pronunciation to become automatic (Jacoby, 1978).

Aspects of speech entrainment have been studied in other areas as well. Okada and Hickok (2009) showed that visual speech provides motor predictions that influenced speech perception. Researchers have shown that the neuroanatomy involved when lipreading influenced what was heard through fMRI (Okada & Hickok, 2009). Hashemian and Fadaei (2011) reported that when English language learners were taught using an intuitive-imitative approach, they had better pronunciation of diphthongs. The imitative nature of this approach incorporates aspects of entrainment by providing visual and verbal speech models. Borrie (2015) reported that there was an increase in perception when visual speech information was added to the auditory signal of disordered speech (i.e., dysarthric or imprecise speaking). Using both visual and verbal speech models improved listeners' comprehension of messages. None of the researchers incorporated synchronization of speech, but all studied the effects of visual and verbal models of speech.

A possible benefit of entrainment may be less work for the individual because there is not a need to decipher a verbal explanation of where or how the mouth moves. it was also suggested that entrainment was a fast process (Weidman et al., 2016). Based on this information, speech entrainment could be aligned with an intuitive-imitative method since it appears to be an implicit way of learning.

Existing evidence from different areas indicates that speech entrainment or aspects of entrainment may play a pivotal role in promoting positive pronunciation changes by eliminating a perceived accent and increasing communication effectiveness. This expands evidence and efficacy in the area of accent modification and gives

clinicians additional techniques to effectively and efficiently provide pronunciation instruction.

Implementation

Clinical judgment is used when developing a plan for an individual's accent modification. Aligning the individual's goals with an effective approach, method, and techniques yields the desired outcome. The application of behavioral principles also influences the outcome. Applying behavioral analysis in a session is as essential as a speech-language pathologist's knowledge and skills in pronunciation instruction.

Applied behavior analysis. Applied behavior analysis using changing criterion designs accelerates desired behaviors and reduces unwanted behaviors (McDougall et al., 2006). In effect, this approach systematically increases the desired pronunciation and reduces unwanted speech productions. Individuals achieve and feel success when they reach a specified performance or criteria. The perception of accentedness could be compared to playing a game of limbo where the bar (i.e., criterion) is lowered systematically until within a desirable and reachable level. Similarly, speech intelligibility could equate to playing basketball where the hoop (i.e., criterion) is placed incrementally further away until it is within a challenging, but achievable distance.

Range-bound changing criterion (RBCC) expands performance expectations by providing a performance range, rather than a point or specific level to be achieved. Criteria changes with the participant's performance and those changes or future goals are within a reasonable expectation instead of a single target. Techniques used in the session are expected to change the individual's speech, and the changes are expected to occur within a range between the lower and upper criterion over time. McDougall et al. (2006)

explained that the length of the phases and the magnitude of criterion changes adjusted during the training to allow for flexibility in performance. The flexibility and variation through the process accommodate days that are better and days when performance is worse (McDougall et al., 2006). Thus, using RBCC enables the individual to make changes in pronunciation incrementally. Modifying an accent can be difficult because "speaking style is a well-engrained motor habit" (Ojakangas, 2013, p. 101), thus making gradual changes is supported. The functional relationship of the training technique can be demonstrated while continually changing pronunciation positively. Rather than bursts of high performance, RBCC focuses on consistent change, within a reasonable range, over time (Alberto & Troutman, 2003).

Training the trainers. Whether in a graduate program or professional development course, teaching clinicians to apply behavioral analysis and to perform accent modification is accomplished by motivating them to think about pronunciation and to apply academic knowledge to clinical situations. Engagement is ensured when clinicians are encouraged and supported. Their participation in the learning process changes beliefs and enables them to take action based on their new perspectives (Merriam & Bierema, 2014).

When learning new information to implement a new skill, there must be a balance of resources and demands for participation and progress to be made (Merriam & Bierema, 2014). The amount of support provided varies and is adjusted based on the learners' needs. One way to provide support is to borrow from what is already known. The similarities between accents, dialects, and disorders allow for overlapping techniques to be used for addressing differences and disorders. Also, the use of technology supports

education as it is a tool for organizing and illustrating learning experiences. Technology allows learners to relate, build, and connect new learning experiences (Merriam & Bierema, 2014). Both clinical educators (i.e., supervising speech-language pathologists) and clinicians must recognize the learners' needs and adjust the amount of support and guidance provided to achieve optimal clinical training experiences.

In summary, accent modification relies on a decision-making process implemented by speech-language pathologists to help an individual achieve their goals in changing their pronunciation. This study focuses on a specific technique, speech entrainment, and its effect on changing pronunciation in nonnative speakers. With supervision, future speech-language pathologists implement accent modification with speech entrainment to English language learners while accruing clinical hours and competencies. Because the study involves graduate student clinicians in speech-language pathology, effective adult learning methods are used to teach about this part of the profession. To address the limited empirical evidence in accent modification, the study experiments with speech entrainment to determine whether it is a valuable technique to use with individuals seeking to change their pronunciation.

Chapter III

Methods

Clear Speech Using Entrainment

The study investigated speech entrainment as a worthwhile technique for use with individuals enrolled in accent modification training. Accent modification training, provided by speech-language pathologists, helps individuals who seek to change their accent or pronunciation from a foreign accent to GAE. Modifying pronunciation "entails changing the neural circuitry in the brain and how it functions" (Ojakangas, 2013, p. 102); thus, motor learning research is needed to investigate the processes involved. Speech entrainment, or providing a speech model for an individual to mimic in unison, is a successful technique used to treat motor speech disorders (Fridricksson et al., 2012) and a potential technique to be used in accent modification.

Although speech entrainment has not yet been comprehensively studied among accent modification scholars, existing evidence from research in motor speech indicated entrainment could benefit individuals seeking to change their pronunciation. The use of speech entrainment could play a pivotal role in promoting positive pronunciation changes, thus eliminating a foreign accent and increasing communication effectiveness. This is important because it expands evidence and efficacy in the area of accent modification. Giving clinicians additional techniques to effectively and efficiently teach how to change pronunciation facilitates the success of the individuals and, ultimately, contributes to their success in school or at work.

Design

A single-subject experimental study was conducted using a range-bound changing criterion (RBCC) design to examine the effects of the entrainment technique. Application of the technique, the independent variable, was expected to change the participant's speech performance (i.e., accentedness), the dependent variable. The changes occurred over time (e.g., 12 weeks) and within a range between lower and upper criteria. The length of the phases and the magnitude of criterion changes was adjusted during the study based on each of the participants' performances. Using RBCC allowed for flexibility in performance, which is a necessity when learning to speak differently.

Questions

1. What is the effect of speech entrainment on accentedness of advanced English-language learners seeking accent modification training?
2. What is the effect of speech entrainment on the intelligibility of advanced English-language learners seeking accent modification training?
3. What is the rate of speech of advanced English-language learners seeking accent modification training?

Participants and Sample Criteria

Five subjects participated in the study. The participants represented a broad population because of their varied first languages, ages of acquisition of English, and ages of arrival to the United States. They voluntarily sought accent modification training at a university speech, language, and hearing clinic to aid academic success or employment advancement. Participants were advanced English-language-learning adults that immigrated to the United States for educational opportunities. Four of the

participants had connections to the university and heard about accent modification from previous participants. One participant sought the clinic after a website search.

All participants' English language skills were screened during the evaluation revealing appropriate expressive and receptive language abilities at a conversational level. The participants reported their age of acquisition of English, which greatly ranged between 4 years of age to 28 years of age. Table 3 shows the participant's age of arrival and age of acquisition of English.

Table 3

Participants' Demographic Information

Pseudonym	Age	Native Language	Age of Arrival to the United States	Age of Acquisition of English
Linh	25	Vietnamese	23 years old	6 years of age
			2.5 years ago	19 years ago
Lucia	40	Spanish	38 years old	4 years of age
			2 years ago	36 years ago
MinJoo	41	Korean	36 years old	28 years of age
			5 years ago	13 years ago
Raj	34	Hindi	22 years old	6 years of age
			12 years ago	28 years ago
Trang	26	Vietnamese	24 years old	14 years of age
			2 years ago	12 years ago

Note. The participants reported their age of arrival to the United States and age of acquisition of English.

Two participants were graduate students, one was a post-baccalaureate student, one was a former kindergarten teacher, and one was a technology professional. All agreed to practice 15 minutes twice a week outside of the hour-long twice-weekly sessions except for one participant who attended an hour-long session once a week. Length of home practice (i.e., outside of a session) was the same to avoid a threat to internal validity and was documented in a written log from verbal report.

Participants met the study requirements if their speech productions were at a level where GAE production of words and sentences were the focus in training. The levels or contexts of speech production are listed in Figure 13. The participants' short term goals were within levels 3-8, thus they were eligible for the study. The trial of speech entrainment was used to teach the pronunciation of words and sentences. Since the technique relied on producing speech in unison, it was not used in conversational speech. Participants did not have a diagnosis of impaired neurological function, psychiatric conditions, or cognitive impairment, as those may interfere with neurophysiological aspects of the speech entrainment technique.

The participants selected had different histories (e.g., the age of English acquisition) and weekly exposure to English. To show a generalization of the results to individuals enrolled in accent modification, details about participants' background is provided, allowing other clinicians to match the study participants to their clients. A summary of the inclusion and exclusion criteria is shown in Table 4 and Table 5.

Table 4

Inclusion Criteria

Inclusion Criteria
Adult (18 years +)
English-language learner
Available to participate at the university clinic
Different first languages • L1 = Spanish • L1 = Vietnamese • L1 = Hindi • L1 = Korean
Different lengths of time in training • never received training • received > 1-year training • received 1+ year training
Different age of acquisition of English
Committed to 15 min/twice a week at home
Individual goals are at the word or sentence levels (i.e., levels 3-8 in the hierarchy shown in Figure 13)
Use or exposure to English at school or work

Note. Inclusion criteria for speech entrainment participants.

Table 5

Exclusion Criteria

Exclusion Criteria
Does not seek elective service
Lacks commitment to home practice or insists on practicing longer than prescribed
Lacks availability to participate during sessions regularly
Must not have a neurological diagnosis, psychiatric conditions, cognitive impairment
Demonstrates no command or little knowledge of English; Has not yet acquired English
Learned English simultaneously with another language
Individual goals are at conversation or presentation level or individual goals relate to auditory discrimination (goals must target speech production that is not spontaneous; see Figure 13 for a hierarchy of speaking contexts)
Does not use or has no exposure to English

Note. Exclusion criteria for speech entrainment participants. Participants with the listed characteristics or conditions were not selected as candidates for the study.

Setting

The experiment was conducted in a university speech, language, and hearing clinic, which offered a wide range of evaluation and treatment for speech, language, and hearing disorders and differences. It was located at a large public university and was the training facility for students enrolled in a graduate program in Communication Sciences and Disorders. Graduate students earned clinical hours and competencies when working with the participants under the supervision of a licensed and certified speech-language pathologist.

Graduate student clinicians were assigned to clients in the clinic based on mutually available schedules. The clients were approached to participate in the study after the clinic started, and assignments were made. There were four clinicians for the five participants because one clinician trained two of the participants. The clinicians were paired with the participants for the length of the study, which was also the approximate length of the semester. Graduate clinicians established effective working relationships with the participants and met the criteria for clinic practicum.

The training rooms were sparsely furnished with a table and chairs. A double-sided mirror was also in each room. Rooms were equipped with a video and audio recording system for the supervising speech-language pathologist to observe from down the hall. The activities for each session were developed in collaboration with the speech-language pathologist and brought to the sessions by the graduate student clinician. The activities addressed the participants' individual goals and consisted of word lists, sentence lists, or reading passages. Participants brought their log of practice time to sessions.

Method

Applied behavior analysis using changing criteria accelerates desired behaviors and reduces unwanted behaviors (McDougall et al., 2006). In effect, this approach systematically increased the desired pronunciation and reduced unwanted speech productions. Individuals achieve success when they reach a specified performance or criteria. The perception of accentedness could be compared to playing a game of limbo where the bar (i.e., criterion) is lowered systematically until within a desirable and reachable level. Similarly, speech intelligibility could equate to playing basketball where the hoop (i.e., criterion) is placed incrementally further away until within a challenging, but achievable distance.

Each of the sessions was video and audiotaped. The graduate student clinicians judged the accentedness and intelligibility from the conversational samples collected in the session. The rate of speech was also calculated from the samples.

Participants were shown their performance from the previous session at the beginning of a new session. Goals and performance expectations were discussed and illustrated to allow the participant to see their progress and the steps or phases to meet their long term goal. This also encouraged them to do their best to achieve the next steps in the process. Criteria changed based on their speaking performance in session and allowed pronunciation changes to be made over time. Specifically, the participant needed three performances in the goal range to progress to the next step in the process. The details, such as length of time or number of steps, were not known at the beginning of the study because the criteria changed based on each participant's performance. Figures 8

and 9 show examples of illustrations that were used to discuss each participant's performance as they progressed through the process.

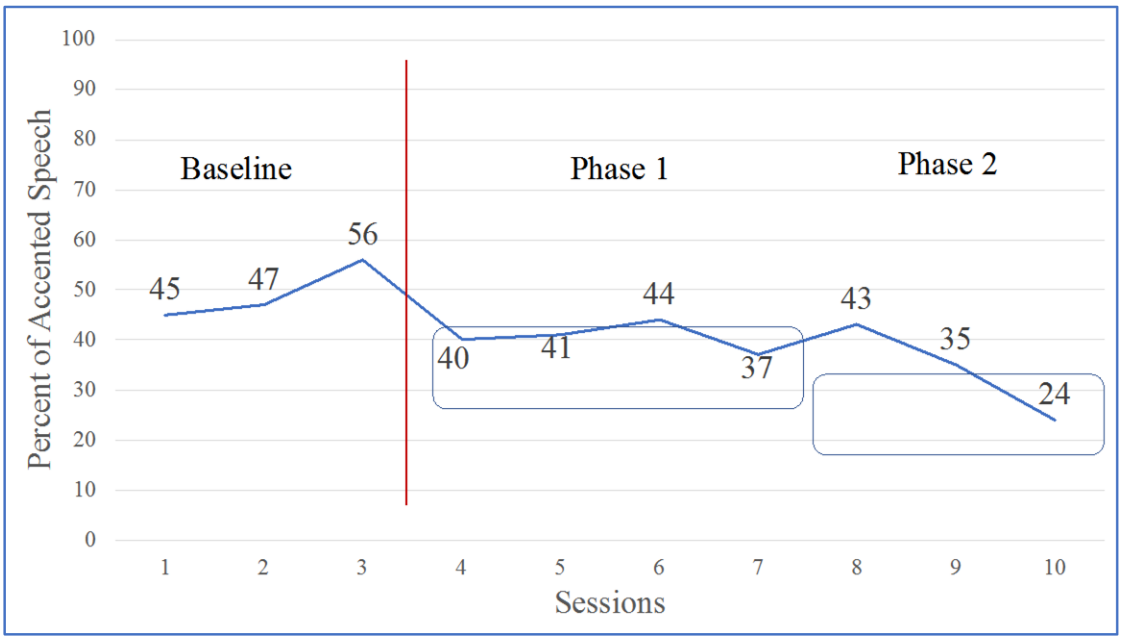

Figure 8. Sample RBCC for accented speech performance. A sample of how accented speech performance was illustrated for the participant. During the first three sessions, baseline data were collected, and the average performance percentage was used to calculate the range of performance for the first phase of the study. Since less accent is desired, a 15-point decrease with a range of fifteen points became the expected performance for phase 1. The average of the three data points within the range in phase 1 was used to calculate the range of performance for the second phase of the study. Again because less accent is desired, a 15-point decrease with a range of fifteen points became the expected performance for phase 2. The participants were shown their performance from each session and also saw the expectation or goal (i.e., box). The phase lengths varied based on the participant's performance. In this example, the participant met criteria in three out of four sessions for phase 1. This continued for the duration of the study.

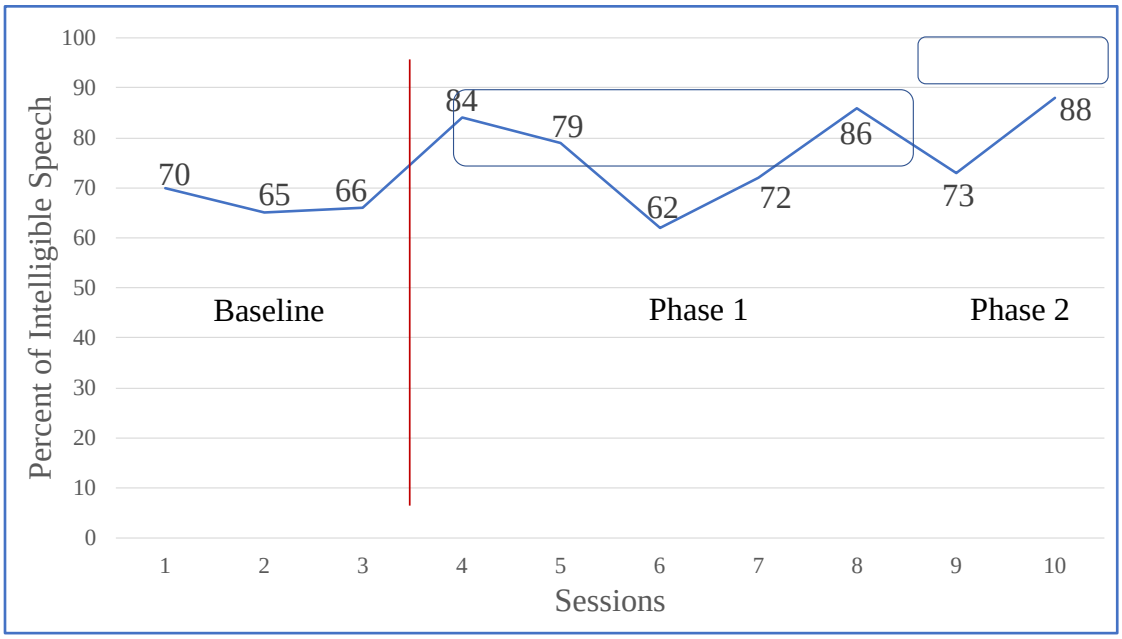

Figure 9. Sample RBCC for intelligibility performance. A sample of intelligible speech performance was illustrated for the participant. During the first three sessions, baseline data were collected, and the average performance was used to calculate the range of performance for the first phase of the study. Since more intelligible speech was desired, a 15-point increase with a range of fifteen points became the expected performance for phase 1. The expected range of performance for the second phase of the study was calculated based on the three performances within the first phase. The range of performance for the second phase was less because it is not possible to exceed one hundred percent. The participants were shown their performance from each session and also saw the expectation or goal (i.e., box). The phase lengths varied based on the participant's performance. In this example, the participant met criteria in three out of five sessions for phase 1.

Throughout the study, the expectation was that the rate of speech would remain constant so that the fluctuating speed of speech did not influence accentedness and intelligibility. Speech that is too fast can reduce word intelligibility (Hosoi et al., 1992), and conversely, speech produced at a typical rate aids intelligibility. With a stable rate of speech, the known variable that helps or hinders the production of clear speech was removed. Figure 10 shows an example of an illustration that could be used with the participant to report their rate of speech.

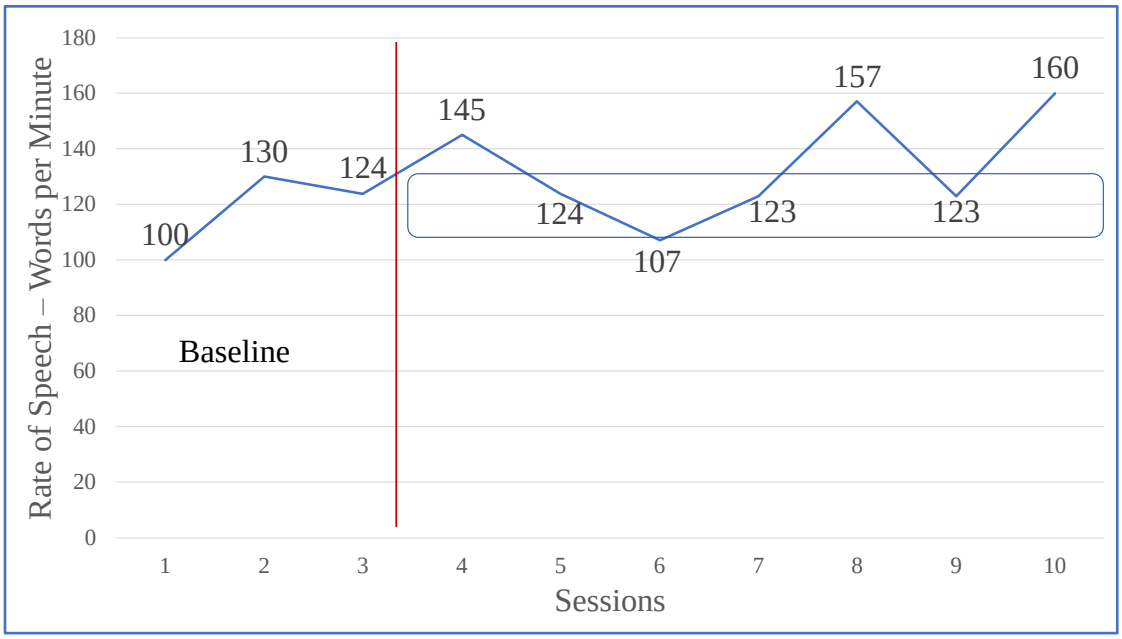

Figure 10. Sample RBCC for rate of speech. A sample of the rate of speech was illustrated for the participant. The number of words spoken per minute in conversational speech was calculated. The average from the first three sessions was used to create a fifteen-point range. The expectation is that the participant's speech rate remained constant throughout the study. The participants were shown their performance from each session and also saw the expectation or goal (i.e., box).

RBCC expands the concept of adjusting expectations by providing a performance range, rather than a point or specific level to be achieved. Techniques used in the sessions were targeted to change the individual's speech, and the changes were expected to occur within a range between the lower and upper criteria over time. The length of the phases and the magnitude of criterion changes were adjusted during the training and allowed for flexibility in performance. The flexibility and variation through the process accommodated days that were better and days when performance was worse (McDougall et al., 2006). Using RBCC enabled the individual to make changes in pronunciation incrementally. Modifying an accent can be difficult because "speaking style is a well-engrained motor habit" (Ojakangas, 2013, p. 101) that is facilitated by gradual change. The functional relationship of the training technique was demonstrated while continually

changing pronunciation positively. Rather than bursts of high performance, RBCC focused on consistent change, within a reasonable range, over time (Alberto & Troutman, 2003).

An additional advantage of using changing criteria in this single-subject study was that the production of GAE sounds and patterns are already in the participant's repertoire (Richards et al., 1999); thus, the specific sound or pattern does not need to be taught. Rather than teaching fundamentals of pronunciation, the emphasis was on consistent use of GAE pronunciation; however, even with the ability to produce GAE sounds and patterns, production was neither consistent nor automatic, which further makes changing criterion design appropriate for ensuring consistent GAE use that becomes automatic. A final reason that RBCC supported changing pronunciation is that the speech entrainment technique was not withdrawn during the study; therefore, the ethical and practical problems of removing support for GAE pronunciation were eliminated (Poling et al., 1995).

Variables

Independent variables (input). The study variables demonstrated whether speech entrainment was an effective technique to use in accent modification. It was expected that the use of speech entrainment would increase speech intelligibility and decrease the perception of accentedness. The rate of speech should not be affected by the use of speech entrainment because the expectation was that the rate remained the same throughout the study.

Independent variables: Experimental.

Use of speech entrainment. Speech entrainment was the technique applied in each session. Entrainment capitalizes on the brain and body's ability to synchronize to the environment and is accomplished in a three-step process. First, the participant's clinician said the targeted word/sentence; second, the word/sentence was said in unison; and third, the participant said the word/sentence aloud, while the clinician modeled the word/sentence without sound (i.e., mouthing). Targeted words or sentences were used as stimuli and were based on the participant's goals in training. The goals were developed from the evaluation results and with the participant's input. The stimuli were presented from lists of words or sentences; however, the focus was on the interaction between the participant and clinician, rather than the written stimuli. Further intervention components were provided in Table 7.

Independent variables: Predictors.

Background of the participant. The background information of the participant is fixed information that does not change. It was desirable to have varied and diverse backgrounds to show a generalization of results to different individuals seeking accent modification. The background of a participant was comprised of the following variables:

- age of acquisition of English,
- first language (L1),
- exposure to and use of English,
- prior participation in accent modification, and
- age, and gender.

Commitment to practice outside of the session. Participants documented home practice for 15 minutes, twice a week. More or less practice may have an impact on the results of the study.

Feedback and praise. Regularly providing verbal feedback and praise were provided as it is an inherent part of teaching.

Independent variables: Other. The two remaining independent variables were training techniques used only in the initial session:

- phonetic placement cues with or without anatomy and physiology illustrations and
- auditory perception and discrimination tasks.

Since pronunciation requires changes in either placement of articulators, the manner of production, or voicing changes, it was helpful to initiate training by reviewing anatomy and physiology and the impact these have on the auditory perception of speech. Examples of placement, manner, and voice cues are as follows, respectively: tongue touches alveolar ridge (placement); tongue constricts airflow to produce /s/ (manner); vocal folds vibrate for /g/ but not for /k/ (voice).

Independent variable fidelity. All graduate student clinicians participated in a clinic orientation. The graduate student clinicians with participants received additional training sessions with the supervising speech-language pathologist. The training included information about the background and implementation of speech entrainment. Fridricksson's study (2012), as well as his TedTalk on the topic, were shared. The technique was taught and practiced until perfected, and a visual aid was provided to use during sessions. As with other clinicians, clinic plans and documentation were approved by the supervising speech-language pathologist.

Sessions were supervised nearly 100%, which exceeded the 25% requirement. Audio recordings of the authentic conversational samples were uploaded into a password protected folder and for the second-rater to access.

Dependent variables (outcomes). The participant's pronunciation was analyzed to reveal outcomes. The dependent variables, perception of accentedness, speech intelligibility, and the rate of speech, were measured from recorded samples of spontaneous speech in training sessions.

The recordings of one hundred words of the participants' spontaneous speech were analyzed after each session by graduate student clinicians participating in the study. Separately, a second listener rated participants' speech productions from the same recordings. The analysis consisted of listening to and marking words that were not understood (i.e., unintelligible) and words that were not produced with GAE, which may include differences in rate, rhythm, or intonation. This detailed analysis guided future focus in sessions.

Inter-rater Agreement

Measuring performance from a conversational speech sample is valid because it closely represented how the individual speaks in conversation outside of the session. The measurement uses authentic, spontaneous speech so that the results are easily generalized to everyday speech. Additionally, accurately and consistently assessing the participants' performance contributes to reliability. Inter-rater agreement was accomplished through analysis of speech clinician training. First, graduate student clinicians were taught to transcribe speech using the International Phonetic Alphabet (IPA); thus, differences in phoneme production are easily detected. This skill is the outcome of the course in

phonetics, which is a required undergraduate course for graduate clinicians. During the analysis of speech clinician training the clinicians and researcher achieved an accentedness agreement of .90 and an intelligibility agreement of .97. Specific training related to teaching adult English-language learners was completed during clinic orientation. Additionally, guidance was provided to clinicians as they worked under the supervision of a licensed and certified speech-language pathologist.

Reliability

Data reliability was assessed for each participant. A second-rater judged fifteen percent of the authentic conversational speech samples. The second-rater analyzed approximately one sample per phase. The second rater was a more experienced graduate student who also completed the analysis of speech clinician training. The second rater judged audio recordings after the study in the span of a few days. The frequency of agreement was calculated by dividing the lower result by the higher result from the same sample. Table 6 shows that the mean agreement was .69 for an agreement of accentedness and .99 for an agreement of intelligibility.

Table 6

Overall Rater Agreement Averages

Phase	Accentedness Agreement	Intelligibility Agreement
Baseline	.72	.99
Phase I	.82	.99
Phase II	.63	.98
Phase III	.57	.98
Total	.69	.99

Note. The averages of agreement between the participants' clinicians and the second-rater for accentedness and intelligibility are provided by phase.

As shown in Table 6, a trend was noted as the second-rater tended to agree less with the participants' clinicians as the study progressed. The agreement of the participants' intelligibility during the authentic speech sample was high, indicating that both the participant's clinician and the second-rater understood what was said. The agreement of the participants' accentedness during the authentic speech samples was less, indicating that the participant's clinician and the second-rater had different perceptions of speech. In other words, the determination of whether a participant's authentically spoken word differed in pronunciation compared to GAE was, at times, questionable. Preferably, an agreement of .8 to .9 would have been ideal because it accounts for a small margin of error (Kazdin, 2011). The decreased agreement indicated differences in perception of the participant's accent.

A factor that could have impacted the frequency of agreement of accentedness was familiarity. The participants' clinicians, over 12 weeks, became familiar with the participants' speaking style. Browne's (2016) data from a study comparing raters' accent-familiarity levels on pronunciation scores revealed that the level of familiarity increased pronunciation score leniency. Exposure to an accent positively affects listeners' processing and increases intelligibility (Browne, 2016). Consistent with Browne's study results, it may be plausible that the graduate student clinicians' ratings of the participants' accentedness and intelligibility levels were better because they became familiar with the accent. The second rater, who judged the participants' performance in a week, did not have the same familiarity that the clinicians gained during the 12-week study.

Goals

Individual goals were determined from an evaluation, which was completed before beginning training. To verify that the goals were still relevant and appropriate, baseline testing was completed in the first week of training. Targeting the short-term goals impacts the overall performance represented in the long-term objective. Examples of long and short-term goals are depicted in Figure 11.

The overall long-term objective and the reason that individuals seek accent modification training is to produce GAE. There are two components of this overarching goal: (a) increase intelligible speech and (b) decrease foreign accent when speaking. In other words, the goal is to work towards using "newscaster" speech so that audiences perceive the individual's speech with ease.

Long Term Goal	**The client will produce speech consistent with General American English speech sounds and patterns. (increase intelligible speech, decrease accented speech)**
Short Term Goals	1) The client will produce the voiceless /th/ sound in isolation and in consonant-vowel-consonant-vowel (CVCV) words with 80% accuracy. 2) The client will produce consonants in the final position of words or words in simple sentences with 80% accuracy. 3) The client will repeat appropriate lexical stress in spoken language consistent with General American English in words or simple sentences with 80% accuracy.

Figure 11. Sample long term and short term goals. The goals are for an individual seeking accent modification services and may be adjusted to meet the overarching reason that the individual requested services. More short term goals may be added based on the individual's performance during the evaluation.

Typical Session

Based on individual need, recommendations are made regarding training dosage. It is common for clients to participate in training twice a week for one hour each session. A routine is established in the session. A plan for a typical accent modification session is shown in Table 7.

Table 7

Sample Session Plan

Time	Procedures, activities, materials
1:00 – 1:05 pm	At the beginning of each session, home practice is discussed, and minutes of practice are recorded.
1:05 – 1:10 pm	A conversational speech sample is collected. The recording is analyzed at a later time for speech accentedness, intelligibility, and rate of speech.
1:10 – 1:25 pm	Goal 1 is targeted. Material to elicit the voiceless /th/ sound will be used at the word level. Relevant words will be selected from various sources. For each word produced, the participant receives verbal feedback regarding GAE production. Any pronunciations not consistent with GAE utilize speech entrainment to elicit the voiceless /th/ sound.
1:25 – 1:40 pm	Goal 2 is targeted. Materials focused on final consonant sounds are used at the word level. Relevant words are selected from various sources. For each word produced, the participant receives verbal feedback regarding GAE production. Any pronunciations not consistent with GAE utilize speech entrainment to elicit the final consonant sound.
1:40 – 1:50 pm	Goal 3 is targeted. Material with multisyllabic words (2-syllable, 3-syllable, 4-syllable, and 5-syllable words) is used at word and sentence levels to increase the client's awareness of GAE lexical stress patterns. For each word produced, the participant receives verbal feedback regarding GAE production. Any pronunciations not consistent with GAE utilize speech entrainment to elicit GAE in multisyllabic words.
1:50 – 2:00 pm	New recordings are made for the participant's home practice. Words/sentences may be selected based on individual goals or may be requested by the participant (i.e., a word not comprehended by coworkers or a frequently produced word in an upcoming presentation). The clinician uses their phone or the participant's phone to record the home practice exercises.

Note. A lesson plan with estimated time allotment provides an example for clinicians to use when planning sessions. Adjustments to the routine may be made to accommodate for the participant's pronunciation needs. Progress towards goals will be discussed periodically.

Outside of spontaneous speech data collection, each session was comprised of two components: verbal feedback and use of speech entrainment. Graduate student clinicians were trained to use speech entrainment by viewing a video of speech entrainment used with individuals with motor speech disorders, and then the clinicians practiced implementation with the speech-language pathologist until perfected. A visual of the three steps was used in sessions to remind the participants of the technique. The use of speech entrainment and verbal feedback are described in Table 8.

Table 8

Speech Entrainment and Verbal Feedback in Accent Modification

Speech entrainment
Entrainment occurs when brains and bodies synchronize as a result of auditory and motor systems coupling. Speech entrainment requires three steps: 1. Say the word or sentence. Ensure that the participant sees the modeled mouth movement and hears the auditory model produced. 2. Say the stimuli together, in unison. 3. Mouth the word or sentence while the participant produces the word or sentence. Ensure that the participant sees the modeled mouth movement. No sound should be produced.
Verbal feedback
Verbal feedback was provided to increase the participant's performance. Labeling what is pronounced as GAE was helpful and alerted the participant of pronunciations that were not consistent with GAE. For example, the clinician may say, "Awesome, your *r* sound was right on!" or "The way you stressed that part of the word is exactly the way a native-speaker says it—wow!" A clinician may also say, "Oh, the end of the word was missing," or "the *th* sound came out like a *d* sound." Feedback was individualized for each participant as the participant describes his or her goals and current pronunciation using certain words, which the clinician incorporated.

Note. Speech entrainment and verbal feedback were the two components that were included in each accent modification session.

12-Week Plan

A 12-week plan was developed for the clinicians to implement the study with the participants. All participants received an introduction, which reviewed articulator

placement, the manner of production, and voicing of phonemes (i.e., sounds) as well as a period of baseline testing. Table 9 shows a plan for graduate student clinicians to implement; however, changes were needed based on the participant's performance.

Table 9

Sample Semester Plan

Week	Description
Week 1: Session 1	• Verify information from the case history. Check the age of acquisition of English, intensiveness of previous accent training and English training, length of time of English immersion, or other relevant background information. • Ensure language proficiency through informal assessment and update weekly language exposure (i.e., time exposed to English versus L1). • Collect conversational speech samples.
Week 1: Session 2	• Complete informal testing by selecting 10–20 stimuli per goal at and above last reported level (i.e., if the recommendation was for /th/ in words, test 10 words and ten simple sentences). • Teach general intelligibility strategies: louder (decibel meter), slower (metronome or other), emphasis (move mouth more). • Introduce the rationale/purpose of training. Begin training by teaching phonetic placement and auditory discrimination. Show articulator placement, manner, and voicing through practice exercises. Demonstrate effects through auditory discrimination activities.
Week 2: Session 1	• Share individualized goals with the participant. • Share percentages of speech accentedness, intelligibility, the rate of speech from samples with the participant. • Begin training at the word or sentence level, based on baseline results. • Exclusively use speech entrainment to teach GAE pronunciation. • Assign 15 minutes of home practice using clinician made videos.
Week 2: Session 2	• Continue training at the word or sentence level, depending on performance. • Exclusively use speech entrainment to teach GAE pronunciation. • Assign 15 minutes of home practice using clinician made videos.
Weeks 3-12	• Continue training at the word or sentence level, depending on performance. • Exclusively use speech entrainment to teach GAE pronunciation. • Assign 15 minutes of home practice using clinician made videos. • Add phases for study.

Note. The sample 12-Week plan served as a weekly guide for the study.

Range-Bound Phases

Baseline testing completed in training (first or second session) confirmed the appropriate level of complexity to be addressed in accent modification training. The study was conducted by showing the participants the expected performance phases. At least three phases was the goal for each participant throughout the study, each with a different criterion of performance. The first phase was determined using the average performance of three prior sessions. For intelligibility, the phase was fifteen points higher than the average, and, for accentedness, the phase was fifteen points lower. From those points, a range of performance expectations was calculated with a fifteen point range or target for the participant to perform. For example, in Figure 5, if the intelligibility average was 50, then the goal range for the first phase will be 58 to 73. This set the goal range about 15 percent higher than the current performance making the criteria for change a step higher.

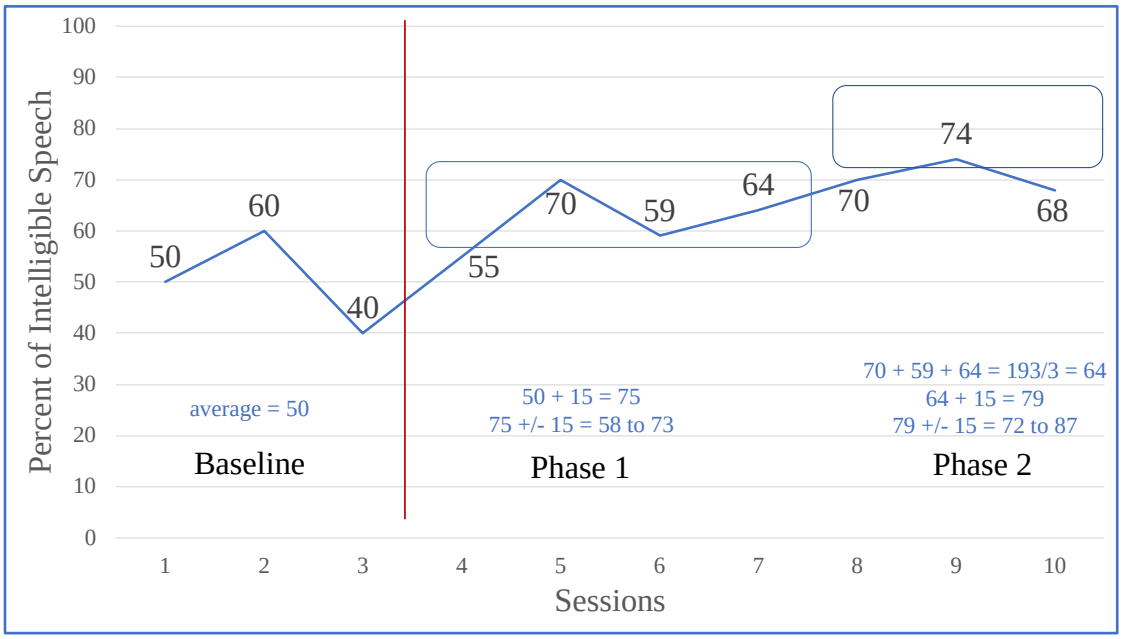

Figure 12. RBCC phase calculation. The average of the first three sessions was 50. Since more intelligible speech is desired, a 15-point increase with a range of fifteen points became the expected performance for phase 1. That is, 75 is the expectation with a range from 58 to 73. The expected range of performance for the second phase of the study was calculated based on the three performances within the first phase. The average of the scores was 64. Since more intelligible speech is desired, a 15-point increase with a range of fifteen points will become the expected performance for phase 2. That is, 79 is the expectation with a range from 72 to 87.

In addition to the phases which evaluated the overall impact of speech entrainment on spontaneous speech through measurements of accentedness, intelligibility, and rate of speech, individual goals were targeted at increasingly complex speech production levels. Auditory discrimination is a listening task, and as such speech entrainment, a speech production technique, cannot be applied. Participants must have mastered skills in these levels before speech entrainment can be used. Next, in the hierarchy are words, then sentences. The skills are in increasingly complex levels beginning with consonant-vowel words (e.g., *key*), to a consonant-vowel-consonant (e.g., *cat*). At the next higher level are multisyllabic words (e.g., *chalkboard, television*). After mastery at the multisyllabic level, carrier phrases may be targeted. A carrier phrase

begins with the same words but changes one part of the phrase (e.g., *I know that man*; *I know that location*; *I know that saying*). The hierarchy continues to include simple sentences, complex sentences, and lastly, reading passages. Conversational speech cannot be addressed in the study because speech entrainment cannot be applied to spontaneous speech; however, pronunciation at lower levels may likely generalize to higher levels of complexity. Figure 13 is a chart showing the different levels of complexity in order.

<table>
<tr><td></td><td>Baseline</td><td>Progress</td><td>Baseline</td><td>Progress</td><td>Baseline</td><td>Progress</td><td></td></tr>
<tr><td>Presentation</td><td colspan="6" rowspan="2">Speech entrainment cannot be implemented at these levels.</td><td>10</td></tr>
<tr><td>Conversation</td><td>9</td></tr>
<tr><td>Reading passage</td><td></td><td></td><td></td><td></td><td></td><td></td><td>8</td></tr>
<tr><td>Complex sentence</td><td></td><td></td><td></td><td></td><td></td><td></td><td>7</td></tr>
<tr><td>Simple sentence</td><td></td><td></td><td></td><td></td><td></td><td></td><td>6</td></tr>
<tr><td>Carrier phrase</td><td></td><td></td><td></td><td></td><td></td><td></td><td>5</td></tr>
<tr><td>Multisyllabic word</td><td></td><td></td><td></td><td></td><td></td><td></td><td>4</td></tr>
<tr><td>CV / CVC</td><td></td><td></td><td></td><td></td><td></td><td></td><td>3</td></tr>
<tr><td>Sound</td><td colspan="6" rowspan="2">Speech entrainment cannot be implemented at these levels.</td><td>2</td></tr>
<tr><td>Auditory discrimination</td><td>1</td></tr>
<tr><td></td><td colspan="2">Goal 1</td><td colspan="2">Goal 2</td><td colspan="2">Goal 3</td><td></td></tr>
</table>

Figure 13. Hierarchy of speech production. This illustration shows the levels of complexity of speech production. Isolated speech sounds are easier to produce than sounds in conversational speech. Conversely, presenting information using GAE is more difficult than saying multisyllabic words using GAE. Speech using consonant-vowel (CV) or consonant-vowel-consonant (CVC) combinations, multisyllabic words, or words in phrases, sentences, and reading passages were used as stimuli in the study because these levels could be produced in unison with another speaker. Discriminating sounds (i.e., selecting which sound was heard) and producing sounds (i.e., saying the /s/ sound) are foundational skills which must be mastered before participating in the study. Speech entrainment is not possible in conversational speech and speech during presentations.

Data Analysis

Analysis of the change in performances of spontaneous speech productions was measured before and after phases of training, providing evidence of the effectiveness of the entrainment technique. The analysis measured intelligibility and the amount of accent (i.e., GAE pronunciation) in the participant's speech. Measurement consisted of judging the recorded spontaneous speech samples, then calculating the percent accuracy for accentedness and for intelligibility. Measurements were collected each session and graphed with dashed vertical lines separating the two conditions (i.e., baseline and training) and each subphase (i.e., performance expectation). For example, in Phase 1, participants were expected to perform between 45%–60% accuracy on accentedness, followed by Phase 2, where the performance expectation on accentedness is 30%–45%. (Accentedness is the amount of foreign accent detected in spontaneous speech, and as such, a low percentage is desired.) The same type of organization was used for intelligibility measures.

A minimum of three phases was projected for each participant. Performance expectations were dependent on baseline measures and confirmed the effectiveness of entrainment by improving pronunciation by approximately 15% each phase. For example, if the participant's baseline for accentedness is 80%, the performance expectation is 60%, with a range of 55%–70%. A difference of 15% for each phase is aggressive as compared to the measurement of clients enrolled in accent modification; nevertheless, a change of this degree confirms the effectiveness of entrainment. Measurement outcomes determined the length of phases.

Separately, the rate of speech was calculated by timing a portion of the speech sample and counting the number of words produced during that time. When one speaks using a typical rate of speech (i.e., 140–160 words per minute), the measurements of accentedness and intelligibility are valid because overly fast or slow productions do not influence them. The rate of speech was monitored and graphed. A consistent rate of speech can contribute to differences in accentedness and intelligibility; therefore, a stable rate of speech was desired. If participants produced a rate of speech that was not consistent, verbal or visual cues were provided to remind the participant to speak more slowly or to speak more quickly. Visual aids, such as a picture of a tortoise or a rabbit, were useful as subtle reminders during conversational speech practice.

Ethics and Human Relations

Researchers are obligated to inform participants of the study's purpose, duration, and procedures. Because the training that was applied in the study is different than what would typically be used, approval by the Institutional Review Board (IRB) was necessary. Participation in the study did not pose any health risks; however, it was possible that the technique did not work or did not work as effectively as it does with disordered speech. Whether it succeeded or not, the participant received feedback about speech productions as well as home practice exercises.

Clients enrolled in accent modification training at the University Speech-Language-Hearing Clinic were selected for the study. Those individuals who met the study requirements were approached for voluntary enrollment as participants. The fees typically applied were waived since the training provided in the study was not (yet)

evidence-based for individuals with a speech difference. At the beginning of the study, evidence was only provided for individuals with a motor speech disorder.

Chapter IV

Results

The following chapter provides an analysis of the results of a study examining the effects of speech entrainment in accent modification. Data was collected from the participants' performance in twice-weekly, hour-long sessions over 12 weeks using a single-subject experimental design with a range-bound changing criterion. In particular, the effects of speech entrainment on accentedness, rate of speech, and intelligibility were analyzed. The outcomes were described using graphs to represent outcomes across phases, means, and standard deviations by phases, and a multivariate test to identify any significant differences by phase. The following were the research questions that guided the study:

Questions

1. What is the effect of speech entrainment on accentedness of advanced English-language learners seeking accent modification training?
2. What is the effect of speech entrainment on the intelligibility of advanced English-language learners seeking accent modification training?
3. What is the rate of speech of advanced English-language learners seeking accent modification training?

Procedures

Upon receiving approval from the institutional review board and written consent, five participants were enrolled in the study. The comprehensive evaluations of their accentedness, rate of speech, intelligibility, and speaking needs were used to develop

individual goals in accent training. Four participants attended 24 sessions, approximately an hour, twice a week. One participant attended 12 sessions due to work travel schedule.

Five adult English language learners who sought accent modification services participated in the study where speech entrainment was used to train GAE pronunciation. Performance expectations were adjusted using the participant's results according to the range-bound changing criterion design. Each participant met or made progress on their individual short-term goals using speech entrainment. Results were gathered from authentic conversational speech samples, even though the technique was used to train word and sentence productions. The trained graduate student clinician judged the samples, which were collected during each session, and the researcher compiled the data into a graph depicting the changing criterion within a reasonable range. Results of accentedness, rate of speech, and intelligibility are presented in the tables below in the section describing individual participant results.

Table 10

Participants' Background Information and Evaluation Results

Name (age) L1 Age of Arrival Age of Acquisition	English Use and Exposure	Previous Training	Evaluation Results
Linh (25) Vietnamese 23 years old 6 years old	60% English	3 previous semesters	Moderate difficulty producing GAE
Lucia (40) Spanish 38 years old 4 years old	60% English	No previous training	Moderate difficulty producing GAE
MinJoo (41) Korean 36 years old 28 years old	10% English	No previous training	Mild difficulty producing GAE
Raj (34) Hindi 22 years old 6 years old	90% English	No previous training	Mild difficulty producing GAE
Trang (26) Vietnamese 24 years old 14 years old	60% English	3 previous semesters	Moderate difficulty producing GAE

Note. Demographic information of the participants shows their pseudonym, age, native language (L1), age of arrival to the United States, the age that they reported acquiring English, weekly English use and exposure, previous participation in accent modification training, and their initial evaluation results.

General Linear Model

A General Linear Model multivariate test was computed to determine any differences in accentedness, rate of speech, and intelligibility across the four phases of the intervention for all participants. Overall, a significant difference was identified by

phase using Wilks' Lamda as the multivariate criterion (F = 5.094; $df_{9,248.392}$; p = 0.000; partial eta squared = 0.128). Tests of between-subjects effects by phase determined that overall, accentedness (F = 11.116; df_3; p = 0.000; partial eta squared = 0.243) and intelligibility (F = 8.953; df_3; p = 0.000; partial eta squared = 0.205) were significantly different by phase when tested separately. The means and standard deviations for each phase are provided in Table 4.

Tukey B post hoc follow-up tests (see Table 11) identified that baseline, and phase one had significantly higher accentedness than did phases two and three. Across all five participants, accentedness was lower at the end of training than it had been before training. Post hoc follow-up tests (see Table 12) identified that baseline and phase one had significantly lower intelligibility than did phases two and three. Across all five participants, intelligibility was higher at the end of training than it had been before training using speech entrainment.

Table 11

Overall Accentedness Using Tukey B's Statistical Test

		Subset	
Phase	N	1	2
1 Baseline	19	32.11%	
2 Training	39	30.21%	
3 Training	38		16.87%
4 Training	12		16.58%

Note. Post Hoc analyses of the differences in accentedness showed that baseline and phase one of the training scores were higher (i.e., more accented) than phases three and four of training.

Table 12

Overall Intelligibility Using Tukey B's Statistical Test

		Subset		
Phase	N	1	2	3
1 Baseline	19	95.47%		
2 Training	39	97.08%	97.08%	
3 Training	38		98.39%	98.39%
4 Training	12			99.75%

Note. Post Hoc analyses of the differences in intelligibility showed that baseline and phase one of the training scores were slightly lower (i.e., less intelligible) than phase three or four of training.

Overall, the average percent of **perceived accented speech** at baseline was 32%. This means that in a 100-word authentic conversational speech sample, an accent other than GAE was detected in 32 words. Initial training with speech entrainment was applied, and the percent of perceived accented speech decreased to 30%. As the training continued into the next phases, the percent of perceived accented speech decreased further to 16%.

The average **rate of speech** at baseline was 140 words per minute. From a 100-word authentic conversational speech sample, a calculation was completed to determine the number of words spoken in one minute. Initial training with speech entrainment was applied, and the words per minute increased to 153. The training continued, and words per minute rose to 163. The last phase of training showed that the rate balanced, returning to 153 words per minute. A typical rate of speech for native English speakers ranges from 150 to 250 words per minute and is contingent on the cognitive load that the

speaker is engaged when conversing (Yorkston, 2010). When the training was applied, the participant's rate of speech increased to a typical rate of speech.

The average percent of **intelligible speech** at baseline was 95%. This means that in a 100-word authentic conversational speech sample, only five words were not understood by the examiner. Initial training with speech entrainment was applied, and the percent intelligible speech increased slightly to 97%. As the training continued into the next phases, the percent of perceived intelligible speech increased so that all of the conversational samples were understood.

Overall, the perception of accented speech decreased, the rate of speech increased slightly into a typical range, and intelligible speech increased slightly.

Table 13

Overall Means for Accentedness, Rate of Speech and Intelligibility by Phase

Phase		Accentedness	Rate of Speech	Intelligibility
1 Baseline	Mean	32.11%	140.63 wpm	95.47%
	N	19	19	19
	Std. Deviation	11.54	42.88	3.85
2 Training	Mean	30.21%	152.87 wpm	97.08%
	N	39	39	39
	Std. Deviation	16.48	40.11	2.86
3 Training	Mean	16.87%	168.76 wpm	98.39%
	N	38	38	38
	Std. Deviation	9.83	42.80	1.65
4 Training	Mean	16.58%	153.25 wpm	99.75%
	N	12	12	12
	Std. Deviation	5.47	15.30	.45

Note. The overall means include five participants' data to show the effect of speech entrainment in accent modification. Accentedness and intelligibility percentages are provided as well as the rate of speech in the number of words per minute (wpm).

Visual inspection of the participants' data provided information about the patterns observed in the study. Kratochwill et al. (2014) provided steps for visual analysis of single-subject data. In line with their suggestions, viewing the baseline data in comparison to the phases of training showed differences in performance level. The trends observed in each participant's results confirm the differences in performance between baseline and training phases. Variable performances, as expected when assessing pronunciation from authentic speech samples, were noted; thus, reliance on overall performance trends provided more specific information about positive pronunciation changes. The immediacy of effect was not apparent, but also not necessarily expected, especially when the participants were learning to change a well-engrained speaking habit.

Individual Participant Results

The next component of these analyses presents each of the five participants separately. Initially, participant demographics and language skills are discussed, followed by averages and a graph illustrating each participant's overall performance during the study.

Linh. Linh, a 25-year-old female, sought accent modification because she was interested in improving her English skills in order to improve her confidence during conversation and daily life, as well as to communicate with her professors. She sought an accent evaluation in 2017.

Linh was born and raised in Vietnam, and her first language is Vietnamese. Linh reported acquiring English at the age of 6 through twice-weekly, 90-minute sessions with a teacher who used accented English. The emphasis in class was on reading, writing, and

listening. She received minimal instruction in speaking English. At the time of the evaluation, she had been living in the United States for one year and was immersed in English at her job on-campus but spoke Vietnamese at home with her roommates. At the time of the study, she reported having been immersed in English for three years. She spoke or heard English, approximately 60% of the time (i.e., when working). Approximately 40% of the time, she spoke Vietnamese in her community. Participation in the study was her fourth semester of accent modification. Speech entrainment was not used in previous training.

Linh's performance during the evaluation showed that she had moderate difficulty with accentedness and intelligibility, with more notable difficulties with word-level intonation, contrastive lexical stress, GAE vowel production, and consonant cluster pronunciation.

In the study, Linh participated in accent modification twice a week for one-hour sessions. She completed 24 sessions and 4 phases (i.e., baseline, phase I, phase II, phase III).

Initial analyses included a General Linear Model multivariate test that was computed to determine Linh's differences in accentedness, rate of speech, and intelligibility across the four phases of the training. Overall, a significant difference was identified by phase using Wilks' Lamda as the multivariate criterion ($F = 5.079$; $df_{9,43.958}$; $p = 0.000$; partial eta squared = .439). Tests of between-subjects effects by phase determined that Linh's accentedness ($F = 10.554$; df_3; $p = 0.000$; partial eta squared = .613) and intelligibility ($F = 8.619$; df_3; $p = 0.001$; partial eta squared = .564) were significantly different by phase when tested separately. The means and standard

deviations for each phase of Linh's performance are provided in Table 14 and demonstrate her changes in performance by phase.

Table 14

Linh's Means

Phase		Accentedness	Rate of Speech	Intelligibility
1 Baseline	Mean	33.25%	113.50 wpm	94.50%
	N	4	4	4
	Std. Deviation	5.56	18.65	1.92
2 Training	Mean	36.25%	133.63 wpm	98.13%
	N	8	8	8
	Std. Deviation	14.83	13.52	1.55
3 Training	Mean	16.25%	148.75 wpm	98.25%
	N	4	4	4
	Std. Deviation	5.56	8.54	2.87
4 Training	Mean	13.00%	153.75 wpm	99.63%
	N	8	8	8
	Std. Deviation	.93	13.89	.52

Note. The means for Linh show her performance in each phase and the effect of speech entrainment in accent modification.

Tukey B post hoc follow-up tests (see Table 15) identified that baseline and phase one had significantly higher accentedness than did phases two and three. Linh's accentedness was lower at the end of training than it was before training. Post hoc follow-up tests (see Table 16) identified that the baseline had slightly lower intelligibility than the training phases. Linh's intelligibility was higher at the end of training that it had been before training using speech entrainment.

Table 15

Linh's Accentedness Using Tukey B's Statistical Test

			Subset	
	Phase	N	1	2
1	Baseline	4		33.25%
2	Training	8		36.25%
3	Training	4	16.25%	
4	Training	8	13.00%	

Note. Post Hoc analyses of the differences in Linh's accentedness showed that baseline and phase one of the training scores were higher (i.e., more accented) than phases three and four of training. Linh's accentedness ratings decreased (i.e., improved) during training with speech entrainment.

Table 16

Linh's Intelligibility Using Tukey B's Statistical Test

			Subset	
	Phase	N	1	2
1	Baseline	4	94.50%	
2	Training	8		98.13%
3	Training	4		98.25%
4	Training	8		99.63%

Note. Post Hoc analyses of the differences in Linh's intelligibility showed that baseline scores were slightly lower (i.e., less intelligible) than the training phases of training. Linh's intelligibility rating increased (i.e., improved) during training with speech entrainment.

The subsequent analyses involved a graphic representation of the data across time within the four phases. Each session's data from Linh's authentic speech samples is depicted in Figure 14. Linh's accentedness ratings are shown in the middle and bottom

portions of the graph. When training began, Linh's perceived accented speech increased (i.e., became worse) likely due to learning how to change her pronunciation using speech entrainment. As training continued, the amount of perceived accented speech decreased (i.e., improved). Intelligibility ratings are shown on the top of the graph. Her intelligibility was high, at or near 100% each session. The rate of speech data is shown in the middle to top portions of the graph. Over time, Linh's rate of speech was calculated to be faster and in the typical speaking range. Trendlines for Linh's outcomes show a decrease in perceived accented speech, a slight increase in intelligible speech, and an increase in her rate of speech.

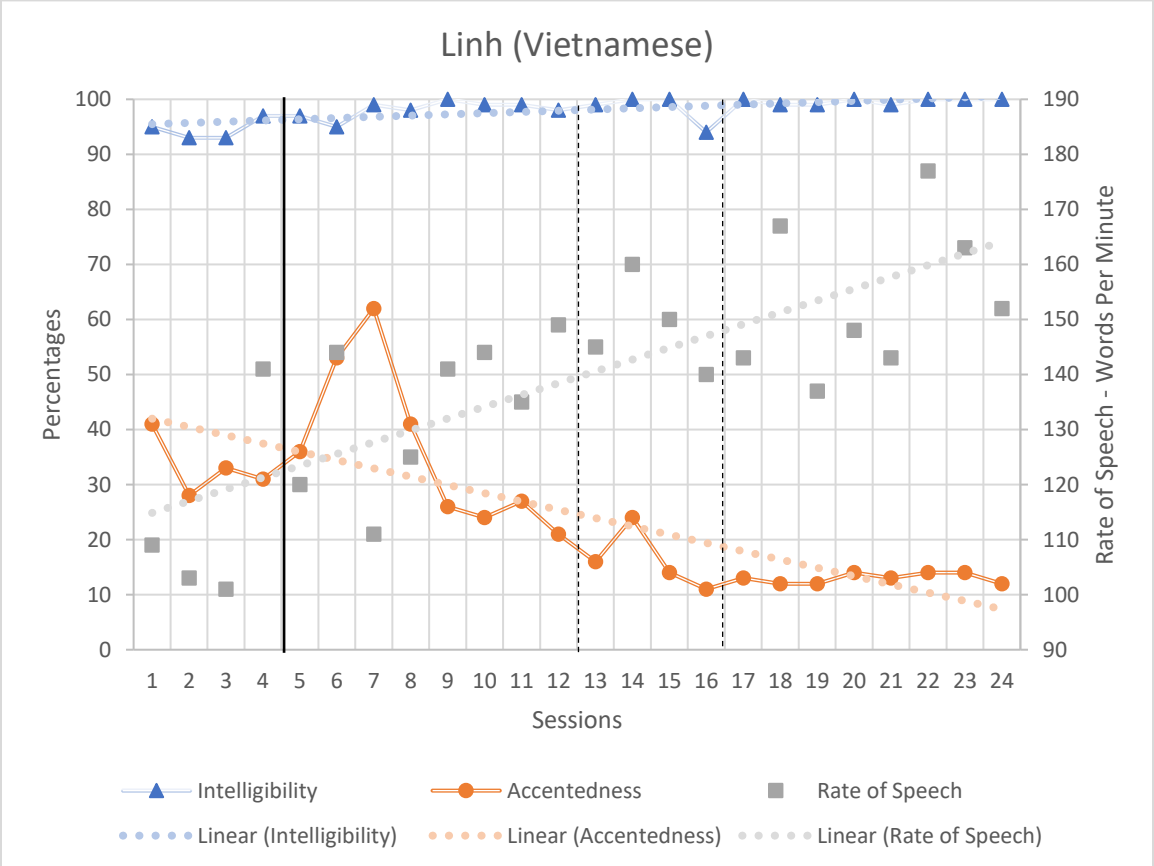

Figure 14. Linh's performance in accent modification with speech entrainment. Linh's performance for each session is plotted, and trendlines show the outcomes of her performance over time.

Lucia. Lucia, a 40-year-old female, sought accent modification in the clinic because she was interested in modifying her accent and improving her overall skills while speaking English for her future professional aspirations. Additionally, Lucia wanted to address her rapid rate of speech in English and Spanish, and she wanted to expand her lexicon with English vocabulary. Lucia indicated that she had some difficulties with others understanding her in conversation. She sought an accent evaluation in 2018.

Lucia is from Pamplona, Spain, and moved to the United States in 2016. Her native language is Spanish. Lucia reported acquiring English at the age of 4 through a bilingual education program where she was taught half-day in English and half-day in Spanish. The majority of Lucia's formal English training occurred in grade school, but primarily focused on grammar, not conversational speaking. At the time of the evaluation, she lived in the United States for two years and was immersed in English while at school as a full-time student. She spoke Spanish at home with her family and friends. Lucia did not receive previous accent modification training.

Lucia's performance during the evaluation showed that she had moderate difficulty producing GAE. She had some difficulty with intelligibility due to accentedness, contrasting sentence pairs, contrastive lexical stress, and vowels in words.

In the study, Lucia participated in accent modification twice a week for one-hour sessions. She completed 24 sessions and 3 phases (i.e., baseline, phase I, phase II).

A General Linear Model multivariate test was computed to determine Lucia's differences in accentedness, rate of speech, and intelligibility across the three phases of the training. Overall, a significant difference was identified by phase using Wilks' Lamda as the multivariate criterion ($F = 7.818$; $df_{6,38.000}$; $p = 0.000$; partial eta squared =

0.552). Tests of between-subjects effects by phase determined that Lucia's accentedness (F = 16.358; df_3; p = 0.000; partial eta squared = 0.609) was significantly different by phase when tested separately; however, Lucia's intelligibility (F = 0.818; df_3; p = 0.455; partial eta squared = 0.072) was not significantly different by phase because it was already very high or intelligible. The means and standard deviations for each phase of Lucia's performance are provided in Table 17 and demonstrate her changes in performance by phase.

Table 17

Lucia's Means

Phase		Accentedness	Rate of Speech	Intelligibility
1 Baseline	Mean	21.33%	102.33 wpm	99.67%
	N	3	3	3
	Std. Deviation	4.04	1.53	.58
2 Training	Mean	15.70%	155.40 wpm	99.50%
	N	10	10	10
	Std. Deviation	6.26	20.34	.71
3 Training	Mean	7.45%	161.82 wpm	99.82%
	N	11	11	11
	Std. Deviation	1.04	16.09	.41

Note. The means for Lucia show her performance in each phase and the effect of speech entrainment in accent modification.

Tukey B post hoc follow-up tests (see Table 18) identified that baseline and phase one had significantly higher accentedness than did phase two. Lucia's accentedness was lower at the end of training than it was before or during the first phase of training. Post hoc follow-up tests (see Table 19) identified that baseline and training phases were stable. Lucia's intelligibility remained high during training using speech entrainment.

Table 18

Lucia's Accentedness Using Tukey B's Statistical Test

		Subset	
Phase	N	1	2
1 Baseline	3		21.33%
2 Training	10		15.70%
3 Training	11	7.45%	

Note. Post Hoc analyses of the differences in Lucia's accentedness showed that baseline and phase one of the training scores were higher (i.e., more accented) than phase three of training. Lucia's accentedness ratings decreased (i.e., improved) during training with speech entrainment.

Table 19

Lucia's Intelligibility Using Tukey B's Statistical Test

		Subset
Phase	N	1
1 Baseline	3	99.67%
2 Training	10	99.50%
3 Training	11	99.82%

Note. Post Hoc analyses of the differences in Lucia's intelligibility showed that baseline scores were as high as the training phases of training. Lucia's intelligibility rating was maintained at a very high percentage during training with speech entrainment.

The subsequent analyses involved a graphic representation of the data across time within the three phases. Each sessions' data from Lucia's authentic speech samples is depicted in Figure 15. Lucia's accentedness ratings are shown in the bottom portion of the graph. When training began, Lucia's perceived accented speech decreased (i.e., improved). Intelligibility ratings are shown on the top of the graph. Her intelligibility was high, at or very close to 100% each session. The rate of speech data is shown in the

middle to top portions of the graph. Over time, Lucia's rate of speech was calculated to be faster and in the typical speaking range. Trendlines for Lucia's outcomes show a decrease in perceived accented speech, stable intelligible speech, and an increase in her rate of speech.

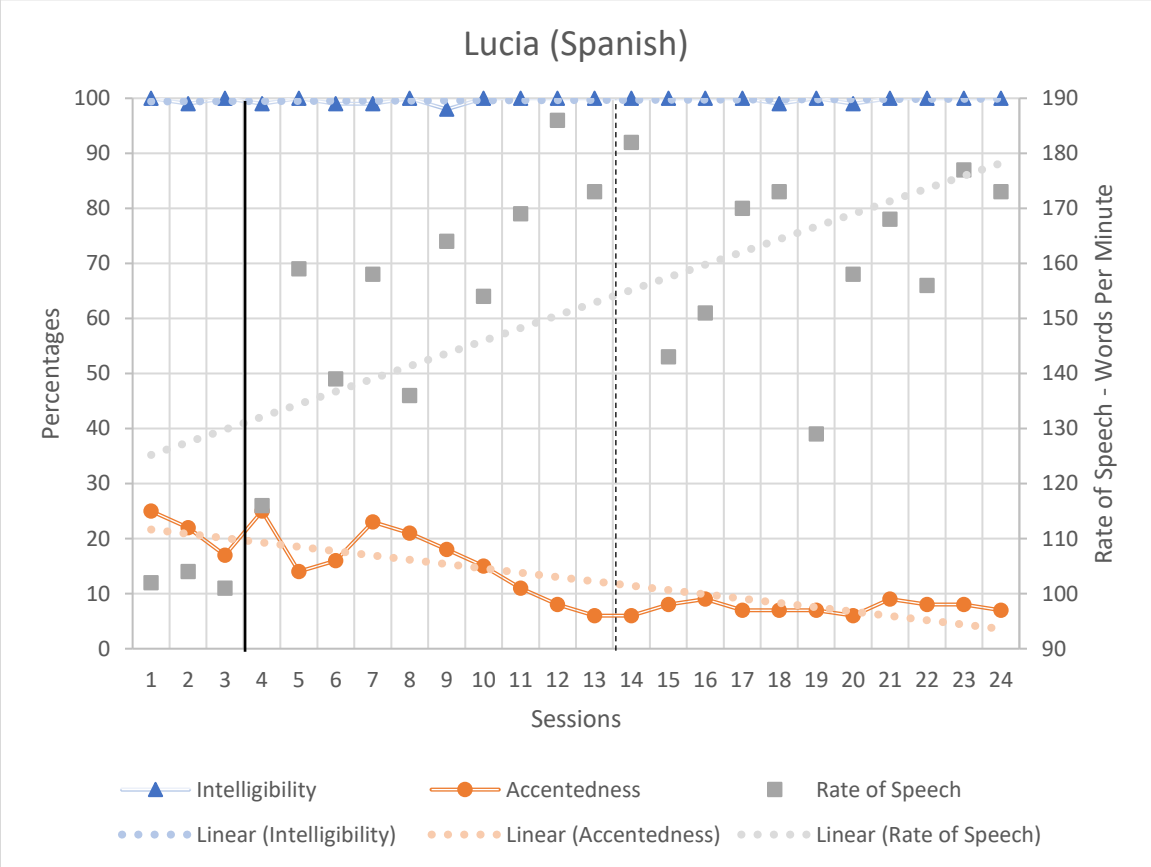

Figure 15. Lucia's performance in accent modification with speech entrainment. Lucia's performance for each session is plotted, and trendlines show the outcomes of her performance over time.

MinJoo. MinJoo, a 40-year-old female, sought accent modification in the clinic because she was interested in modifying her accent and improving her overall skills while speaking English. Specifically, she desired to sound more natural when speaking to other native English speakers in social situations. She expressed her voice sounding "unnatural" when speaking English, which makes her feel "awkward." She sought an accent evaluation in 2018.

MinJoo is from South Korea, and her first language is South Korean. MinJoo was first exposed to English in high school in Korea. She acquired English at the age of 28 while living in the United Kingdom, attending language school. The focus of her English lessons was mostly on grammar, reading, and writing. At the time of the evaluation, she had lived in the United States for five years, and was not immersed in English; however, she practiced speaking English every day. She reported watching some English television shows with subtitles. She also reported speaking English to children once a week when teaching them Korean. She moved to Europe to gain more exposure to spoken English and lived there for five years before moving to the United States. She spoke Korean at home with her husband. MinJoo did not receive previous accent modification training.

MinJoo's performance during the evaluation showed that she had mild difficulty producing GAE. She had some difficulty producing contrastive lexical stress patterns, as well as difficulty producing some consonants such as /r/, /l/, /ð/ and /w/. She also showed difficulty discriminating between certain sounds in heard words.

In the study, MinJoo participated in accent modification with speech entrainment twice a week for one-hour sessions. She completed 24 sessions and 3 phases (i.e., baseline, phase I, phase II).

A General Linear Model multivariate test was computed to determine MinJoo's differences in accentedness, rate of speech, and intelligibility across the four phases of the training. Overall, a significant difference was identified by phase using Wilks' Lamda as the multivariate criterion (F = 8.000; $df_{6,38.000}$; p = 0.000; partial eta squared = 0.558). Tests of between-subjects effects by phase determined that MinJoo's

accentedness (F = 15.717; df_2; p= 0.000; partial eta squared = 0.599) and intelligibility (F = 9.282; df_2; p = 0.001; partial eta squared = 0.469) were significantly different by phase when tested separately. The means and standard deviations for each phase of MinJoo's performance are provided in Table 20 and demonstrate her changes in performance by phase.

Table 20

MinJoo's Means

Phase		Accentedness	Rate of Speech	Intelligibility
1 Baseline	Mean	41.20%	128.20 wpm	91.20%
	N	5	5	5
	Std. Deviation	2.78	16.60	3.70
2 Training	Mean	37.00%	141.00 wpm	95.00%
	N	7	7	7
	Std. Deviation	9.90	27.64	3.11
3 Training	Mean	24.33%	155.25 wpm	97.00%
	N	12	12	12
	Std. Deviation	4.76	18.701	1.41

Note. The means for MinJoo show her performance in each phase and the effect of speech entrainment in accent modification.

Tukey B post hoc follow-up tests (see Table 21) identified that baseline and phase one had significantly higher accentedness than did phase two. MinJoo's accentedness was lower at the end of training than it was before or during the first phase of training. Post hoc follow-up tests (see Table 22) identified that the baseline phase was lower than both training phases. MinJoo's intelligibility increased during training using speech entrainment.

Table 21

MinJoo's Accentedness Using Tukey B's Statistical Test

		Subset	
Phase	N	1	2
1 Baseline	5		41.20%
2 Training	7		37.00%
3 Training	12	24.33%	

Note. Post Hoc analyses of the differences in MinJoo's accentedness showed that baseline and phase one of the training scores were higher (i.e., more accented) than phase three of training. MinJoo's accentedness ratings decreased (i.e., improved) during training with speech entrainment.

Table 22

MinJoo's Intelligibility Using Tukey B's Statistical Test

		Subset	
Phase	N	1	2
1 Baseline	5	91.20%	
2 Training	7		95.00%
3 Training	12		97.00%

Note. Post Hoc analyses of the differences in MinJoo's intelligibility showed that baseline scores were slightly lower (i.e., less intelligible) than the training phases of training. MinJoo's intelligibility rating increased (i.e., improved) during training with speech entrainment.

The subsequent analyses involved a graphic representation of the data across time within the three phases. Each sessions' data from MinJoo's authentic speech samples is depicted in Figure 16. MinJoo's accentedness ratings are shown in the middle and bottom portions of the graph. When training began, MinJoo's perceived accented speech was variable and increased slightly (i.e., became worse) likely due to learning how to

change her pronunciation using speech entrainment. As training continued, the amount of perceived accented speech decreased (i.e., improved). Intelligibility ratings are shown on the top of the graph. Her intelligibility ratings increased (i.e., improved); however, there was only a slight increase because her intelligibility ratings were already above 85%. The rate of speech data is shown in the middle portions of the graph. MinJoo's rate of speech was variable; however, over time, her rate was calculated to be slightly faster, and in the typical speaking range. Trendlines for MinJoo's outcomes show a decrease in perceived accented speech, a slight increase in intelligible speech, and an increase in her rate of speech.

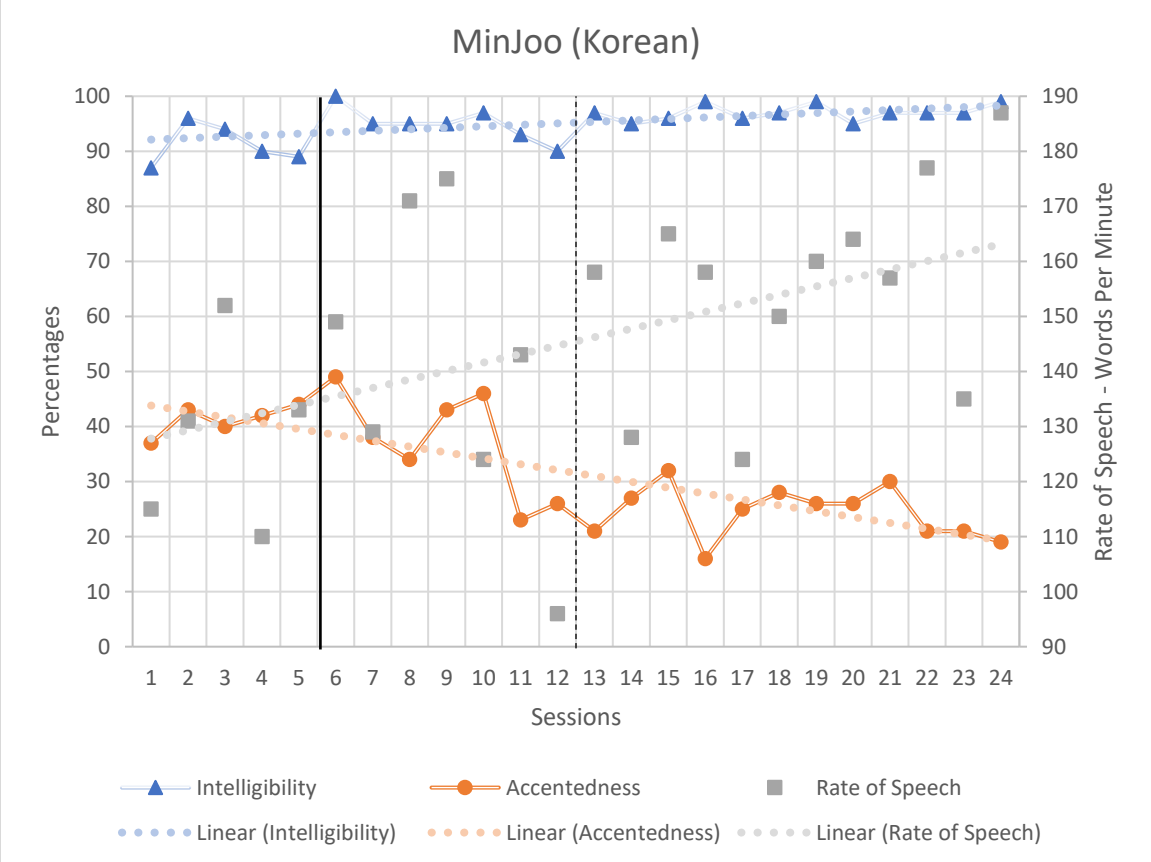

Figure 16. MinJoo's performance in accent modification with speech entrainment. MinJoo's performance for each session is plotted, and trendlines show the outcomes of her performance over time.

Raj. Raj, a 34-year-old male, sought accent modification in the clinic for personal development, clear enunciation, and articulation. Specifically, Raj stated that he wanted to work on the pronunciation of certain words that are different in an Indian accent and American accent (e.g., "bear," which is typically pronounced as "beer" in those with an Indian accent). Raj also reported that while talking to colleagues, he was sometimes asked to repeat himself, which he attributed to his rapid rate of speech. He sought an accent evaluation in 2018.

Raj is from India, and his native language is Hindi. He also reported speaking English and Bengali fluently. Raj reported acquiring English in grade school at the age of 6. Raj's classes throughout school were taught in English except for his Hindi language classes. At the time of the evaluation, he lived in the United States for about 12 years (i.e., he moved to the US in 2006) and was fully immersed in English upon arrival. At the time of the study, he reported being immersed in English while at work in a professional setting and speaking to his wife sometimes in Hindi at home. Raj did not previously participate in accent modification.

Raj's performance during the evaluation showed that he had mild difficulty producing GAE. He had some difficulty with intelligibility due to accentedness, intonation at the word level, phrasing sentences, and producing some consonants.

In the study, Raj participated in accent modification with speech entrainment approximately once a week for one-hour sessions. He completed 12 sessions and 3 phases (i.e., baseline, phase I, phase II).

A General Linear Model multivariate test was computed to determine Raj's differences in accentedness, rate of speech, and intelligibility across the three phases of

the training. Overall, a significant difference was identified by phase using Wilks' Lamda as the multivariate criterion (F = 11.778; $df_{6,14.000}$; p = 0.000; partial eta squared = 0.835). Tests of between-subjects effects by phase determined that Raj's accentedness (F = 67.848; df_2; p = 0.000; partial eta squared = 0.938) and intelligibility (F = 2.236; df_2; p = 0.163; partial eta squared = 0.332) were significantly different by phase when tested separately. The means and standard deviations for each phase of Raj's performance are provided in Table 23 and demonstrate his changes in performance by phase.

Table 23

Raj's Means

Phase		Accentedness	Rate of Speech	Intelligibility
1 Baseline	Mean	20.25%	205.50 wpm	95.75%
	N	4	4	4
	Std. Deviation	2.217	41.845	1.500
2 Training	Mean	10.50%	252.75 wpm	97.50%
	N	4	4	4
	Std. Deviation	2.517	25.118	2.380
3 Training	Mean	4.25%	279.50 wpm	98.25%
	N	4	4	4
	Std. Deviation	.500	25.736	.957

Note. The means for Raj show his performance in each phase and the effect of speech entrainment in accent modification.

Tukey B post hoc follow-up tests (see Table 24) identified that baseline, and both training phases had significantly different accentedness. Raj's accentedness was lower at the end of training than it was before or during the first phase of training. Post hoc follow-up tests (see Table 25) identified no differences in intelligibility across phases. Raj's intelligibility remained stable during the study. Raj's intelligibility remained high during training using speech entrainment.

Table 24

Raj's Accentedness Using Tukey B's Statistical Test

		Subset		
Phase	N	1	2	3
1 Baseline	4			20.25%
2 Training	4		10.50%	
3 Training	4	4.25%		

Note. Post Hoc analyses of the differences in Raj's accentedness showed that the baseline score was higher (i.e., more accented) than the training phases. Raj's accentedness ratings decreased (i.e., improved) during training with speech entrainment.

Table 25

Raj's Intelligibility Using Tukey B's Statistical Test

		Subset
Phase	N	1
1 Baseline	4	95.75%
2 Training	4	97.50%
3 Training	4	98.25%

Note. Post Hoc analyses of the differences in Raj's intelligibility showed that baseline scores were slightly lower (i.e., less intelligible) than the training phases of training. Raj's intelligibility rating increased (i.e., improved) during training with speech entrainment.

The subsequent analyses involved a graphic representation of the data across time within the three phases. Each sessions' data from Raj's authentic speech samples is depicted in Figure 17. Raj's accentedness ratings are shown on the bottom portion of the graph. When training began, Raj's perceived accented speech consistently decreased (i.e., improved). Intelligibility ratings are shown on the top of the graph. His intelligibility was high, at or near 100%, each session. The rate of speech data is shown in the middle

portion of the graph. Raj's rate of speech was variable and was calculated to be faster at the end of the study. His rate of speech was faster than typical speakers; however, consistent with Hindi speakers. He maintained high speech intelligibility despite a fast rate of speech. Trendlines for Raj's outcomes show a decrease in perceived accented speech, maintenance of highly intelligible speech, and an increase in his rate of speech.

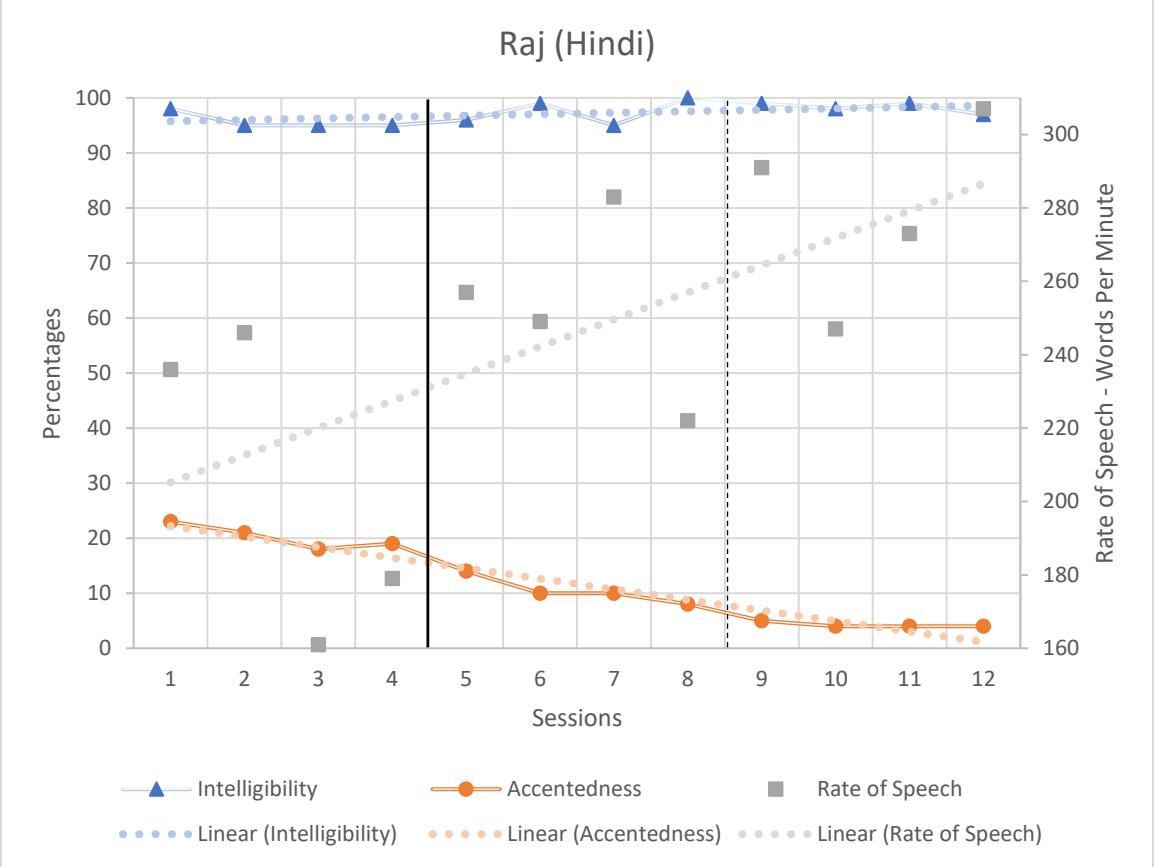

Figure 17. Raj's performance in accent modification with speech entrainment. Raj's performance for each session is plotted, and trendlines show the outcomes of his performance over time.

Trang. Trang, a 26-year-old female, sought accent modification in the clinic because she was interested in improving her English skills so that she could feel more confident speaking at work, during presentations, and in her everyday interactions with native English speakers. She also indicated difficulty with idioms and slang. She sought an accent evaluation in 2017.

Trang was born and raised in Vietnam, and her native language is Vietnamese. Trang reported acquiring English in high school at the age of 14 through daily, hour-long lessons at school. At the time of the evaluation, she lived in the United States for one year and was not fully immersed in English because she spoke Vietnamese at work sometimes. The majority of her exposure to English came from movies, videos, and music. At the time of the study, she reported speaking English 60% of the time and Vietnamese 40% of the time. Trang spoke English with her boyfriend. Participation in the study was her fourth semester of accent modification. Speech entrainment was not used in previous training.

Trang's performance during the evaluation showed that she had moderate difficulty with accentedness and intelligibility, with more notable difficulties with lexical stress and consonant cluster pronunciation.

In the study, Trang participated in accent modification twice a week for one-hour sessions. She completed 24 sessions and 4 phases (i.e., baseline, phase I, phase II, phase III).

Initial analyses included a General Linear Model multivariate test that was computed to determine Trang's differences in accentedness, rate of speech, and intelligibility across the four phases of the training. Overall, a significant difference was identified by phase using Wilks' Lamda as the multivariate criterion ($F = 3.139$; $df_{9,43.958}$; $p = 0.005$; partial eta squared = 0.331). Tests of between-subjects effects by phase determined that Trang's accentedness ($F = 4.253$; df_3; $p = 0.018$; partial eta squared = 0.389) and intelligibility ($F = 8.478$; df_3; $p = 0.001$; partial eta squared = 0.560) were significantly different by phase when tested separately. The means and standard

deviations for each phase of Linh's performance are provided in Table 17 and demonstrate her changes in performance by phase.

Table 26

Trang's Means

Phase		Accentedness	Rate of Speech	Intelligibility
1 Baseline	Mean	42.00%	149.33 wpm	99.33%
	N	3	3	3
	Std. Deviation	17.349	16.073	.577
2 Training	Mean	43.00%	134.10 wpm	95.10%
	N	10	10	10
	Std. Deviation	14.575	15.716	2.923
3 Training	Mean	26.43%	151.00 wpm	98.71%
	N	7	7	7
	Std. Deviation	7.115	24.310	.756
4 Training	Mean	23.75%	152.25 wpm	100.00%
	N	4	4	4
	Std. Deviation	2.217	20.156	.000

Note. The means for Trang show her performance in each phase and the effect of speech entrainment in accent modification.

Tukey B post hoc follow-up tests (see Table 27) identified that baseline, and phase one had significantly higher accentedness than did phases two and three. Trang's accentedness was lower at the end of training than it was before training. Post hoc follow-up tests (see Table 28) identified that the baseline had slightly lower intelligibility than the training phases. Trang's intelligibility was higher at the end of training that it had been before training using speech entrainment.

Table 27

Trang's Accentedness Using Tukey B's Statistical Test

Phase	N	Subset 1
1 Baseline	3	42.00%
2 Training	10	43.00%
3 Training	7	26.43%
4 Training	4	23.75%

Note. Post Hoc analyses of the differences in Trang's accentedness showed that baseline and phase one of the training scores were higher (i.e., more accented) than phases three and four of training. Trang's accentedness ratings decreased (i.e., improved) during training with speech entrainment.

Table 28

Trang's Intelligibility Using Tukey B's Statistical Test

Phase	N	Subset 1	2
1 Baseline	3		99.33%
2 Training	10	95.10%	
3 Training	7		98.71%
4 Training	4		100.00%

Note. Post Hoc analyses of the differences in Trang's intelligibility showed that phase one scores were slightly lower (i.e., less intelligible) than the baseline and phases three and four of training. Trang's intelligibility rating, with the slight exception in phase two, was maintained during training with speech entrainment.

The subsequent analyses involved a graphic representation of the data across time within the four phases. Each sessions' data from Trang's authentic speech samples is depicted in Figure 18. Trang's accentedness ratings are shown in the middle and bottom portions of the graph. When training began, Trang's perceived accented speech initially

decreased then increased (i.e., became worse) likely due to learning how to change her pronunciation using speech entrainment. As training continued, the amount of perceived accented speech decreased (i.e., improved). Intelligibility ratings are shown on the top of the graph. Her intelligibility was high each session, except for a couple of weeks in the first phase of when her intelligibility rating decreased coinciding with the same time as an increase in perceived accented speech. The rate of speech data is shown in the middle portions of the graph. Over time, Trang's rate of speech was calculated to be slightly faster and in the typical speaking range. Trendlines for Trang's outcomes show a decrease in perceived accented speech, a slight increase in intelligible speech, and an increase in her rate of speech.

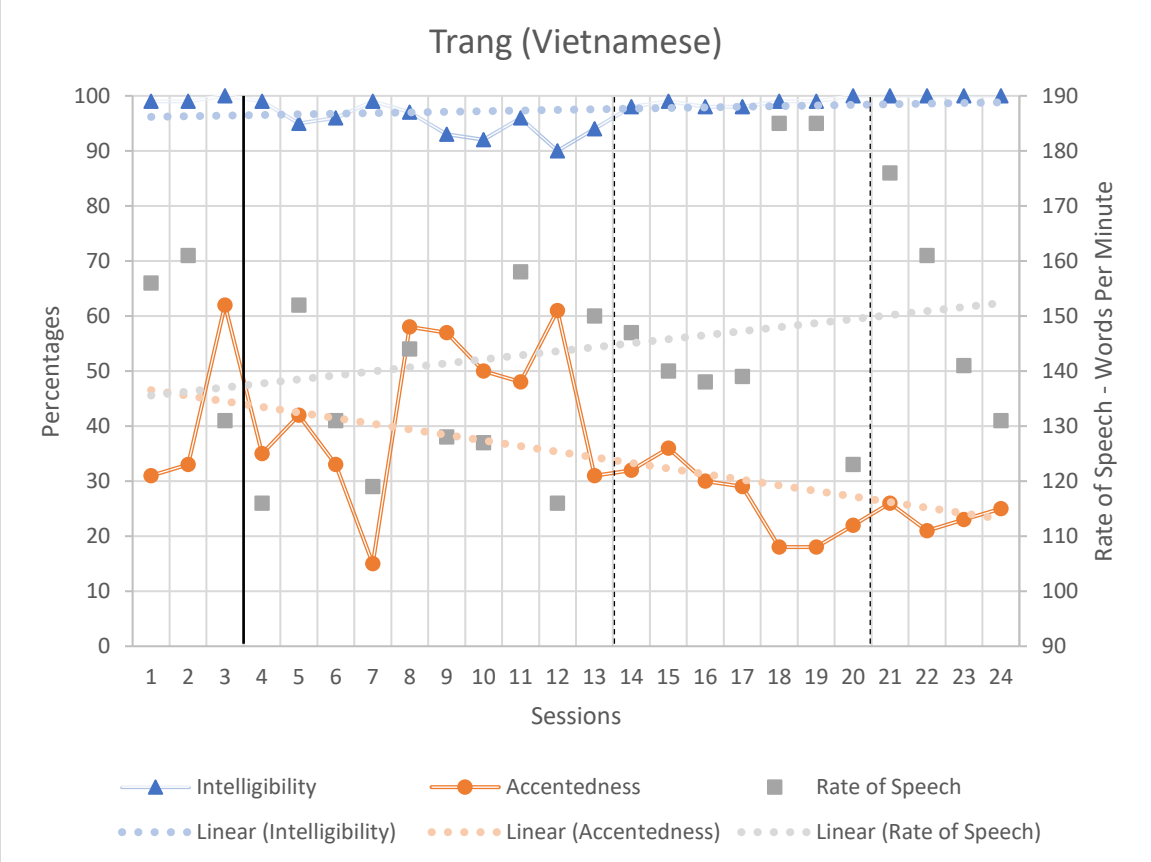

Figure 18. Trang's performance in accent modification with speech entrainment. Trang's performance for each session is plotted, and trendlines show the outcomes of her performance over time.

Chapter V

Discussion

The purpose of the study was to determine whether speech entrainment was a viable technique to use in pronunciation instruction for adult English language learners and, in the process, add empirical evidence to the research literature in accent modification. By providing efficient and practical tools, speech-language pathologists can better serve individuals seeking to change the way they speak and accommodate the growing need for accent modification. This chapter synthesizes the results and discusses the clinical implications of speech entrainment in accent modification.

This study was designed to measure changes in accentedness, rate of speech, and intelligibility for five individuals who sought help with their pronunciation using speech entrainment. The participants attended sessions with a proficient graduate student clinician under the supervision of a licensed and certified speech-language pathologist and researcher. The participants attended hour-long sessions, usually twice a week, for 24 sessions, except for Raj, who could only participate in 12 sessions. Speech entrainment was used to address the participants' goals in accent modification. The effects of the technique were measured from spontaneous speech samples collected in each session. The samples were rated by the graduate student clinician and, later, by a second rater who was also a graduate student clinician. Using range-bound changing criterion design, once a participant reached the criterion for a phase, a calculation was made to form the next goal range. The new performance expectation was presented to the participant and served to motivate the participant to achieve the next level of

improvement. Goal ranges were calculated from the participant's past performance, not from a prescribed plan.

The following discussion about results and future research possibilities help answer these questions:

1. What is the effect of speech entrainment on accentedness of advanced English-language learners seeking accent modification training?
2. What is the effect of speech entrainment on the intelligibility of advanced English-language learners seeking accent modification training?
3. What is the rate of speech of advanced English-language learners seeking accent modification training?

Summary of Findings

The use of speech entrainment yielded significant positive results. Together, the overall means showed a decrease in perceived accented speech, a slight increase in the rate of speech, and a slight increase in intelligible speech. The participants' speech intelligibility was already high, so only a slight increase was possible. Individual performances also showed improvement in pronunciation as the result of the exclusive use of the speech entrainment technique in accent modification sessions.

Speech entrainment made positive pronunciation changes with a broad range of English-language learners. The participants who spoke Vietnamese had a similar background; they both moved to the United States a couple of years ago, and they reported acquiring English over 12 years ago. Both completed four phases of the study and showed significant pronunciation improvement. The participant who spoke Spanish also moved to the United States a couple of years ago; however, she reported acquiring

English nearly 40 years ago. She also made significant positive pronunciation changes during the 12-week study. The participant who spoke Korean arrived in the United States five years ago and reported acquiring English over 10 years ago. Despite limited English exposure and use (only about 10% during the week) she also made significant positive changes in English pronunciation. The participant who spoke Hindi arrived in the United States 12 years ago, notably earlier than the others. Similar to the Spanish speaker, the Hindi speaker reported acquiring English for a lengthy amount of time beginning nearly 30 years ago. He could only participate in the study half the amount of time as compared to other participants but still made significant positive pronunciation changes. Despite some similarities, the participants' backgrounds were generally different; nonetheless, all demonstrated significant positive pronunciation changes.

Implications for Practice

Expanding the number of evidence-based techniques that can be used in accent modification makes speech-language pathologists more effective in teaching pronunciation to English-language learners. Utilizing proven tools contributes to the individual's success when speaking and increases communicative effectiveness. A range-bound changing criterion design showed that the use of speech entrainment promoted positive changes in pronunciation. In this study, there was a functional relation between using speech entrainment and improvement in pronunciation. Graduate student clinicians enrolled in a communication sciences and disorders program implemented the experimental technique. All five participants demonstrated positive changes in the key components of pronunciation: accentedness, rate of speech, and intelligibility.

Modifying an accent is driven by the individuals seeking the service. Participation in accent modification leads to the attainment of clear speech whereas the age of acquisition, exposure to English, and to some degree, the ability to perceive differences are not variables that can be changed. Individuals pursue positive outcomes that will impact their verbal communication when speaking in their community. Positive pronunciation changes were accomplished with the use of speech entrainment.

Speech entrainment would be considered an intuitive–imitative technique because of the imitative nature of the "I do, we do, you do" tool. Speech entrainment requires three parts. First, the individual listens to a word or sentence spoken by a speaker while watching the word or sentence being produced by the speaker's mouth. Second, the individual and the speaker say the word/sentence at the same time (i.e., in unison). Lastly, the individual says the word/sentence while the speaker's mouth makes the motion of the word/sentence (i.e., no voicing). The synchronism phenomenon allows one individual to match the speech of another individual with the help of a neural mechanism; speech entrainment capitalizes on the coupling of the auditory and motor systems. Also, widespread practice and repetition results in the formation of habits, and the desired pronunciation becomes automatic.

Increased globalization, migration, and diversity place different individuals in contact with each other. When individuals speak differently because of their accent, listeners may fail to comprehend, which can lead to potential problems in school or at work. Data from the U.S. Census Bureau showed that the number of foreign-born individuals living in the United States continues to increase in size and in percent of the population (2016). Approximately 24 million individuals may seek pronunciation

instruction to improve their spoken English to advance in school or at work. The implementation of speech entrainment is quick and easy; therefore, the economic impact of this study is far-reaching. Around the world, speech-language pathologists and language instructors can add this evidence-based technique to their repertoire, improving pronunciation and communicative effectiveness to all that they teach.

Limitations

A limitation in the study was the lower levels of interrater agreement for perceived accented speech. The second rater judged 15% of the authentic conversational speech samples, which was approximately one sample per phase. Rather than rating the audio recordings as the study progressed, the second rater judged participants' pronunciation in the span of a few days. The second rater tended to agree more with the graduate student clinicians' perception in the baseline or phase one of the study than in subsequent phases.

A factor that could have impacted the frequency of agreement of accentedness was familiarity. Browne (2016) revealed that a judge's level of familiarity with an individual's speech increased pronunciation score leniency. Consistent with Browne's study results, it may be plausible that the graduate student clinicians' ratings of the participants' accentedness levels were more lenient because they became familiar with the accent. The second rater, who judged the participants' performance during a 1-week period only, did not familiarize with the accent to the extent that the graduate student clinicians did during the 12-week study. A solution to prevent clinicians from becoming familiar would be to rotate or switch participants periodically.

Another limitation was using speech samples of authentic conversation as the measurement of progress. Even though conversational speech closely represents speech outside of the session, it is characteristically variable. Perhaps using a more standardized measurement such as a reading passage (e.g., the Rainbow Passage) would facilitate determining changes in pronunciation because of its known number of sounds and patterns. It is unclear whether the determination of accentedness, whether from a participant's authentic speech sample or a known reading passage, would have been the same since accented speech is perceived differently by different individuals.

Conclusions and Recommendations for Future Studies

In accent modification, one single technique could not be expected to address all the complex speaking needs of the individual. However, adding a technique such as speech entrainment provides an additional and effective way to address the needs of those seeking help with pronunciation. Speech entrainment is simple for individuals to use because it is intuitive in practice and does not require the application of specific information nor a detailed analysis of productions. Allowing neural connections to be made by watching and listening to another person speak is remarkably easy. The technique capitalizes on a synchronism phenomenon, works quickly, and is then practiced until it becomes automatic.

The results of this study provide initial data to suggest that a technique used to treat motor speech disorders in individuals with brain injury also facilitates improvement in the pronunciation of individuals with speech differences. The implementation of speech entrainment in accent modification provides a new area and context for the use of

the technique. The results expand beyond the scope of this study and represent a promising direction for future research.

The use of speech entrainment in accent modification is a worthwhile technique to use in a session. The simple, 3-step technique, which can be prompted by saying to the participant "I do, we do, you do," is an effective way to elicit desired pronunciation using an implicit teaching method. Speech entrainment should be added to the speech-language pathologists' toolbox.

As individuals from around the world interact with each other, there will be a need for clear communication. Several million individuals will need help adjusting their pronunciation to be understood. The use of speech entrainment in accent modification produces positive pronunciation changes and will help all who seek to change the way they speak.

Chapter VI

Clinical Training in Accent Modification

The following chapter provides a guide for graduate programs to incorporate accent modification into the clinical training experience for graduate student clinicians. Graduate programs that offer clinical training in accent modification produce speech-language pathologists that have a greater ability to evaluate all types of clients (Schmidt & Sullivan, 2003). Specifically, speech-language pathologists trained in accent modification possess the ability to provide a more in-depth differential diagnosis (Schmidt & Sullivan, 2003). Schmidt and Sullivan (2003) completed a national survey that revealed that not all graduate programs provide training in accent modification despite "accent/dialect modification" listed in the speech-language pathologists' scope of practice (ASHA, 2016). Further, the U.S. Census Bureau reported that the number of foreign-born individuals living in the United States continues to increase in size and percent of the population (U.S. Census Bureau, 2016); thus, suggesting that there is a growing need for accent modification. Accent modification should be a consistent part of the graduate students' training to prepare future speech-language pathologists to meet the increasing demand for accent modification and to perform a better differential diagnosis of all types of clients.

Training future speech-language pathologists to provide accent modification ensures that these graduate clinicians have the knowledge and skills to work with individuals seeking to change their pronunciation. As a result of accent modification, individuals will improve their speech intelligibility and comprehensibility, making them more employable and better students or employees. Quality candidates for education

programs and employment must express the knowledge and skills they possess clearly. Accent modification training provided by speech-language pathologists helps individuals seeking to change their accent or pronunciation from a regional or foreign accent to GAE (ASHA, 2017). Speech-language pathologists use techniques in session to effectively and efficiently promote positive pronunciation changes to ensure the success of the individuals in school or at work.

Clinical Training in Accent Modification

It is common for graduate student clinicians to be assigned to clinical teams to accrue clinical hours and competencies while being concurrently enrolled in academic coursework. Ideally, the clinical team should be comprised of faculty, clinical educators, and other graduate student clinicians. To meet degree requirements as well as state license and national certification requirements, students must accrue at least 400 clinical hours and show competencies in nine separate and distinct areas of the profession: speech sound production, language, hearing, voice, fluency, social, cognitive, alternative communication, and swallowing. Accent evaluations and accent modification training count toward the requirements in the speech sound production area.

Accent modification training may be provided in on-campus University clinics, off-site locations, or any setting where graduate student clinicians have opportunities to learn how to perform accent modification. Upon receiving the clinical assignment, evidence-based training approaches, methods, and techniques should be taught to the graduate student clinicians. Adjustments based on clients' needs and characteristics should be applied to individualize and target specific goals. Ongoing supervision from a

certified and licensed speech-language pathologist is needed throughout the term to ensure that quality clinical services are delivered.

Training graduate student clinicians to perform accent modification requires engagement, motivation, and support.

Engagement. Graduate student clinicians must be engaged in adult learning as well as the individuals seeking to change their pronunciation. It can be a feat to engage both the clinicians and the clients to learn and change well-engrained patterns, whether in teaching or in speaking. Working with the graduate student clinicians has a ripple effect; when clinicians are engaged and successful in service provision, the clients benefit. Hence the focus in clinical training on the clinicians.

A fundamental concept that graduate student clinicians learn is that accents and dialects are differences, whereas speech sound disorders are not. Everyone has an accent and a dialect. Differences are noticed when speaking outside of family or community. Accent refers to the pronunciation of language (i.e., speech) while a dialect is broader and encompasses differences in language, including grammar, vocabulary, and even the way language is used socially. A speech sound disorder is characterized by difficulty producing sounds or sound patterns due to an anatomical or physiological problem. Individuals with a different accent only vary the pronunciation of English. Individuals with different dialects express language differently. Recognizing these definitions and differences is significant and has a high impact on graduate student clinicians.

Teaching graduate student clinicians is accomplished by motivating each of them in a way that changes how and what they think about pronunciation. Engagement is ensured when clinicians are both interested and supported. Participating in the learning

process changes beliefs and enables students to take action based on their new perspectives (Merriam & Bierema, 2014).

Motivation. Motivation, whether extrinsic or intrinsic, enhances enthusiasm and is the drive and energy put into accomplishing a task (Merriam & Bierema, 2014). In most graduate programs, most graduate student clinicians are extrinsically motivated to accrue clinical hours and earn clinical competencies to fulfill the requirements of the master's degree. Motivation can contribute significantly to the progress of the clinician's clinical training due to their willingness to prepare, participate, and practice.

Support. A power-load margin formula can explain the difficulties that students may face when making changes. Motivation and amount of support can offset the power (i.e., resources) against the load (i.e., demands). The load is the demand for the student to maintain a level of independence with other obligations such as academic commitments or family responsibilities. Power is the resources that the student uses to cope with the load. The margin is the relationship between load and power. As expected, graduate student clinicians are more willing to make changes if they have more margin or less load. When learning new information to implement a new skill, there must be a balance of resources and demands for participation and progress to be made (Merriam & Bierema, 2014, pg. 155). The amount of support provided to graduate student clinicians varies based on the margin. Clinical educators working with the clinicians must recognize the margin and adjust the amount of support and guidance provided to the clinician for optimal clinical training experiences.

One way to provide support is to borrow from what students already know. The similarities between accents, dialects, and disorders allow for overlapping techniques to

be used for addressing differences and disorders. Franklin & McDaniel (2016) completed a study showing that English language learners used phonological patterns similar to typically developing children in English. Additionally, Brady et al. (2016) showed that visual feedback from spectrograms combined with traditional articulation training strategies was effective in targeting vowels in a non-native speaker of English. These researchers showed that elicitation techniques used in speech sound disorder treatment help in pronunciation instruction. If graduate student clinicians use the known techniques, the load is decreased, and less support is needed.

Another way to provide support is through the use of technology as it is a tool for organizing and illustrating learning experiences. Technology allows students to relate, build, and connect new learning experiences (Merriam & Bierema, 2014). It was revealed that blended instruction, that is, a combination of online and face-to-face instruction, was more beneficial than face-to-face or online learning. Students who are given online resources with some face-to-face instruction can control their interactions with information leading to increased reflection and self-monitoring. Feedback preferences should be provided one-on-one since group guidance was proven less effective. It was also recommended that instructors develop games that promote collaboration, problem-solving, and procedural thinking as it undoubtedly provides an effective combination of support and motivation to accomplish clinical decision-making.

Assessment of Current Knowledge and Skills

The clinical training process relies on the interconnection of cognitive functioning, experience, and connection. Cognitive functioning is foundational and required for learning. There is no doubt that graduate clinicians are capable of clinical

learning. The connection between experiences and new learning provides perspective, and motivation ensures persistence in the process. New learning is enhanced by a spiritual connection, which is accomplished with embodied learning. When graduate clinicians know something, it changes them; they can feel it within. The knowledge and skills provide meaning that is reflected within students and can be shared with others as a result.

Cognition, experience, and connection overlap with the goals of clinical training. Clinical assignments are provided to train graduate student clinicians in different areas of the profession. The objective of clinical education is to provide clinical content and support for meaningful clinical experiences. In other words, rigor, relationship, and relevance should be the focus of clinical training. Rigor relates to the students' achievement of clinical competencies. Relationship relates to the support needed to be successful. Relevance relates to meaningful learning in the clinic.

Rigor. A strong foundation needs to be established to begin training graduate student clinicians in accent modification. Orientation provides an overview of accent modification with shared definitions and terminology, as well as the rationale and purpose. Expectations about the type of service provision are discussed so that clinicians and clinical educators are on the same page. Techniques to be used in sessions are explained and demonstrated so that clinicians have immediate tools to use when they begin seeing clients. Through this orientation process, different learning theories are emphasized.

Orientation prepares graduate student clinicians to teach an adult to speak a different way, a task as complex as speaking is a well-engrained habit. As with any

teaching technique, the presentation of information must be clear so that it can be implemented. The ability to organize clinical information to present it to the client in a concise manner was highlighted by the self-directed learning theory (Merriam & Bierema, 2014).

Transformational learning theory is associated with the creation of a space to express one's self (Merriam & Bierema, 2014); thus, graduate student clinicians should be encouraged to integrate information using their own words and to present using their style while in session. The session is their space to express concepts and to provide feedback to the client that is genuine and meaningful. Each clinician, based on their expression, presents information differently. Of course, key elements are needed to be useful, but the way the instruction and feedback are provided varies and is supported by transformational learning theory. Transformational learning theory focuses on cognitive aspects of learning and delves into emotional aspects of learning (Merriam & Bierema, 2014); therefore, clinicians learn critical elements of service provision and implement the information using their unique style.

Another way that transformational learning theory is emphasized is when graduate student clinicians collaborate. When similarities exist between clients, that is, they have the same first language or the same goals, then clinicians work with each other to exchange materials and share techniques. Collaboration is encouraged as it broadens the clinical experience. Collaboration assists in creating change and inspiring other adults also to change perspectives (Merriam & Bierema, 2014).

Rigor is demonstrated in clinical training when graduate student clinicians learn about accent modification and, with guidance, make clinical decisions. Theories of

learning and cognitive functioning should be emphasized most when graduate student clinicians are trained in accent modification.

Relationship. The clinical training process should begin with an orientation and a continuous distribution of information throughout the term. Since the process is formative, each week, new information or new skills should be emphasized in team meetings for the graduate student clinicians to acquire clinical competencies. Individual meetings may occur for more personalized instruction and feedback. A balance of resources and demands supports graduate student clinicians' participation in clinical training and can be affected by the relationship between clinical educator and themselves. A clinical educator can provide more resources and more demands as well as to support or to challenge clinicians in clinical training.

The clinical educator should gauge the relationship and provide what is needed at the appropriate time. When one area or skill is weak or lacking, the other area may be stronger or more extensive to counteract or compensate. For example, motivation can offset lacking experience in the same way that extensive or very positive experiences can offset lacking motivation. Intrinsic motivation may be lacking but could be balanced through more extensive prior experiences. Understanding the interconnection between clinical factors facilitates appropriate and effective clinical training.

Most graduate student clinicians do not have prior experience providing accent modification; therefore, extended time may be required for this new learning. Clinical educators should understand that initially, clinicians may think of accent modification more abstractly since they cannot connect or relate it to a previous experience. Due to unfamiliarity, this may mean that the clinician teaches rules of English before teaching

the pronunciation. For example, the clinician may ask the client to distinguish between the words *desert* and *dessert*; however, delay teaching how to place emphasis on different parts of those words because of lacking prior experience.

Graduate student clinicians may lack the motivation to participate in clinical training. This may mean that the clinical educator spends more time praising the clinician and providing one-on-one reinforcement to increase motivation and active participation. Additionally, more time may be needed for additional practice to ensure in-depth understanding and more automatic and natural performance in the session. Adjustments may be made by the clinical educator to accommodate stress or illness. The clinician's cognitive load or capacity may be temporarily decreased due to fatigue or stress; thus, the clinical educator may reduce expectations for the session to minimal requirements or may step in and use the opportunity to demonstrate a specific method or technique while the clinician observes.

The supervisory relationship and amount of support needed in clinical training fluctuate based on various factors. It is critical that the clinical educator recognizes the clinician's needs and provides support effectively to ensure successful clinical training.

Relevance. When clinical activities are relevant to graduate student clinicians, they are meaningful. Information is retained with the use of reflection and embodied learning. Both the clinical educator and the graduate student clinicians need to participate meaningfully in the learning process.

To participate in adult learning, one must possess the ability to reflect. Reflection is a metacognitive skill involving serious thought and consideration (Merriam & Bierema, 2014). It is helpful for clinicians to verbalize thoughts and reflections and to

receive guidance from the clinical educator, peers, or even the client to learn how to apply information in a way that makes an impact. Sharing may also be in the form of doing so clinicians may opt to replicate or role-play an interaction that occurred in sessions rather than describe it in a play-by-play format. Applying the learned information immediately is an efficient way of expressing that the concepts were learned; thus, the clinical educator is also available after sessions for a debriefing if it is needed.

It is useful to have clinical instruction and session recordings accessible for in-depth reflection and accurate interpretation of information and interactions. An accent modification orientation may be provided through the use of four ten-minute online learning modules easily accessible via YouTube links or other media so that clinicians can access them quickly and revisit them as needed. All sessions should be recorded and accessible, yet still meet the Health Insurance Portability and Accountability Act (HIPAA) requirements, so that clinicians and revisit and reflect as needed.

In new learning experiences such as those in the clinic, it is suggested that graduate student clinicians attend to their body's reactions to clinical situations as it helps guide and refine that experience. Spirituality, or a connection to one's self or others, is associated with meaning-making, an inherent component of adult learning (Merriam & Bierema, 2014). Embodied learning unifies the mind and body. The concept emphasizes being attentive to the body and its experiences as a way of knowing (Merriam & Bierema, 2014).

Graduate student clinicians should be taught techniques and provided with feedback to learn new ways to elicit differences in pronunciation. Going further, the clinicians should incorporate new knowledge within themselves so that the learning

becomes inherent and independent. It is imperative that the clinician learn to hear differences and adjust their instructions and techniques accordingly. Whether consciously or unconsciously, clinicians who are more aware of their bodies and feelings experience new learning much more profoundly than others who do not have the same awareness and connection.

Adult Non-Native English Language Learners

Individuals seeking to change their pronunciation and the participants of the study were advanced English language learning adults who received accent modification training at a university speech, language, and hearing clinic. Differences among individuals seeking accent modification are acceptable. For example, individuals may have different first languages as well as different ages of acquisition, and different lengths of time in accent training are appropriate to participate in accent modification training. Home practice should be encouraged and documented in a written compliance log. A summary of the inclusion and exclusion criteria is shown in Appendix 1. Exceptions to the criteria are acceptable since accent modification is an elective service. There are no exact eligibility requirements. Individuals may be good candidates for accent modification despite exceptions to the listed criteria.

Graduate Student Clinicians

Graduate student clinicians, with guidance and supervision, will train the adult non-native English language learners who seek accent modification. Quality graduate student clinicians are admitted to graduate programs, and they learn the requisite knowledge and skills in a supportive and challenging environment with easy access to faculty and clinical educators. Students experience a well-balanced educational and

training program. Before admission, graduate student clinicians took undergraduate courses that provided a foundation for clinical training. The courses may be anatomy & physiology, phonetics, speech and language development, speech and language disorders, audiology, aural rehabilitation, speech science, and clinical procedures, or related others.

Graduate programs offer a formative sequence in clinical education and graduate student clinicians complete multiple semesters in clinic practicum. Rapport and establishment of a sense of belonging should be established with graduate student clinicians. Because they are enrolled in the same academic courses and have similar schedules, they know each other well. Rapport is usually well-established without particular assistance; however, if problems arise, faculty should quickly make adjustments to address students who may be struggling. In the clinic, graduate student clinicians may be paired to cotreat clients so that multiple clinicians experience that particular type of clinical training. An advantage of service provision with two clinicians is the efficiency in session. Clients may also benefit from more intense intervention. For those clients that need more naturalistic settings, adding a co-clinician helps too.

Readiness in the clinic should be established through a robust graduate orientation. Beginning orientation beginning before graduate classes begin at the university is ideal. Policies and procedures should be reviewed, and team building activities can ensue. Previous graduate students may share tips and tricks for success in the program, as well. Orientation should continue until graduate student clinicians are well-prepared and have adjusted to the demands of academic coursework before clinical training begins. Graduate student clinicians may meet with their clinical teams or individually with their clinical educator. Clinical service provision should start slowly

with extended clinical educator guidance. By the time clinic begins, the graduate student clinicians should have completed an extensive file review, developed and practiced a training plan, drafted a data collection form, reviewed videos of the client from previous terms, discussed scenarios with the clinical educator, role-played clinical interactions, and introduced themselves to the client when confirming the start of sessions.

Clinical Readiness

Two forms of knowledge, essential and prior, must be applied when preparing graduate student clinicians. Essential knowledge that combines with prior knowledge enables practical clinic skills.

Essential knowledge. Graduate student clinicians should be taught crucial information to begin clinical training in accent modification. This includes foundational concepts and essential skills related to standards and competencies for graduate student clinicians as well as best practice for accent modification service provision. The information should be shared in different formats through orientation, clinical team, and individual meetings.

Researchers and practitioners agree that participation in accent modification training is beneficial to the individuals who seek the elective service. Lee et al. (2015) completed a review of 86 studies that revealed medium-to-large and statistically significant effects of pronunciation instruction. Pronunciation instruction must utilize effective evidence-based techniques because modifying an accent can be difficult because speaking style is a well-engrained motor habit (Ojakangas, 2013). The degree of accentedness may result from the age of exposure and the age of acquisition of a second language. It was shown that early exposure to a second language had less impact on the

speech production of consonants in the second (i.e., English) language because of the nonnative speakers' language proficiency (Chakraborty, 2011). Flege et al. (1999) revealed a relationship between the age of arrival into the United States and the level of foreign accent. As the age of arrival increased, the foreign accent was stronger (Flege et al., 1999), thus a greater need for help with pronunciation.

Individuals with a different accent only vary the pronunciation of English. Individuals with different dialects express language differently. Individuals with a disorder also pronounce words differently, but due to an underlying deficit. Saying the word *route* by pronouncing it as "root" /rʊt/ or "r-out" /raʊt/ varies based on the accent of the individual. Using "y'all" or "you guys" is an example of a dialectical difference because it involves different vocabulary, just as is the use of "coke" or "pop" to refer to soda. Saying "wabbit" /wæbɪt/ for *rabbit* /ræbɪt/ illustrates the difficulty the individual encounters with lip and tongue placement and movement.

Prior knowledge. Before beginning an accent modification clinic, graduate student clinicians have background knowledge from their undergraduate coursework as well as their graduate course in speech sound disorders. The integration of new knowledge with prior knowledge helps clinicians to apply the information in the clinic.

Clinical Skills

Clinical skills used with one type of client may be applied to other types of clients. Clinicians may have used speech entrainment with their clients who had aphasia due to a stroke and may use entrainment again with their client who seeks to change their pronunciation. Other techniques, such as phonetic placement or auditory discrimination, may be used in training as well. Further, since pronunciation requires changes in either

placement of articulators (e.g., tongue touches alveolar ridge), manner of production (e.g., tongue constricts airflow to produce a strident sound /s/), or voicing changes (e.g., vocal folds vibrate to produce /g/, but not for /k/) it may be helpful to review anatomy and physiology and the impact place, manner, or voice has on the auditory perception of speech.

Data collection and analysis of the client's performance are also clinical skills that are taught in the clinic. Prior experiences enable graduate student clinicians to transcribe speech using the International Phonetic Alphabet (IPA); thus, differences in phoneme production are easily detected. This broad training was the outcome of the course, phonetics, which is a required undergraduate course for graduate student clinicians. Specific training related to English language learners should be completed during clinic orientation. Additionally, guidance will need to be provided to clinicians as they gain clinical hours and competencies while supervised by a licensed and certified speech-language pathologist.

Prior knowledge and experience allow graduate student clinicians to analyze speech production performance or outcomes of accentedness and intelligibility from the clients' recorded samples of spontaneous speech (i.e., conversation) in training sessions. Each week a one-hundred-word digital recording of the client's spontaneous speech should be analyzed to measure progress over time. Measuring performance from a conversational speech sample closely represents how the individual speaks in conversation outside of sessions and provide insight about actual performance in conversations out of the clinic. The analysis should consist of listening to and marking words that were not understood (i.e., unintelligible) and marking words that were not

produced with GAE, which includes differences in rate, rhythm, or intonation. All differences in productions should be analyzed for patterns and targeted in future sessions.

Targeting the short-term goals impacts the overall performance represented in the long-term goal. To begin, the individual's goals are determined from an evaluation that is completed before beginning accent modification. Goals are adjusted regularly based on performance. An example of long and short-term goals is in Appendix B. Goals should be addressed in sessions with several different activities that are part of a routine. An example of a plan for an individual training session is provided in Appendix C and an example of an overall plan for a 12-week term is provided in Appendix D. The weekly plans and session activities are driven by the individual's performance. In the beginning, the accent evaluation determines what should be targeted as a result of the identification of differences in pronunciation and levels of complexity in testing. Graduate student evaluators provide recommendations that focus on goals that addressed the difficulty of producing GAE. If there is a gap in time from the evaluation and the start of training, informal baseline testing should be completed in training (i.e., first or second session) to confirm the appropriate level to be targeted. The evaluation or baseline testing will reveal the level of performance on a hierarchy of speech production.

A hierarchy of complexity exists in speech production. Auditory discrimination and sound production are foundational skills. Next in the hierarchy are words, then sentences. If using a bottom-up approach, performance is expected in increasingly complex levels beginning with consonant-vowel words (e.g., *key*), to consonant-vowel-consonant (e.g., *cat*). At the next higher level were multi-syllabic words (e.g., *chalkboard, television*). After mastery at the multi-syllabic level, carrier phrases may be

targeted in session. A carrier phrase begins with the same words, but changes one part of the phrase (e.g., *I know that man*, *I know that location*, *I know that saying*). The hierarchy continues to include simple sentences, complex sentences, and reading passages. Conversational speech and presentations are the highest levels of the hierarchy of speech production.

Graduate Student Clinical Experience Evaluation Tools

A questionnaire and interview protocol were developed to assess the graduate student clinicians' experience in the clinic. Both tools assist the clinical educator in supporting and adjusting the clinical experience for the graduate student clinician.

Questionnaire. The questionnaire was developed to probe graduate student clinicians' responses to implementing clinical services with clients as well as the supervisory process. The questions seek to identify graduate student clinician feelings of confidence, attitudes, and reactions when working with clients and participating in the supervisory process during their clinical assignment. The purpose is to promote clinical competence and to engage graduate student clinicians more fully in the clinical provision of services and the supervisory process.

The results of the questionnaire provide the clinical educator with information about concerns or feelings about the clinical placement, the clinical educator, the supervisory process, and the level of competence as well as confidence in providing services in the clinic. The ratings relate to having no concern or expression of feelings that are not at all typical for graduate student clinicians to those that have great concern or feelings that are very typical for graduate student clinicians. The results provide the clinical educator with information so that the concerns and feelings can be addressed.

Interview protocol. The interview questions were developed to probe graduate student clinicians' responses to implementing clinical training with clients as well as the supervisory process. The interview seeks to identify graduate student clinician feelings of confidence, attitudes, and reactions when working with clients and participating in the supervisory process. The purpose is to promote clinical competence and to engage

graduate student clinicians in the clinical provision of services and the supervisory process by relating their previous experiences and gauging their motivation for their current clinical assignment.

The results of the interview will provide the clinical educator with the graduate student clinician's attitudes, feelings, beliefs, and ideas about the clinical assignment. The answers to the interview questions will determine the intensity of concern, if any, about their clinical assignment. If completed during midterm evaluations, the protocol will determine the level of use or engagement in clinical training. The information will allow the clinical educator to address the graduate student clinician's concerns and engagement to ensure that the assignment is meeting expectations. Specifically, the clinical educator, in collaboration with the clinic director and graduate program advisor, can address concerns about the clinical placement, the clinical educator, the supervisory process, and the level of competence as well as confidence in providing services in the clinic.

Evaluation outcomes. Graduate student clinicians can express a wide range of concerns based on their stages of clinical growth and other personal factors impacting participation in the clinic. Depending on the outcome of the questionnaire and interview, graduate student clinicians may be at a stage of no concern. This may be due to prior experiences before beginning the graduate program or could be due to prior experiences in the on-campus clinic. Often, graduate student clinicians either have no concerns entering their third on-campus practicum, or they have refocusing concerns, meaning that they want to make their clinical experience better by refining it or making it more efficient. First-semester graduate student clinicians often are very concerned and express

more intense feelings because the clinical practicum is a new experience. They seek information about the clinic process as well as personal information about their roles and responsibilities in the clinic. Second-semester graduate student clinicians' results often indicate curiosity with how others are performing in the clinic or are interested in clinical management and decision-making processes. Expectations exist about how graduate student clinicians will express their feelings about their clinical assignments are primarily based on prior experience and motivation.

Graduate student clinicians may be at a stage of nonuse or not yet engaged if they are completing the questionnaire or interview before beginning their clinical assignment. Graduate student clinicians exiting their third clinical assignment may be at a level of advance use or advanced engagement in the clinical training process.

Summary

The chapter provided a guide for graduate programs to incorporate accent modification into the clinical training experience. Key components of accent modification were provided, as well as assessment tools for evaluating graduate student clinicians' experiences in the clinical setting were provided for clinical educators.

References

Adger, C. T., Wolfram, W., & Christian, D. (2007). *Dialects in schools and communities*. Lawrence Erlbaum Associates.

Alberto, P. A., & Troutman, A. C. (2003). *Applied behavior analysis for teachers* (6th ed.). Merrill Prentice Hall.

American Speech-Language-Hearing Association. (2016). *Scope of practice in speech-language pathology*. https://doi.org/10.1044/policy.SP2016-00343

American Speech-Language-Hearing Association. (2017). *Accent modification*. https://www.asha.org/PRPSpecificTopic.aspx?folderid=8589943199&section=Overview

Ansaldo, A. I., Marcotte, K., Scherer, L., & Raboyeau, G. (2008). Language therapy and bilingual aphasia: Clinical implications of psycholinguistic and neuroimaging research. *Journal of Neurolinguistics*, *21*(6), 539–557.

Behrman, A. (2014). Segmental and prosodic approaches to accent management. *American Journal of Speech-Language Pathology*, *23*(4), 546–561. https://doi.org/10.1044/2014_AJSLP-13-0074

Bhatia, T. K. (2017). Bilingualism and multilingualism from a socio-psychological perspective. *Oxford Research Encyclopedia of Linguistics*. https://doi.org/10.1093/acrefore/9780199384655.013.82

Borrie, S. A., & Liss, J. M. (2014). Rhythm as a coordinating device: Entrainment with disordered speech. *Journal of Speech Language and Hearing Research*, *57*(3), 815. https://doi.org/10.1044/2014_JSLHR-S-13-0149

Borrie, S. A. (2015). Visual speech information: A help or hindrance in perceptual processing of dysarthric speech. *The Journal of the Acoustical Society of America*, *137*(3), 1473–1480. https://doi.org/10.1121/1.4913770

Bradlow, A. R., Akahane-Yamada, R., Pisoni, D. B., & Tohkura, Y. (1999). Training Japanese listeners to identify English /r/and /l/: Long-term retention of learning in perception and production. *Perception & Psychophysics*, *61*(5), 977–985.

Brady, K. W., Duewer, N., & King, A. M. (2016). The effectiveness of a multimodal vowel-targeted intervention in accent modification. *Contemporary Issues in Communication Science and Disorders*, *43*, 23–34.

Browne, K. C. (2016). *Raters' accent-familiarity levels and their effects on pronunciation scores and intelligibility on high-stakes English tests*.

Carlson, H. K., & McHenry, M. A. (2006). Effect of accent and dialect on employability. *Journal of Employment Counseling*, *43*(2), 70–83. https://doi.org/10.1002/j.2161-1920.2006.tb00008.x

Celce-Murcia, M., Brinton, D., & Goodwin, J. M. (2010). *Teaching pronunciation: A course book and reference guide.* Cambridge University Press.

City of Houston, Planning and Development Department. (2017). *Region of birth of foreign born*. http://www.houstontx.gov/planning/Demographics/docs_pdfs/updates/Region-of-Birth-of-Foreign-Born_2011-2016.pdf

Chakraborty, R., Domsch, C., & Gonzales, M. D. (2011). Articulatory behaviors of nonnative speakers: Role of L2 proficiency and accent modification. *Perceptual and Motor Skills*, *113*(1), 311–330. https://doi.org/10.2466/11.17.21.28.PMS.113.4.311-330

Derwing, T. M., & Munro, M. J. (2009). Putting accent in its place: Rethinking obstacles to communication. *Language Teaching*, *42*(4), 476–490. https://doi.org/10.1017/S026144480800551X

Derwing, T., & J. Rossiter, M. (2003). The effects of pronunciation instruction on the accuracy, fluency, and complexity of L2 accented speech. *Applied Language Learning*, *13*.

Derwing, T. M., Munro, M. J., & Wiebe, G. (1998). Evidence in favor of a broad framework for pronunciation instruction. *Language Learning*, *48*(3), 393–410. https://doi.org/10.1111/0023-8333.00047

Fields, R. D. (2008). White Matter Matters. *Scientific American*, *298*(3), 54–61.

Flege, J. E. (1995). Second language speech learning: Theory, findings, and problems. In W. Strange (Ed.)., *Speech perception and linguistic experience: Issues in cross-language research* (p. 23). York Press.

Flege, J. E., Yeni-Komshian, G. H., & Liu, S. (1999). Age constraints on second-language acquisition. *Journal of Memory and Language*, *41*(1), 78–104. https://doi.org/10.1006/jmla.1999.2638

Florez, M. A. C. (1998). 'Improving adult ESL learners' pronunciation skills' Eric Digest. Washington DC, USA: National Clearinghouse for ESL Literacy Education.

Franklin, A., & McDaniel, L. (2016). Exploring a phonological process approach to adult pronunciation training. *American Journal of Speech-Language Pathology*, *25*(2), 172. https://doi.org/10.1044/2015_AJSLP-14-0172

Freysteinson, W. M., Adams, J. D., Cesario, S., Belay, H. A., Clutter, P., Du, J., Duson, B. M., Goff, M., McWilliams, L., Nurse, R. P., & Allam, Z. (2017). An accent modification program. *Journal of Professional Nursing*, *33*(4), 299–304. https://doi.org/10.1016/j.profnurs.2016.11.003

Fridriksson, J., Hubbard, H. I., Hudspeth, S. G., Holland, A. L., Bonilha, L., Fromm, D., & Rorden, C. (2012). Speech entrainment enables patients with Broca's aphasia to produce fluent speech. *Brain*, *135*(12), 3815–3829. https://doi.org/10.1093/brain/aws301

General American English. (2011). *American Heritage® Dictionary of the English Language, Fifth Edition*. https://www.thefreedictionary.com/General+American+English

Grosjean, F. (2011, January 25). Bilinguals and accents. http://www.psychologytoday.com/blog/life-bilingual/201101/bilinguals-and-accents

Guenther, F. H. (2006). Cortical interactions underlying the production of speech sounds. *Journal of Communication Disorders*, *39*(5), 350–365. https://doi.org/10.1016/j.jcomdis.2006.06.013

Hahn, L. D. (2004). Primary stress and intelligibility: Research to motivate the teaching of suprasegmentals. *TESOL Quarterly*, *38*(2), 201–223. https://doi.org/10.2307/3588378

Hashemian, M., & Fadaei, B. (2011). A comparative study of intuitive-imitative and analytic-linguistic approaches towards teaching English vowels to L2 learners. *Journal of Language Teaching and Research, 2*. https://doi.org/10.4304/jltr.2.5.969-976

Hosoi, H., Murata, K., Ohta, F., & Imaizumi, S. (1992). Effect of the rate of speech flow on speech intelligibility in normal and hearing-impaired subjects. *Nihon Jibiinkoka Gakkai Kaiho*, *95*(4), 517–525.

Jacoby, L. L. (1978). On interpreting the effects of repetition: Solving a problem versus remembering a solution. *Journal of Verbal Learning and Verbal Behavior*, *17*(6), 649–667. https://doi.org/10.1016/S0022-5371(78)90393-6

Jam, B., & Adibpour, M. (2014). Intuitive-imitative approach versus analytic-linguistic approach toward teaching /T/, /Δ/, and /w/ to Iranian students. *Procedia - Social and Behavioral Sciences*, *98*, 757–763. https://doi.org/10.1016/j.sbspro.2014.03.478

Kazdin, A. E. (2011). *Single-case research designs: Methods for clinical and applied settings, 2nd ed*. New York, NY, US: Oxford University Press.

Khurana, P., & Huang, E. (2013). Efficacy of accent modification training for international medical professionals. *Journal of University Teaching and Learning Practice*, *10*(2). https://eric.ed.gov/?id=EJ1017317

Klineberg, S. L. (2017). The kinder Houston area survey: Thirty-six years of measuring responses to a changing America. https://kinder.rice.edu/sites/g/files/bxs1676/f/documents/2017%20Kinder%20Houston%20Area%20Survey%20FINAL.pdf

Kratochwill, T. R., Levin, J. R., Horner, R. H., & Swoboda, C. M. (2014). Visual analysis of single-case intervention research: Conceptual and methodological issues. In T. R. Kratochwill & J. R. Levin (Eds.), *Single-case intervention research: Methodological and statistical advances.* (pp. 91–125). https://doi.org/10.1037/14376-004

Lee, J., Jang, J., & Plonsky, L. (2015). The effectiveness of second language pronunciation instruction: A meta-analysis. *Applied Linguistics*, *36*(3), 345–366. https://doi.org/10.1093/applin/amu040

Major, R. C., Fitzmaurice, S. F., Bunta, F., & Balasubramanian, C. (2002). The Effects of nonnative accents on listening comprehension: Implications for ESL assessment. *TESOL Quarterly*, *36*(2), 173–190. https://doi.org/10.2307/3588329

McDougall, D., Hawkins, J., Brady, M., & Jenkins, A. (2006). Recent innovations in the changing criterion design: Implications for research and practice in special education. *The Journal of Special Education*, *40*(1), 2–15. https://doi.org/10.1177/00224669060400010101

Merriam, S., & Bierema, L. (2014). *Adult learning: Linking theory and practice* (1st ed.). Jossey-Bass.

Michelman, B. (2009). Effective communication: the key to career success and great leadership. *Journal of Healthcare Protection Management: Publication of the International Association for Hospital Security*, *25*(1), 9–13.

Ojakangas, C. L. (2013). Viewpoint: What brain research can tell us about accent modification. *SIG 14, Perspectives on Communication Disorders and Sciences in Culturally and Linguistically Diverse (CLD) Populations*, *20*(3), 101–108. https://doi.org/10.1044/cds20.3.101

Okada, K., & Hickok, G. (2009). Two cortical mechanisms support the integration of visual and auditory speech: A hypothesis and preliminary data. *Neuroscience Letters*, *452*(3), 219–223. https://doi.org/10.1016/j.neulet.2009.01.060

Poling, A., Methot, L. L., & LeSage, M. G. (1995). *Fundamentals of behavior analytic research*. Springer.

Richards, S. B., Taylor, R., & Rangasamy, R. (1999). *Single-subject research: Applications in educational and clinical settings*. Singular Publishing Group.

Ross, J. M., & Balasubramaniam, R. (2014). Physical and neural entrainment to rhythm: Human sensorimotor coordination across tasks and effector systems. *Frontiers in Human Neuroscience, 8*. https://doi.org/10.3389/fnhum.2014.00576

Rubin, R. B., & Graham, E. E. (1988). Communication correlates of college success: An exploratory investigation. *Communication Education*, *37*(1), 14–27. https://doi.org/10.1080/03634528809378700

Saito, K. (2012). Effects of instruction on L2 pronunciation development: A synthesis of 15 quasi-experimental intervention studies. *TESOL Quarterly*, *46*(4), 842–854. https://doi.org/10.1002/tesq.67

Schmidt, A. M., & Sullivan, S. (2003). Clinical training in foreign accent modification: A national survey. *Contemporary Issues in Communication Sciences and Disorders, 30*, 127–135. https://doi.org/1092-5171/03/3002-0127

Sikorski, L. D. (2005). Regional accents: A rationale for intervening and competencies required. *Seminars in Speech and Language*, *26*(02), 118–125. https://doi.org/10.1055/s-2005-871207

Szpyra-Kozłowska, J. (2015). *Pronunciation in EFL Instruction. A Research-based Approach*. Multilingual Matters.

Terui, S. (2012). Second language learners' coping strategy in conversations with native speakers. *University of Oklahoma, Journal of International Students*, *2*(2), 168.

Texas Workforce Commission. (2015). *Workplace basic skills: Employer demands and worker preparation.* https://lmci.state.tx.us/shared/PDFs/WorkplaceBasicSkills_web.pdf (Original work published 2009).

Texas Workforce Commission. (2009/2015). *National origin discrimination*. https://twc.texas.gov/jobseekers/national-origin-discrimination

U.S. Census Bureau. (2016). *Language spoken at home: 2012-2016 American Community Survey 5-year estimates*. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF

U.S. Department of Justice. (2016). *Overview of Title VI of the Civil Rights Act of 1964*. https://www.justice.gov/crt/fcs/titlevi-overview

U.S. Equal Employment Opportunity Commission. (2008). *Facts about national origin discrimination* [Fact sheet]. https://www.eeoc.gov/facts/fs-nator.pdf

Weidman, S., Breen, M., & Haydon, K. C. (2016). Prosodic speech entrainment in romantic relationships. *Proceedings and Speech Prosody*, 508-512. https://www.isca-speech.org/archive/SpeechProsody_2016/pdfs/321.pdf

Yorkston, K. M. (2010). *Management of motor speech disorders in children and adults*. Pro-Ed.

Zong, J., Batalova, J., & Hallock, J. (2018, February 8). Frequently requested statistics on immigrants and immigration in the United States. *Migration Information Source*. https://www.migrationpolicy.org/article/frequently-requested-statistics-immigrants-and-immigration-united-states#ChangeOverTime

Appendix A

Inclusion and Exclusion Criteria

Table A1

Inclusion and exclusion criteria for individuals seeking accent modification training

Inclusion Criteria	**Exclusion Criteria**
Adult (18 years +)	No neurological dx, psychiatric conditions, cognitive impairment
English Language Learner	No command of English
Acquired English before seeking services	Has not yet acquired English
Use or exposure to English regularly	No use or exposure to English
Sequential language learners that may have different first languages • L1 = Spanish, Vietnamese, other(s) • L2 = English	No simultaneous language learners
Seeks the elective service or has previously participated in accent modification or pronunciation instruction	Does not seek the elective service
Available to regularly participate	Not available to regularly participate
Committed to home practice	Lacks commitment to home practice

Note. The suggested inclusion and exclusion criteria is described and may be adopted by speech-language pathologists working with individuals seeking accent modification.

Appendix B

Sample Goals in Accent Modification

Table B1

Example of long-term and short-term goals used in accent modification

Long-Term Goal	The client will produce speech consistent with General American English speech sounds and patterns.
Short-Term Goals	1) The client will produce the voiceless **/th/** sound in isolation and in CVCV (consonant-vowel-consonant-vowel) words with 80% accuracy. 2) The client will reduce **final consonant deletion** by appropriately producing consonants in the final position of words in words or simple sentences with 80% accuracy. 3) The client will repeat appropriate **lexical stress** in spoken language consistent with GAE in words or simple sentences with 80% accuracy.

Note. Speech-language pathologists, after administering an evaluation, will develop goals that incorporate the client's speaking needs. The example provides a goal for sounds, patterns, and intonation.

Appendix C

Sample Lesson Plan for an Accent Modification Session

Table C1: A typical session is described in the sample lesson plan.

Time	Procedures, Activities, Materials
1:00 – 1:10 pm	At the beginning of each session, the home practice will be reviewed using a logbook or speech sample (e.g., a recording of the client's production). Verbal feedback regarding performance will be provided. Any pronunciations not consistent with GAE will be targeted using evidence-based techniques.
1:10 – 1:15 pm	Discuss words or situations where communication was clear. Problem-solve words or situations where there was a reported misunderstanding. Words/sentences may be selected based on individual goals or may be requested by the client (i.e., words not understood at work).
1:15 – 1:30 pm	Goal 1 will be targeted. Material to elicit the voiceless /th/ sound will be used at the word level. Specifically, relevant words will be selected. For each word produced, the client will receive verbal feedback regarding GAE production. Any pronunciations not consistent with GAE will be targeted using evidence-based techniques.
1:30 – 1:45 pm	Goal 2 will be targeted. Materials focused on final consonant sounds will be used at the word level; specifically, relevant words will be selected. For each word produced, the client will receive verbal feedback regarding GAE production. Any pronunciations not consistent with GAE will be targeted using evidence-based techniques.
1:45 – 1:55 pm	Goal 3 will be targeted. Material with multisyllabic words (2-syllable, 3-syllable, 4-syllable, and 5-syllable words) will be used at word and sentence levels to increase the client's awareness of GAE lexical stress patterns. For each word produced, the client will receive verbal feedback regarding GAE production. Any pronunciations not consistent with GAE will be targeted using evidence-based techniques.
1:55 -2:00 pm	Close the session by reviewing performance and assign home practice.
Verbal Feedback: Verbal feedback is provided to increase the client's performance. Labeling what was pronounced as GAE is helpful and alerts the individual of pronunciations that were not consistent with GAE. For example, the clinician may say, "Awesome, that was an American R!" or "The way you stressed that part of the word is exactly the way a native-speaker says it – wow!" A clinician may also say, "oh, the end of the word was missing" or "the TH sound came out like a D sound." Feedback should be individualized for the individual.	
Evidence-Based Techniques: Evidence-based techniques are listed in Tables 1 and 2 in Chapter II. They include implicit and explicit ways to change pronunciation. Examples include phonetic training, imitation, minimal pair drills, vowel shifts, and other types of techniques.	

Note. The sample lesson plan provides initial guidance to structure a session. Based on the individual's preferences, adjustments may be made to accommodate needs or requests.

Appendix D

Sample 12-Week Plan for Accent Modification

Table D1: Sample 12-Week Plan

A 12-week plan was developed for the graduate student clinicians to implement with the individual assigned to them in the clinic. All individuals should receive an introduction, which reviews articulator placement, the manner of production, and voicing of phonemes (i.e., sounds).

Week 1 Session 1	• Verify information from the case history. Check the age of acquisition of English, intensiveness of previous accent training and/or English training, length of time that they have been immersed in English, or other relevant background information • Collect conversational speech samples
Week 1 Session 2	• Complete informal baseline testing by selecting 10-20 stimuli per goal at and above last reported level (i.e., if the recommendation was for /th/ in words, test 10 words and 10 simple sentences) • Teach general intelligibility strategies: louder (decibel meter), slower (metronome or other), emphasis (move mouth more) • Introduce the rationale/purpose of training. Begin training by teaching phonetic placement and/or auditory discrimination. Show articulator placement, manner, and voicing through practice exercises. Demonstrate effects through auditory discrimination activities.
Week 2 Session 1	• Share individualized goals with the client • Share percent accuracies of accentedness, intelligibility, the rate of speech from samples • Begin training at the appropriate level of complexity, depending on baseline results • Assign home practice
Weeks 2-12	• Continue training at the appropriate level, depending on the performance • Assign home practice

Note. The sample semester plan provides initial guidance to structure a 12-week program. Adjustments will be necessary to individualize the program.

Appendix E

Hierarchy of Complexity in Accent Modification

	Baseline	Progress	Baseline	Progress	Baseline	Progress	
Presentation							10
Conversation							9
Reading Passage							8
Complex Sentence							7
Simple Sentence							6
Carrier Phrase							5
Multisyllabic Word							4
CV / CVC							3
Sound							2
Auditory Discrimination							1
	Goal 1		Goal 2		Goal 3		

Note. Baseline performance should be labeled in the hierarchy. The approach used in accent modification will determine the complexity level that will be targeted in the sessions. A top-down approach would target goals in the top or most complex contexts. A bottom-up approach would target the next level up or more complex from baseline performance. An interactive approach would target contexts at the top and bottom of the hierarchy.

Appendix F

Graduate Student Clinician Assignment Questionnaire

Graduate student clinicians should complete this questionnaire at the beginning of their clinical assignment. They should answer the following questions by circling the number that best matches the feeling. The rating scale depicts an eight-point scale with zero (0) indicating feelings that are not at all typical to seven (7), stating very typical feelings.

Question	Rating							
	Not at all typical of my feelings			Somewhat typical of my feelings		Very typical of my feelings		
	0	1	2	3	4	5	6	7
1. I feel respected by my Clinical Educator	0	1	2	3	4	5	6	7
2. I feel independent in providing training for my clients, even though my Clinical Educator observes 25% of the time	0	1	2	3	4	5	6	7
3. I am confident in my ability to establish rapport with my clients	0	1	2	3	4	5	6	7
4. I am equally a part of the collaboration that occurs between my Clinical Educator and me	0	1	2	3	4	5	6	7
5. I am confident in my ability to self-evaluate to make changes in my clinical behavior	0	1	2	3	4	5	6	7
6. I am confident in my about to make necessary changes in my client's training plan	0	1	2	3	4	5	6	7
7. I feel a sense of belonging with my peers	0	1	2	3	4	5	6	7
8. I feel a sense of belonging in the clinic	0	1	2	3	4	5	6	7
9. I am aware of my Clinical Educator's expectations for me and my performance	0	1	2	3	4	5	6	7
10. I feel capable of meeting my Clinical Educator's expectations of me	0	1	2	3	4	5	6	7
11. I feel my Clinical Educator's expectations of my performance are realistic	0	1	2	3	4	5	6	7

12. I feel my actions contribute to my success with my clinical assignment	0	1	2	3	4	5	6	7
13. I feel my actions contribute to the success of my clients in the clinic	0	1	2	3	4	5	6	7
14. I respect my Clinical Educator	0	1	2	3	4	5	6	7
15. I feel I am a competent graduate student clinician	0	1	2	3	4	5	6	7
16. I feel confident using technology to aid my clients in clinic	0	1	2	3	4	5	6	7
17. I feel the clinic provides appropriate access to technology to use in clinic	0	1	2	3	4	5	6	7
18. I feel confident using electronic medical records for clinical documentation	0	1	2	3	4	5	6	7
19. I feel positive about my Clinical Educator	0	1	2	3	4	5	6	7
20. I feel my Clinical Educator is sensitive to different cultures	0	1	2	3	4	5	6	7
21. I am engaged in the supervisory process	0	1	2	3	4	5	6	7
22. I feel my Clinical Educator uses technology in a way that supports clinical training	0	1	2	3	4	5	6	7
23. I feel comfortable bringing suggestions or new ideas to my Clinical Educator	0	1	2	3	4	5	6	7
24. I feel I have control over my success in my clinical assignment	0	1	2	3	4	5	6	7
25. I feel positive about my clinical assignment	0	1	2	3	4	5	6	7
26. I feel competent in introducing tasks, explaining, instead of modeling	0	1	2	3	4	5	6	7
27. I feel competent in managing my client's behavior	0	1	2	3	4	5	6	7
28. I feel competent closing tasks by summarizing the client’s performance and/or restating the purpose of the activity	0	1	2	3	4	5	6	7
29. I feel competent using specific reinforcement procedures	0	1	2	3	4	5	6	7

30. I feel competent collecting data during the session (not relying on video or audio recordings)	0	1	2	3	4	5	6	7
31. I demonstrate critical thinking in session	0	1	2	3	4	5	6	7
32. I implement clinical activities at a level that my client needs (e.g., use a hierarchy)	0	1	2	3	4	5	6	7
33. I use resources to learn more about my client and his/her needs	0	1	2	3	4	5	6	7
34. I set goals for my clinical growth and development	0	1	2	3	4	5	6	7
35. I am confident analyzing my clinical skills	0	1	2	3	4	5	6	7
36. I am confident that my Clinical Educator will respond appropriately when I express needs	0	1	2	3	4	5	6	7
37. I am confident in setting goals for my client	0	1	2	3	4	5	6	7
38. I am motivated to perform at my highest potential in the clinic	0	1	2	3	4	5	6	7
39. I feel supported by my Clinical Educator	0	1	2	3	4	5	6	7
40. Expectations about my clinical assignment have been covered in the previous questions	0	1	2	3	4	5	6	7

Note. Speech-language pathologists who supervise graduate student clinicians may use responses to the questionnaire to make adjustments in the clinical assignment.

Appendix G

Graduate Student Clinician Interview Questions

The following questions are organized by topic and may be asked during the interview. The interview should occur after some implementation of clinical services.

Previous Experiences

1. Describe any previous clinical experiences that you have had. Please include experiences in related fields or areas.
2. Describe previous coursework you have had that applies to the clients you have been assigned.
3. Have you received clinical supervision in the past? If yes, what did you like about the supervisory experience? What did you dislike?

Motivation

4. Describe your motivation to succeed. Is it extrinsic or intrinsic?
5. Do you feel supported to meet your highest potential in the clinic?
6. What resources do you have available to you that support your participation in the clinical assignment? Conversely, what responsibilities do you have outside of your coursework and clinical assignment that may affect your participation in the clinical assignment?
7. Do you get along with your peers? Is there a sense of belonging? Do you feel like you belong in the clinic? Describe the space and attitudes of others in the clinic? How do they make you feel welcome/unwelcome?
8. Do you feel you have control over your success in your clinical assignment? What are the positive aspects of your clinical assignment? What are the negative aspects of your clinical assignment?

Supervisory Relationship

9. How did you establish rapport with your current clinical educator?
10. Do you have a preference for how you receive feedback about your performance in the clinic? (written, verbal, combination, other)
11. How does your clinical educator show respect? Do you respect your clinical educator?
12. Do you have an equal part in the collaboration that occurs between your clinical educator and yourself? If not equal, describe the ratio.
13. How were you made aware of your clinical educator's expectations for you? Do you feel capable of meeting the established performance expectations? Are the expectations realistic?
14. What are your feelings toward your clinical educator?
15. How have you engaged in the supervisory process?
16. Are you comfortable bringing suggestions or new ideas to your clinical educator?
17. When you expressed needs, did your clinical educator respond appropriately?

Clinical Provision of Service

18. Describe the level of independence you have in providing accent modification training to your clients.

19. Do you feel that the amount of supervision that you are receiving (minimum is 25%) is adequate?
20. How did you establish rapport with your clients?
21. How confident are you in your ability to self-evaluate sessions to make changes in your clinical behavior?
22. Do you have the ability to make necessary changes in your client's training plan?
23. Tell how your actions contribute to your success with your clients.
24. In what ways do you show your competence as a graduate student clinician in training?
25. How do you show your competence with clinical activity/task introductions? Are you competent in closing activities by summarizing the client's performance and/or restating the purpose of the activity? Please provide examples.
26. What behavior management techniques have you used with your client?
27. What reinforcement procedures have you used with your clients? Please describe.
28. How do you collect data in the session?
29. In what ways have you demonstrated critical thinking in the clinic?
30. Describe how you implement clinical activities differently for different clients. What hierarchy do you use? Please describe the steps or levels.
31. What resources are available to you to learn more about your client and his/her needs? Which resources did you use?
32. Did you develop goals for your client? What resources did you use for goal-writing?
33. How and when did you set goals for your own clinical growth and development? Were you confident in analyzing your clinical skills?

Use of Technology

34. What technology do you use in session? What technology do you use for clinical documentation?
35. How comfortable are you learning to use new technology? Do you take notes using your laptop or other technology? Do you prefer to write notes using paper and pen?
36. Do you expect that your Clinical Educator will teach you about new technology?

Conclusion

37. What expectations about the clinical assignment have not been covered? What else do you want me to know about your feelings about the clinical assignment?
38. What could be done to ensure that the clinical assignment this term is positive for you?

Note. Speech-language pathologists who supervise graduate student clinicians may use responses expressed in the interview to make adjustments in the clinical assignment.

Appendix H

Institutional Review Boards (IRB) Approval Letter

UNIVERSITY of HOUSTON

DIVISION OF RESEARCH
Institutional Review Boards

APPROVAL OF SUBMISSION

February 4, 2019

Laura Cizek

lcizek@uh.edu

Dear Laura Cizek:

On February 4, 2019, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title of Study:	The effect of speech entrainment in non-native English speakers
Investigator:	Laura Cizek
IRB ID:	STUDY00001382
Funding/ Proposed Funding:	Name: Unfunded
Award ID:	
Award Title:	
IND, IDE, or HDE:	None
Documents Reviewed:	• HIPAA Authorization for Research speech entrainment, Category: Consent Form; • HIPAA and NOPP at University Speech, Language, and Hearing Clinic, Category: Consent Form; • HRP-502a - CONSENT DOCUMENT- NON-CLINICAL - speech entrainment.pdf, Category: Consent Form; • HRP 503 Cizek, Category: IRB Protocol; • training plan for speech entrainment, Category: Other; • Verbal Recruitment Script, Category: Recruitment Materials; • Data Collection Form, Category: Study tools (ex: surveys, interview/focus group questions, data collection forms, etc.);
Review Category:	Expedited
Committee Name:	Not Applicable
IRB Coordinator:	Danielle Griffin

The IRB approved the study from February 4, 2019 to December 31, 1969, inclusive.

To ensure continuous approval for studies with a review category of "Committee Review" in the above table, you must submit a continuing review with required explanations by the deadline for the November 1969 meeting. These deadlines may be found on the compliance website (http://www.uh.edu/research/compliance/). You can submit a continuing review by navigating to the active study and clicking "Create Modification/CR."

For expedited and exempt studies, a continuing review should be submitted no later than 30 days prior to study closure.

If continuing review approval is not granted on or before December 31, 1969, approval of this study expires and all research (including but not limited to recruitment, consent, study procedures, and analysis of identifiable data) must stop. If the study expires and you believe the welfare of the subjects to be at risk if research procedures are discontinued, please contact the IRB office immediately.

Unless a waiver has been granted by the IRB, use the stamped consent form approved by the IRB to document consent. The approved version may be downloaded from the documents tab.Attached are stamped approved consent documents. Use copies of these documents to document consent.

In conducting this study, you are required to follow the requirements listed in the Investigator Manual (HRP-103), which can be found by navigating to the IRB Library within the IRB system.

If your study meets the NIH or FDA definitions of clinical trial, or may be published in an ICMJE journal, registration at ClinicalTrials.gov is required. See the UH ClinicalTrials.gov webpage for guidance and instructions.

Sincerely,

Research Integrity and Oversight (RIO) Office
University of Houston, Division of Research
713 743 9204
cphs@central.uh.edu
http://www.uh.edu/research/compliance/irb-cphs/