The Impact of Accented English on Speech Comprehension

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THE IMPACT OF ACCENTED ENGLISH ON SPEECH COMPREHENSION

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DEDICATION

I dedicate this work with all my love and appreciation to the authors of my days, Benigno and Abigail Valles to whom I owe everything. I especially dedicate this to my wife, Nena and my daughters Larisa and Abigaił for their unconditional love and support throughout this endeavor, for without them, none of this would have been possible.
THE IMPACT OF ACCENTED ENGLISH ON SPEECH COMPREHENSION

by

BENIGNO VALLES, JR., MS, CCC-SLP

DISSERTATION

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Benigno Valles, Jr.
ABSTRACT

In the context of shifting demographics in the United States and with an increasing multicultural workforce, the verbal exchange of information is vital especially between health care providers and patients. Although English is the official language in the United States, many individuals from different national origins speak English with some degree of accent. Before we can address health care provider/patient communication, it is necessary to investigate the potential impact of accented English on speech comprehension and its implications on basic communicative interactions. The verbal exchange of information between health care providers and patients is important in diagnostics, treatment, patient compliance, and overall patient care across disciplines (Beck, Daughtridge, & Sloane, 2002; Slort, Schweitzer, Blankenstein, Abarshi, Riphagen, Echteld, et al., 2011). Previous studies investigating the impact of speech accents on communication have relied mainly on the subjective judgments of listeners in comparison to predominately White Standard American English speakers. This study directly assessed how various degrees of accented English affected a listeners’ ability to respond to a standardized auditory comprehension task (Revised Token Test, McNeil & Prescott, 1978; Lara, 2012) by having English speaking participants respond to spoken instructions from a native English speaker with standard American accent, and non-native English speakers with different degrees of accented English (near-native, moderate and heavy). Fifty-four English speaking participants (15 males and 39 females) between the ages of 18 and 37 were tested. It was hypothesized that among English listeners: 1) response accuracy is poorer on trials delivering instructions in non-native accented English as compared with native accented English; 2) response accuracy will decrease as the degree of accented non-native English increases; and 3) latency of response increases with an increase in the degree of accented English. A quasi-experimental design was
used to test the hypotheses using a repeated measures ANOVA, testing for the within-subjects main effect of accentedness on response accuracy and for the within-subjects main effect of accentedness on response latency. Study results show that accuracy of response in listeners was significantly affected by the heavy accent degree. Pattern of latency of responses demonstrated that the near-native accented speech required significantly less time to process than even the native English accent perhaps because this near-native form of English is representative of the surrounding community and participants in this study were more familiar with this form of accented English.
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Chapter 1

INTRODUCTION

1.1 Background

The purpose of this study is to investigate if speech comprehension of spoken English is affected by non-native accented English speech across native, near-native, moderate or heavy degrees of accentedness. Immigrants from all over the world come to the United States with different cultural and linguistic backgrounds, in hopes of creating a better life for themselves and their families. The Migration Policy Institute (2010) reported that from 1990 to 2000, the foreign-born population expanded from 19.8 to 31.1 million and from 2000 to 2008 this same population grew from 31.1 to 38 million. The U.S. labor force has also seen a dramatic change to a more ethnically diverse workforce that is increasingly non-native English speaking (Akomolafe, 2013).

Humans communicate using many forms, but mostly by verbal and nonverbal means. Most individuals use language as the primary mode for communication and speech as the means for expressing language (See Fig. 1).

![Communication Model](image)

**Figure 1. Communication Model.** This communication model represents a two-way communication in which the speaker and listener change roles in sending and receiving messages.
Dialects represent a form of language variation that is shared by a group of people within a language and are often referred to as regional accent since they incorporate specific uses of vocabulary, morphology, syntax and melodic patterns. More specifically, accent is the speech variability arising from the phonology of a language, and every individual who speaks does so with an accent. Although speech is highly variable both within and across speakers, it still serves as a consistent and reliable means with which to convey complex and intricate linguistic meaning (Owens, Metz, & Farinella, 2011). As Lippi-Green (2012) points out, in order to understand and define accents, one needs to have a reference or norm to which the accent can be compared.

Standard American English (SAE), sometimes referred to as mainstream English, has been the linguistic tool with which we measure, compare and/or judge the speech of others to establish how close or how distant this speech variation of English is from this standard. However, this “standard measure” is only an idea, a hypothetical construct that does not exist, it is difficult to define, and changes over time (Wolfram, 2000; Bauman-Waengler, 2012; Lippi-Green, 2012). Linguists have identified and mapped the major regional accents/dialects of the United States (North, Central, Southern, Western and Eastern) and have found that most English speakers in the U.S. agree that the central territory of the country, ranging from Colorado to Ohio, speak the more standard form of the English language (Edwards, 1997; Bauman-Waengler, 2012).

Likewise, accents can be difficult to define. In 1982, Wells defined accents as deviations along the phonetic, phonotactic, phonological, and lexical levels. Lippi-Green (1997) and Cristia et al. (2012) defined accents by looking at segmental and prosodic (suprasegmental) features. However, Cristia et al. (2012) further described accents from the perspective of the listener as divergent from the listener’s own use of segmental and suprasegmental features. For
the purpose of this investigation, accents are defined as variations in the execution of speech characterized by changes in segmental and/or prosodic features that are perceived as different from any native, standard, regional, or dialectal form of speech.

Two types of accents have been identified in the literature: native accent (L1) sometimes referred to as a regional accent, and non-native accent (L2) sometimes referred to as a foreign accent (Lippi-Green, 1997, ASHA 2014). In this investigation, we will consider SAE as a native L1 accent as it relates to the different degrees of L2 accented English. Another example of L1 accent is known as African American Vernacular English, which is a variation of SAE that is used in and around the U.S. Spanish American English, also known as Hispanic dialect, is a form of L2 English accent since it is influenced by Spanish and is also highly variable within the Spanish speaking communities all over the U.S. Other forms of L2 English accents such as Scandinavian English have evolved over time and are now considered L1 regional English accents.

The Civil Rights Act of 1964 was passed to prohibit discrimination on the basis of race, color, national origin, sex, and religion in employment, education and access to public facilities and public accommodations. However, not until 1987 did the Equal Employment Opportunity Commission (EEOC) expand the employment provision under Title VII in the U.S. Code to further define national origin which now includes linguistic characteristics of a national origin, referring to L2 accents. The law does provide some flexibility to the employers by which they can deny employment if the person’s accent seriously interferes with the job performance or the safety of the employee or that of others (EEOC, 2014). Accent discrimination cases brought before the courts have yielded mixed rulings because the law provides a degree of subjectivity when determining what constitutes serious interference.
There are legitimate instances in which accent discrimination is acceptable. Since 1951, the International Civil Aviation Organization (ICAO) implemented English as the international language for aviation in an effort to minimize communication breakdowns between air traffic controllers and airline pilots that service international routes. Clearly, this form of accent discrimination is based solely on safety concerns rather than on national origin discrimination.

Derwing and Munro (2009) highly recommend that in order to gain awareness into the understanding of accentedness and comprehensibility, attention should be given to the listeners’ judgments. Previous studies concerning acoustic relationships of intelligibility or comprehensibility of accented speech have depended mostly on listeners’ ratings when measuring accent effects. Speech intelligibility is what is perceived from the spoken message’s acoustic signal and is an impartial measure of the degree to which a spoken statement is understood (Nicolisi, Harrymann, & Kresheck, 1996). Auditory comprehension of speech is the idea or thought that is understood from the spoken message within a communicative interaction and is centered on a native speaker’s opinion of how easy or difficult it is for the listener to understand the speaker’s message (Derwing & Munro, 1997; Lindemann, 2000, 2002). Munro reported in 1993 that there were no standards that had been developed for rating accented speech, and exhaustive review of the literature indicates that still, to this date, no standards have been established. Southwood and Flege (1999) found that listeners segmented accentedness into equal intervals and proposed that a linear scale was an effective method for rating accents.

Multiple studies on the accented speech of individuals have been conducted since the 1950’s. Researchers have looked at the effects of L2 accents on comprehensibility using various rating scales and methodologies. In general, results from various studies point out that that native L1 accents (SAE) as well as regional accents tend to be perceived as easier to understand
than non-native L2 accents, especially unfamiliar L2 accents. These findings hold true across native speakers of English and non-native speakers of English. In the same way, studies involving neurologically impaired listeners have also yielded similar findings in that patients with aphasia rate non-native unfamiliar speakers as more difficult to understand than familiar L1 accents.

As a result of the changing demographics in the U.S., there are an increased number of patients and health care providers with different cultural and linguistic backgrounds who use spoken English as the principal means for exchanging information. This verbal communicative interaction between healthcare providers and patients could potentially impact the management of diseases and overall patient outcomes across disciplines when unfamiliar accents are spoken.

Therefore, the aim of this study is to compare the performance of listeners on speech comprehension tasks in response to native accented English and non-native accented English across different degrees of accentedness (native, near native, moderate and heavy). A breakdown in communication between the patient and healthcare provider can negatively affect the diagnosis, plan of treatment, compliance, and ultimately patient care (Beck, Daughtridge, & Sloane, 2002; Slort, Schweitzer, Blankenstein, Abarshi, Riphagen, Echteld, et al., 2011).

1.2 Statement of the Problem

In the context of shifting demographics in the U.S., and with a remarkably diverse healthcare staff in the United States, it is necessary to evaluate the impact of accentedness on speech comprehension and investigate the degree of accentedness that mostly affects the comprehension of the intended spoken message (Dunton, Bruce, & Newton, 2011).

This dissertation study compared the performance of individual listeners on speech comprehension tasks in response to native accented English and non-native accented English
across different degrees of accentedness (native, near native, moderate and heavy). Rather than having listeners use subjective judgments in a rating scale to evaluate comprehensibility of the accented speech, this study involved a one-directional communication approach using a modified version of the Revised Token Test (McNeil & Prescott, 1978; Lara, 2012) and used computer-assisted instrumentation for systematic presentation and randomization of task stimuli to objectively assess speech comprehension by measuring the response accuracy and response latency of the listeners.

1.3 Purpose of Study

The purpose of this study and aims of this research are to compare response accuracy among English listeners on trials delivering instructions in non-native accented English as compared to native accented English and to compare response latency among English listeners on trials delivering instructions in non-native accented English as compared to native accented English.

1.4 Research Questions

This investigation attempts to answer the following questions: 1) Is response accuracy poorer on trials delivering instructions in non-native accented English as compared with native accented English? 2) Will response accuracy decrease as the degree of accented non-native English increases? and 3) Does latency of response increase with an increase in the degree of accented English?
1.5 Assumptions

1) Listeners’ speech comprehension is different under the native accented English condition as compared to that under non-native accented English conditions. 2) Listeners’ performance in speech comprehension tasks is similar under native and near native accented English conditions. 3) Moderate to heavy accented English decreases listeners’ performance in speech comprehension tasks. 4) An increase in latency of response increases response accuracy when listening to non-native English speakers.

1.6 Significance of Study

When accents affect the spoken message, a breakdown in communication may result in a delay or inaccuracy of the intended message. A review of the literature suggests that comprehensibility is affected by unfamiliar non-native accented speech, that accent discrimination is indeed one of the last frontiers of discrimination, and that the comprehensibility of accented speech has been assessed mostly by nonstandard subjective rating scales. This breakdown in communication, especially in the healthcare setting, can negatively affect the diagnosis, plan of treatment, compliance, and overall patient care. Because healthcare personnel is more diverse due to increased immigration (Dunton, Bruce, & Newton, 2011); this study has significant social and clinical implications.

This study attempts to provide objective data regarding the degree or degrees of accented English that may affect speech comprehension resulting in a breakdown in communication. This data will provide speech-language pathologists with additional information to guide their clinical management of accents in the qualification process for services and during service delivery. If services are warranted, the treatment of accents should be geared towards increasing the
successful transmission of the accented speaker’s message rather than focusing on the reduction or elimination of an individual’s accent.

This study also provides other health related disciplines with needed information about the communication process between healthcare providers and patients or between healthcare providers themselves. Understanding the level or degree of accentedness that most impacts the exchange of information between healthcare providers and patients provides us with the necessary knowledge to minimize misunderstandings and ensure that the transmission of the spoken message is successful.
Chapter 2

LITERATURE REVIEW

2.1 Speech Variability

People communicate using a variety of methods, including verbal and nonverbal modalities. Although language is the primary mode for human communication, the most widely used means for expressing language is speech. While speech variability exits within and across speakers, it still serves as a consistent and reliable process with which to convey complex and intricate linguistic meaning (Owens, Metz, & Farinella, 2011). If the central auditory mechanism of hearing has developed normally, humans have the ability to cope with variability, at least to some degree, of the spoken message (Flowers, 1983). This ability to recognize the same sound over different speakers, pitches, and other varying aspects in the environment is referred to as perceptual constancy (Bauman-Waegnler, 2012).

Perception (intelligibility), comprehensibility and interpretability are three separate processes that work together to convey the speaker’s message to the listener. Speech perception and speech comprehension are often not accurately or consistently distinguished in the literature while speech interpretability is seldom considered in research studies.

The Smith paradigm of intelligibility contains three levels: intelligibility, comprehensibility, and interpretability (Smith, 1978). As previously noted, speech intelligibility is the acoustic signal that is perceived from the spoken message and is an unbiased measure of the amount to which an utterance is understood (Nicolisi, Harrymann, & Kresheck, 1996). Comprehensibility is the idea or thought that is understood from the spoken message within a communicative interaction and is centered on the perception of how simple or difficult it is for a listener to understand the speaker’s message (Derwing & Munro, 1997; Lindemann, 2000, 2002).
A third dimension of intelligibility is the concept of interpretability. Interpretability refers to a person’s ability to understand the motivation or purpose of the intended utterance. Interpretability is found in cross-cultural settings and serves a more socio-cultural function (Kachru, 2008). In other words, an utterance may be intelligible and comprehensible but may not be interpretable. For example; if a young man speaking English as his L1 were to ask another English L1 speaker, “Where are you going?” and the other young man responds, “To the blue after breakfast,” the utterance may have been intelligible (perfectly articulated) and comprehensible (understood the words and syntax) but the response may not have made sense to the young man because his understanding of blue as a color does not help explain the intended meaning of the utterance. In this example, “the blue” has a socio-cultural function since the community gym where the neighborhood youth convene socially is blue and is commonly referred to as “the blue” within that community. Without having prior knowledge of “the blue”, the listener’s ability to interpret the message is impaired.

Previous studies have relied primarily on subjective measures when addressing intelligibility and comprehensibility of accents. For the present study, the primary focus will be on the objective measurement of intelligibility and comprehensibility in basic communicative interactions before we can address the interpretability factor and health care provider/patient communication. This study takes place in a university laboratory outside a socio-cultural environment and experimental stimuli are simple commands using colors and shapes in an attempt to objectively assess the impact of accentedness on the ability to perceive the spoken message’s acoustic signal and its perception of how simple or challenging it is for the listener to comprehend the speaker’s message.
Variations exist in spoken language among all speakers and even within speakers in terms of phonology, morphology, syntax, semantics and language use. This variability is not only normal in a society that encompasses numerous social groups, but is a central part of the linguistic economy of the community to satisfy the linguistic demands of everyday life (Lippi-Green, 1997, 2012; Bauman-Waengler, 2012). Linguists have identified three sources that may explain language variations (Lippi-Green, 1997, 2012):

- **Language-internal pressures**, derived in part from the mechanics of production and perception of language.
- **Language-external pressures**, influences on language, as a social behavior subject to norms and other formative social pressures.
- **Variation** derived from language as a creative vehicle of free expression.

To understand the development and maintenance of variations of accented speech, we must primarily consider the first two sources of language variation. The first, language-internal pressures, proposes that human neurological and vocal mechanisms used for speech production and perception are structurally and physiologically universal and because of this, there is great similarity in the way we produce and perceive the sounds of a language. One can say that every person is born with the potential to produce a full range of possible sounds. There is a finite set of potentially meaning-bearing sounds (vowels, consonants, tones) which may be produced within the human vocal tract. This set is universal and is available to all human beings in the absence of physical or neurological impairments. Each language uses some of the available sounds, but not all (Lippi-Green, 1997). Sounds that survive, because of language-external pressures, become part of the child’s language and are arranged into language-specific systems where each sound stands in relation to the other sounds. The study of speech sounds, their form,
substance, perception and the application of this knowledge to linguistic expressions is known as phonetics. How these sounds are organized into systems is the focus of phonology (Edwards, 1997).

Secondly and most importantly when referring to accents, language-external pressures are the influences on language from our social surroundings, and these help in developing, shaping, and maintaining a set of language behaviors that are subject to normative and other formative social pressures that will eventually manifest in accents and/or dialects. Children are born with the capacity to produce a finite set of possible sounds; however, they eventually limit themselves to the sounds they hear being used around them. This process is the same for all speakers regardless of linguistic, cultural or ethnic backgrounds (Lippi-Green, 1997).

Lippi-Green (1997, 2012) describes two types of accents: First language accent (L1) and second language accent (L2). L1 accent is simply a structured speech variation in the native language. In other words, all native speakers of English have some variation usually due to some geographic area, a melding of one or more areas, or the influence of membership within a given cultural, ethnic or social group. L1 accents are sometimes referred to as regional accents or dialects (Ingram, 2009). Bauman-Waengler (2012) defines dialect as any language variety that is common among a group of speakers that encompasses specific use of vocabulary word forms, sentence structure, and melodic patterns. Lippi-Green (1997) describes accents as loose bundles of prosodic and segmental features that are dispersed across a geographic area and/or social area. In other words, dialectal language variations contain speech variations within them and are therefore, manifested as distinctive accents in and of that dialect.

The second type of accent, L2 accent, is manifested when a native speaker of a language acquires a second language (for the purposes of this study, that is English), and the speaker’s
native language phonology breaks through into the target language. Children who are exposed to multiple languages during their language acquisition period may acquire more than one language if the social conditioning factors are positive resulting in L1 accents in the languages spoken. Although L2 accents are entirely different than L1 accents, both are influenced by language-external pressures in much the same way. However, L2 accents have linguistic characteristics or traits that are more closely associated with the speaker’s national origin or their native language.

In looking at the speech differences among individuals, one must keep in mind that the developmental process of the various accents and how these accents are maintained, sometimes across generations, all share the same paths resulting in unique manifestations of spoken language variations. It is important to note that the majority of these processes are conducted at the unconscious level where the manipulation or control of the accent is not always at the will of the speaker (Lippi-Green, 2012).

Jakobson and Halle (1955, 1971) described their distinctive features theory which defines the boundaries of sound variability within a language’s sound inventory. Consonant sounds are typically described by the presence or absence of voicing, place of articulation, and manner of production. Vowels, which are produced with a more open vocal tract, tend to be described in relation to the oral cavity in terms of lingual height, advancement, and tension, and are also described as being rounded or unrounded in relation to the oral opening. Each sound, therefore, has its own unique set of distinctive features. A change in any one or more segmental features may result in sound distortion, or depending on the features involved, may change the intended sounds entirely resulting in what people perceive as accent.
2.2 Examples of L1 and L2 Accents

An example of L1 accent is African American dialect, oftentimes called Black English, Ebonics, or African American Vernacular English. This refers to a systematic, rule-governed dialect/regional accent that is spoken by many but not by all African Americans living in and around the United States (Bauman-Waengler, 2012). This dialect is a type of L1 accent because it varies to a certain degree from the SAE language. African American dialect actually shares a number of commonalities with SAE and with the regional dialect known as Southern English. There are however, differences that distinguish this dialect in the morphological, syntactical, semantic, pragmatic, and phonological systems from SAE. Morpho-syntactical and semantic system differences are generally more characteristic of African American dialects than phonological differences, which tend to be more characteristic of L2 accents. The degree to which people use African American dialect also varies significantly by age, gender, socioeconomic status, and geography.

Washington and Craig (1994) discuss how the use of this dialect decreases as individuals become older. In fact, children in primary school use a type of African American dialect that differs most from mainstream SAE. In adolescence, dialectal features differ less from mainstream SAE and those differences from SAE tend to level off in adulthood.

Males often demonstrate increased use of African American dialect when compared to female speakers. This difference may be indicative of social differences between males and females (Labov, Yeager, & Steiner, 1972). The use of this dialect is also closely associated to socioeconomic status. Lower and working class African Americans apparently use this dialect more often than do middle to upper-middle-class African Americans (Bauman-Waengler, 2012). The language of African Americans living in the rural south is different than that of the Hispanic
and European Americans who live alongside them, but is still unlike the style of African American dialect spoken in urban centers in the south (Cukor-Avila & Bailey, 2001).

An example of L2 accent is Spanish American English. Many dialects and language variations of Spanish influenced English are classified under the broader category referred to as Spanish American English. The 2000 U.S. census showed that Mexicans, representing 66% of the distribution, make up the largest group of Spanish-speaking individuals in the United States (Bauman-Waengler, 2012). Bauman-Waengler also reports that in the United States, over 4.5 million students are considered Limited English Proficient (LEP) speakers and among these individuals, 79% claim Spanish as their first language. In Texas, she reports that 93.4% of LEP students claim Spanish as their first language. In El Paso, 71.0% of the population speaks Spanish as their first language and 30.4% speak English less than "very well" according to the U.S. Census Bureau (2009-2013 5-Year American Community Survey, 2013). Undoubtedly, the type of accent in this case is a L2 accent even though Spanish is predominantly this region’s L1, especially amongst first generation Americans.

A significant amount of confusion exists across all segments of the Hispanic culture with regards to which language or languages should be used during a child’s developmental years. There are households where either Spanish or English is only spoken, where both are spoken, or where both are spoken resulting in code switching or code-mixing between the two languages (Brice, 2002; Genesee, Paradis, & Crago, 2004; Kohnert & Derr, 2012). Parents are often misguided and are advised to teach their children English first since they are now living in the United States. However, when this advice is followed, children often receive less-than-optimum language input from parents who may or may not be fluent in English (Brice, 2002; Goldstein & Iglesias, 2013). This lack of appropriate language modeling in first generation American
children not only affects how English language variation will manifest but may also jeopardize the emotional and cultural connection with the family (Brice, 2002). Second and third generations still face Spanish-speaking grandparents, English and Spanish-speaking parents and English speaking siblings in the home.

The age at which a second language is introduced to a child is crucial in this population. As previously stated, humans are born with the capacity to produce and perceive a multitude of sounds. It is the external language influences that are responsible for the development, shaping, and maintenance of a child’s language phonology. Therefore, the earlier a child is exposed to a variety of sounds outside their native language, the better they are at assimilating language phonologies and minimizing language variance or L2 accent.

Some accents may have initially started out as L2 accents but with time end up shifting to L1 accents. For example, Scandinavian American English has its origins from the countries of Denmark, Norway, and Sweden. Their native languages are considered to be North Germanic languages; however, this population does not appear to have been studied as its own group, but rather was included in the mix as part of the northern region dialects of the United States. The regional dialect that encompasses this specific group is the dialect of the North Central region which has a tendency to maintain a long high position for long vowels and diphthongs as well as the colored-r (Bauman-Waengler, 2012). Today, we refer to Scandinavian accented English simply as a regional, L1 accent of the North Central region of the U.S. due to its minimal variation from the SAE accent.

2.3 Accent Discrimination

The United States is a land of immigrants from around the world with different cultural and linguistic backgrounds who come here in hopes of creating a better life for themselves and their families. Between 1990 and 2000 alone, The Migration Policy Institute (2010) reported
that the foreign-born population increased 57% to 31.1 million and between 2000 and 2008 this same population has increased an additional 22.2% to 38 million. As a result, approximately 27% of physicians/surgeons and 22% of nurses and other health care providers in the U.S. are foreign born. The U.S. labor force has seen a dramatic transformation to a more ethnically diverse workforce that is progressively more non-native English speaking (Akomolafe, 2013).

As a country, we pride ourselves in upholding the rights of others by means of our constitution, our laws and our respect for one another. Because this was not always the case for many Americans in our history, the U.S. Congress passed the Civil Rights Act in 1964 to prohibit discrimination on the basis of race, color, sex (including pregnancy), national origin, and religion in employment, education, and access to public facilities and public accommodations, such as hotels and restaurants. Title VII in the U.S. Code is often referred to as the employment provisions of the law (EEOC, 2014). In 1987, The Equal Employment Opportunity Commission (EEOC) expanded their definition of national origin to include linguistic characteristics of a national origin (EEOC, 1987 as cited in Ingram, 2009) and the new Civil Rights Act of 1991 extended Title VII benefits to all employees in U.S. corporations abroad not just in the continental U.S. (Akomolafe, 2013; EEOC, 2014).

Although this law protects national origin accents from discrimination, it also provides some latitude to employers by which they can deny employment if the person’s national origin accent seriously interferes with the employment duties, employee safety or the safety of others (EEOC, 2014). This in effect, allows a degree of subjectivity in determining what constitutes serious interference with job performance and how it will be determined. The discretion to choose among equally qualified candidates by employers allows them to bring up the “unintelligible English” defense in cases of accented speakers, and the courts’ willingness to
sustain this threatens to reverse Title VII’s protection against national origin discrimination by surrendering the decision of intelligibility to the subjective evaluation of employers and the courts themselves (Nguyen, 1993).

The law unintentionally gives the employers the protection they need to ensure that accent discrimination can be continued in the workplace under the provision known as the Bona Fide Occupational Qualification (BFOQ). BFOQ is a quality or an attribute as in “proficient in English” or “excellent oral English communication” that employers are permitted to contemplate in hiring or retaining employees under the employment law (Akomolafe, 2013). The problem with this, according to Akomolafe, is that no one, including the EEOC, has defined precisely what proficiency means or what the basis is for an acceptable measure to grant or deny employment.

Mr. James Kahakua, for example, was a meteorologist with 20 years of experience in his profession and a native of Hawaii who spoke English and Hawaiian Creole English. But despite his considerable educational background, he was not promoted due to his Hawaiian accent. Mr. Kahakua sued under Title VII of Civil Rights Act of 1964 on the basis of language characteristics associated to national origin, and lost. Although his accent should have been protected under the law, the judge ultimately determined that he could use Standard American English (SAE) if he wanted. Although the ruling never mentioned how Mr. Kahakua’s accent interfered with his job performance, the judge simply upheld the employer’s assessment of Mr. Kahakua’s accent as unintelligible (Kahakua v. Friday, 1989).

The EEOC has taken various cases to court and won under national origin discrimination due to accented speech. In 2002, the EEOC successfully defended a case in which it required a company to pay a lump sum of money to a woman for not hiring her as a receptionist because of
Another case was brought against Seattle-based Boeing for firing a Vietnamese-American after subjecting him to a hostile work environment, including comments about his accent. That same year, the EEOC won its case against a New York-based music school because the supervisor at the school made derogatory comments about the employees’ accents and pronunciation of English as well as requiring them to only speak English at work (Hearn, 2000).

The differential accent discrimination phenomenon described by Quinn and Petrick (1993) helps to explicate main differences in how people with non-native accents are treated. They note that low-status accents are likely to be construed as hard to comprehend and are more suggestive of ineptitude while high-status accents are construed as easier to comprehend and are more indicative of aptitude. Foreign accents purported to be low-status are also more predisposed to discrimination than high-status accents (Goto, 2008). Not all accents are alike. Hispanic, African, and Eastern European accents are some examples of low-status accents. Conversely, not all accents are considered negatively. According to Ingram (2009), French and Australian accents are viewed positively by many. Some would say that French or British accents are “cute” while others look down upon a Hispanic accent (Lippi-Green, 1997). Speakers of low-status accents suffer considerably more from accent discrimination than speakers of high-status accents (Akomolafe, 2013). Holmes (1992) reported that until 1992, the EEOC had not received one case based on accent discrimination from any Western European immigrant. This further demonstrates that differential accent discrimination does exist.

Homegrown accents or dialects that are a result of variations of one’s native language due to geographical areas or cultural groups not associated to national origin are also negatively perceived and discriminated against. However, Ingram (2009) points out that homegrown
accents and dialects are not protected under Title VII of the Civil Rights Act of 1964. Although not explicitly stated under Title VII, Ingram’s statement was corroborated via telephone conversation with an officer from the EEOC national office (J. Clinton, personal communication, Feb. 13, 2014). Wolfram (2013) notes that language prejudice often goes unnoticed and in some cases, it is even encouraged while other forms of disparities, partiality, and discrimination have come to be uncovered and recognized more in recent decades.

The American Speech-Language Hearing Association (ASHA, 2014) reports that for some individuals, accents may be a source of pride but for others who may not be understood, accents are problematic. Some individuals avoid social interactions for fear of not being understood, some experience frustration when repeating themselves all the time, and some find it difficult when they are trying to communicate and people focus more on the accent than on the conversation. These types of communication problems can negatively affect the individual’s day-to-day activities, job performance, educational progress, and may also affect self-esteem. As a result of these negative experiences, individuals with accents may seek the services of speech-language pathologists to help change or modify their accents.

Kim, Wang, Deng, Alvarez and Li (2011) explored how English proficiency in early adolescence related to apparent biased experiences and depressive symptoms in juveniles. These researchers concluded that among Chinese American teenagers in middle school, low levels of self-reported English proficiency were associated to these same individuals speaking English with an accent in high school which consequently related to their awareness that they had been labeled as “perpetual foreigners” (Kim, et al., 2011, p. 291). Furthermore, the perpetual foreigner label was associated to discriminatory victimization experiences and higher risks of depressive symptoms among males. Among females, the label of perpetual foreigner was
associated to perceived daily discrimination and higher risks of depressive symptoms (Kim, et al., 2011).

In the realm of education, Lippi-Green (1994) discussed a case in which a teacher’s contract was not renewed because the administrators claimed she had a “heavy accent.” In this case, no one made the effort to objectively evaluate her communication skills needed for teaching. In other words, students in her classroom were never assessed as to how the accent impacted her ability to communicate with them or if her accent affected their learning. She took her case to the school board but the school board simply offered to place her at another school where her accent would not interfere with her duties. There are countless injustices such as this, in which discrimination based on a person’s accent is a common occurrence.

There are cases in which accents clearly interfere with job performance, employee safety and/or the safety of others. The aviation sector headed by the International Civil Aviation Organization (ICAO) implemented the use of English as the international language for aviation since 1951 in an effort to eliminate communication error. Only recently did the ICAO implement a universal aviation English proficiency scale ranging from level 1 to level 6 consisting of six parameters; pronunciation, structure, vocabulary, fluency, comprehension, and interactions (See Appendix A). This mandate requires that all pilots flying international routes and air traffic controllers working at international airports must meet level 4 English proficiency at minimum and will be reassessed every three years.

Tiewtrakul and Fletcher (2010) conducted a study on problems in comprehending communications between air traffic controllers and pilots by analyzing the voice transmissions of international flights recorded by the Approach Control Services at the Bangkok International Airport, Thailand. Their findings revealed that voice transmissions between pilots and air traffic
controllers of international flights were problematic especially with the use of different English accents. Results from the study show that communication errors defined by episodes of pilots not understanding occur significantly more frequently when both speakers are non-native English speakers, and even more so with intricate messages containing numerical data (Tiewtrakul & Fletcher, 2010). In the interest of public safety and the safety of the individual, employment discrimination is justified even when the accent is protected under Title VII.

As long as SAE remains the gold standard to which all other speech variations are compared, accent discrimination will continue to exist. This concept of SAE is perpetuated in educational systems that maintain its dominance while denigrating people’s primary linguistic identity. These same systems deny linguistic differences by stressing the need to learn SAE in the schools (Lippi-Green, 1997). This idea is based on the premise that speakers need SAE to progress and subsist in our American society. Lippi-Green points out that those individuals who speak non-mainstream dialects of English adopt the belief of language inferiority and acquiesce to the use of SAE as being superior. Additionally, the media and the film industry use language to highlight stereotyping and stigmatizing perceptions of the various languages, while simultaneously promoting mainstream varieties of English in voices of authority (Lippi-Green, 1997; Wolfram, 2013; Akomolafe, 2013).

Standard American English is the linguistic tool by which we judge the speech of others to determine whether or not a given speech variation of English approximates acceptability. In doing so, we fall into the practice of favoring one speech variation over another. Attitudes will continue to negatively impact those who speak with accents or dialects other than SAE, which now represents a majority of the American population. Unless these attitudes are addressed, the increased numbers of American employees with accents in the bottom levels of the business
sector, and conversely the underrepresentation of these same individuals in the executive ranks of the business, will remain unchanged (Wolfram, 2013; Akomolafe, 2013).

2.4 Understanding Accentedness

Research addressing the communication needs of individuals with accents has been ongoing since the 1950s in the areas of linguistics, foreign language instruction, and English as a second language. Sikorski (2005) points out that the field of speech-language pathology has actively been addressing the communication needs of individuals with accents going back only to the 1980s. She recommends that this profession look outside the field of speech-language pathology for more relevant research on accented speech. However, in conducting a literature review, limited information was found prior to the late 1980’s for empirical findings relevant to the present study.

A variety of methodologies have been applied in the study of intelligibility and comprehensibility of accents. Most studies from the 1950s to the 1970s addressed intelligibility by concentrating mostly on pronunciation and how the intelligibility of accents was perceived as rated mainly by white, native English speakers in comparison to their Standard American English (Nelson, 2008). Lane (1963) looked at studies of intelligibility using single syllable recordings, while others like Bansal (1976) and Munro and Derwing (1995) used actual words and sentences. Other researchers have employed the use of interviews, the reading of texts, verbal monologues and spontaneous speech samples in an effort to measure the concept of comprehensibility (Bobda, 1983; Smith & Rafiqzad, 1983; Lanham, 1990; & Smit, 1996). To further understand the accentedness phenomenon, Derwing and Munro (1995) strongly believed that to gain an insight into the understanding of accentedness and comprehensibility, one should focus on the listeners’ judgments. Their findings demonstrate that L2 accented speech is
typically perceived as being more difficult to understand than L1 accented speech (Munro & Derwing, 1995).

Scales have been used to acquire universal measures of foreign accents and measure the degree to which the accents of non-native speakers differ from those of native speakers of a language (Southwood & Flege, 1999). Since there are no standards to date for rating accented speech (Munro, 1993), Southwood and Flege (1999) note that when rating native speakers of Italian, English-speaking listeners segmented accentedness into equal intervals suggesting that a linear scale was an effective method for the rating of accents. The authors further suggest that scales should have a sufficient range to allow for rater flexibility in judging accents. Restricting raters to specific categories of accentedness or providing raters too great of a range would not be as informative and effective in capturing accentedness.

Going beyond comparing accents, Munro and Derwing (1995) conducted a study that looked at the impact of non-native accent on sentence processing time by having listeners verify statements that were true or false as well as rate the accent and comprehensibility of the statements presented. Results indicated that the native English speakers’ statements were more often correctly identified as true or false than statements from the Mandarin speakers, and response latency data indicated that the Mandarin-accented statements needed additional time to assess than the statements from the native speakers of English. Because accented speech is essentially a perceptual phenomenon, one needs to consider the context of the listening task which can affect the perception of the accented speech. Munro and Derwing (1998) postulated that when accented speech is heard at a slower rate than at a normal rate of speech, it would appear to be less accented and more understandable. Their findings propose that the ideal speaking rate for non-native speakers may be to a certain extent slower than the rate of native
speakers. Derwing and Munro (1999) further explain that because listener demands increase processing time, listeners tend to rate accented speech as less understandable even though it is entirely intelligible. On the condition that non-native speakers routinely speak slower than native speakers, the strategy of deliberately speaking at a slower rate than normal was not normally useful as means to increase understanding and improve accentedness. Cristia et al. (2012) point out that initially, unfamiliar accents do affect the processing of linguistic information across the lifespan but that these listeners eventually adjust to the accented speech making it possible for listeners to eventually understand the accented speaker’s speech in spite of the accent. However, this period of adaptation may vary depending on the amount of time the listener is exposed to the accent and the listener’s ability to identify the processes or patterns of speech found in the speaker’s accent.

The American Speech-Language-Hearing Association (1997) issued a recommendation concerning professionals and students who speak non-standard dialects of English or who speak English with an accent, indicating that these individuals are capable of making appropriate diagnostic decisions or are able to achieve appropriate treatment outcomes because there is no research to prove otherwise. However, Langdon (1999) points out that there is also no research data to support ASHA’s position either.

In general, most previous studies have concentrated on specific features of speech such as consonants, timing of vowels, intonation in relation to fundamental frequencies, or time-based measures of speech production. More recently, Kang, Rubin and Pickering (2010) studied the prosodic features of accentedness and the judgment of oral English language learner proficiency. Their findings suggest that prosodic features as a whole are responsible for half of the differences in rating understandability and oral proficiency. These findings add to the
understanding of this complex phenomenon in terms of combining the segmental and prosodic features involved in the production of accented speech, rather than studying these features as separate or independent components.

Other studies have looked at the impact of international dialects of English, ethnic accents, and regional English accents, on comprehension. Major, Fitzmaurice, Bunta and Balasubramanian (2005) examined the level of difficulty experienced by listeners with regional, ethnic, and international dialects of English in comparison to Standard American English (SAE). Results indicated that there was no significant difference between ESL and native English listeners in how they rated foreign and regional accents. Their findings revealed that native English listeners and English as second language (ESL) listeners both scored higher on listening comprehension tests with regional forms of English accents and both scored lower with ethnic and international dialects of English. These findings suggest that auditory information is similarly processed by monolingual and multilingual listeners.

Levi, Winters, and Pisoni (2007) examined the impact of the listening environment and vocabulary frequency on the perception of foreign accented speech. Listeners were asked to rate a foreign accent under two conditions: 1) auditory and 2) auditory and visual (orthographic display of the target word). Vocabulary words containing high and low frequency use were rated in the study. Levi et al., (2007) revealed that low frequency words were rated as having a greater degree of accent than higher frequency words. The authors found that overall; there are other independent factors that affect the perception of degree of foreign accent than just the speaker’s manner of speech production.

Similarly, Smiljanic and Bradlow (2011) studied how native Croatian language background works together with speaking style alterations in defining levels of speech
intelligibility. Several important findings were obtained from this investigation. First, data revealed a positive correlation between proficiency in the L2 processing and the use of clear speech techniques. As non-native listeners increase their proficiency in L2 processing, they increase the use of clear speech enhancements such as decreasing speaking rate, a broader active pitch range, larger sound-pressure levels, more noticeable stop releases, and using distinctive phonological contrasts as used by native speakers. Secondly, native listeners found clear speech of highly proficient non-native speakers just as intelligible as the conversational speech of native speakers. Additionally, the authors found that non-native clear speech benefited both native and non-native listeners alike. The data also revealed that the speech of non-native speakers was reliably rated as having a higher degree of foreign accent when compared to the native speakers and the rating of accentedness did not appear to change when speech was presented in noise or in quiet backgrounds. These findings and those found in Levi, Winters, and Pisoni (2007) suggest that to a certain degree, objective intelligibility and subjective accentedness are independent entities of non-native speech.

Limited treatment data is available on the impact of accented speech and assessment of individuals with communication disorders in the various parameters addressed by speech-language pathologists (Langdon, 1999). Langdon conducted a survey concerning non-native accents, intelligibility, and the implications for effective treatment on bilingual speech-language pathology (SLP) clinicians in California. Opinions on how clinicians’ foreign accent impacted speech and language treatment for native speakers of a given language were collected. Survey results indicated that more than half of the respondents are in disagreement about what might be the acceptable level or degree of accentedness (Langdon, 1999).
Dunton, Bruce, and Newton (2011) likewise investigated the effects of speaker accents that are unfamiliar to adults with neurological impairments on auditory comprehension. Their findings revealed that significantly more errors were made by individuals with aphasia in spoken sentence comprehension tasks with unfamiliar forms of accent than with a familiar accent. This study proposes that speaker accent familiarity can have a significant effect on the accuracy of understanding sentence level utterances in adults with aphasia. Bruce, To, and Newton (2012) also assessed comprehension by looking at the impact from regional and foreign accents in adults with aphasia. Their findings on listeners who are neurologically impaired appear to support results from Major, Fitzmaurice, Bunta and Balasubramanian (2005) in which monolingual and multilingual listeners performed similarly in auditory comprehension tasks. Individuals who are neurologically impaired and non-impaired individuals also appear to perform similarly with familiar and unfamiliar forms of accents.

2.5 Healthcare and Accented Speech

The possible breakdown of the spoken message in communication interactions resulting from how an individual uses his/her vocal mechanism and/or phonological systems to communicate, impacts not just speech-language pathology but other areas in healthcare. The increased number of patients and health care providers from diverse backgrounds is a challenge for effective communication. Relationships between these two groups are essential in establishing continued and open communication with one another. The verbal exchange of information between the health care providers and patients and among healthcare providers themselves is important in diagnostics in the emergency departments, in the management of diseases, in mental health, in palliative care, and its impact on patient outcomes across
disciplines (Beck, Daughtridge, & Sloane, 2002; Slort, Schweitzer, Blankenstein, Abarshi, Riphagen, Echteld, et al., 2011).

Accents are present in health care provider and patient interactions. Some individuals speak multiple languages with native like proficiency; however, most tend to speak a second language with an accent influenced by their native language (Lippi-Green, 1997). This verbal communication is utilized to make contacts, to reach out to others, to satisfy wants and needs, to reveal feelings and thoughts, and to share information with one another (Owens, Metz, & Farinella, 2011). In healthcare settings, a breakdown in communication can negatively affect the diagnosis, plan of treatment, compliance, and ultimately, patient care outcomes.

Because the United States has seen an increased growth in its limited English proficiency population, health care providers are continually faced with limited language services in the medical setting. However, the responsibility for ensuring safe and effective communication with patients lies entirely with the health care provider, not with the patient (Schenker, Lo, Ettinger, & Fernandez, 2008; Fernandez, Schillinger, Warton, Adler, Moffet, Schenker, et al., 2011). August, Nguyen, Ngo-Metzger, and Sorkin (2011) point out that these communication barriers have contributed to health disparities among minority populations especially in the management of chronic diseases.

Garra, Albino, Chapman, Singer and Thode (2009) looked at the impact of language barriers on the use of diagnostic testing in the emergency department. Their findings demonstrated that language discordance was the most frequently reported form of communication barrier. Emergency room physicians felt that communication barriers decreased their confidence in diagnosing and increased the use of supplementary tests needed to help them
reach their clinical findings (Garra, et al., 2009). This is clearly a misuse of time and resources that impacts the effectiveness and efficiency of emergency departments in general.

In an effort to prevent a communication breakdown between health care provider and patient, Jain and Krieger (2010) studied strategies to bypass cultural and linguistic barriers in medical interactions used by international medical graduates. These same physicians reported language differences on the basis of accents, paralinguistics, and use of slang words as problematic especially in engaging in small talk with the patient, but not when discussing their clinical information which is more systematic and prescriptive.

Additional empirical studies need to be conducted to understand health care provider-patient communication beyond the physician-patient relationship. The impact of communication barriers resulting from accented speech on patient care across health professions needs to be studied in an effort to further the understanding of health care provider-patient interactions, including physical therapy, occupational therapy, speech-language pathology, social work, nursing, psychology, and pharmacy among others.

2.6 Summary

Speech is highly variable among speakers but still serves as a consistent and reliable means with which to convey meaning (Owens, Metz, & Farinella, 2011). Although our perceptual constancy provides us with the innate ability to identify the same sound across different speakers, across pitches, and across other contexts, a breakdown in communication may still occur when L2 accents differ in any one of the distinctive segmental or prosodic features of a target sound resulting in the possible miscommunication of the spoken message. Unfortunately, these differences have been the basis for discrimination against individuals with L2 accents and L1 regional accents as well.
The Civil Rights Act of 1964 prohibits discrimination on the basis of race, color, national origin, sex, and religion in employment, education, and access to public facilities and public accommodations. Not until 1987 did the EEOC further clarify that linguistic characteristics of a national origin were covered under the Title VII national origin provision but failed to include the protection under the law of L1 regional accents. Additionally, the law left some degree of subjectivity in determining if the person’s national origin accent seriously impedes their ability to work, the employee safety or the safety of others (EEOC, 2014). Furthermore, the law left the decision of intelligibility to the subjective evaluation of employers and the courts themselves rather than to professionals who are more capable of conducting these evaluations.

To date, no standards for rating accented speech exist. In previous studies, listeners segmented accentedness into equal intervals, suggesting the use of linear scales as more effective methods for the rating of accents so long as the scales had a sufficient range to allow for rater flexibility in judging accents. Restricting raters to specific categories of accentedness or providing raters too great of a range would not be as informative and effective in capturing accentedness.

Some researchers have addressed accentedness in numerous ways by studying either segmental features, suprasegmental features of L2 accents or a combination of the two. A review of the literature proposes that listeners of non-native accented English are able to better comprehend a more familiar form of accent that is closer to their L1 accent than non-familiar L2 accents. Other findings revealed that native SAE listeners and non-native ESL listeners respond to regional or national origin accents in much the same way suggesting similar processing of auditory information. When comparing individuals with neurological impairment to non-impaired individuals, researchers also found that both groups performed better with more
familiar regional accents than with unfamiliar foreign accents. Bear in mind that most findings relied primarily on the subjective judgments of listeners.

This study uses a novel experimental procedure that requires an overt physical behavior (touching a computer screen) in response to the accented spoken command from the modified version of the RTT (McNeil & Prescott, 1978; Lara, 2012) where each spoken command holds semantic information that is unpredictable. Furthermore, this experimental procedure presents the accented spoken commands in a systematic and random way within each subtest of the modified RTT (Lara, 2012) to minimize predictability and adaptability of both the speaker and their respective accents. A review of the literature did not find studies using an experimental procedure comparable to the one used in the present study.

The fundamental question in studies investigating accented speech is whether the spoken message from a non-native speaker’s degree of accent is understood in whole or in part by other listeners. This initial study attempts to objectively assess the impact of accentedness on speech comprehension by following simple verbal commands to help us understand how, if at all, the accent influences the listener’s understanding of the spoken message in its most basic form. Failure to overcome communication barriers between and among individuals affects the overall communicative process, leading to misunderstandings that could have grave consequences especially between healthcare providers and patients. This study has significant clinical and social implications as the United States is experiencing increased immigration.

This investigation attempts to answer the following questions: 1) Do listeners demonstrate a difference in response accuracy between the native English accented speech commands and the non-native English accented speech commands? 2) What degree of accented
English (native, near-native, moderate or heavy) most negatively impacts response accuracy? 3) Does latency of response impact response accuracy?
Chapter 3

METHODS

The purpose of this study is to compare the performance of listeners on speech comprehension tasks in response to native accented English and non-native accented English across different degrees of accentedness (native, near native, moderate and heavy). The literature review offers evidence that speech comprehension of accented speech has been investigated but has relied mainly on the subjective judgments of listeners. This study attempts to objectively understand what degree of accentedness within the intended message, if any, impacts the speech comprehension in listeners. The Revised Token Test (RTT) (McNeil & Prescott, 1978) was selected for having well established reliability and validity measures and because this instrument contains auditory and linguistic information that is free of contextual cues and cannot be predicted. This investigation attempts to answer the following questions: 1) Do listeners demonstrate a difference in response accuracy between the native English accented speech commands and the non-native English accented speech commands? 2) What degree of accented English (native, near-native, moderate or heavy) most negatively impacts response accuracy? 3) Does latency of response impact response accuracy?

In this chapter, the research study methodology will be described including discussions on the study rationale, preliminary study, study design, research sample, data collection/analysis, pilot study, and study limitations.

3.1 Rationale

Every individual who uses speech as a means to communicate with others speaks with a degree of accent regardless if it is considered an L1 accent or an L2 accent. It is important to study the impact of the accented English on speech comprehension especially when the
communication involves the exchange of information between healthcare providers and patients or between healthcare providers themselves. This study uses a mono-directional approach to the communication model to aid in understanding of what degree or degrees of accentedness most impacts listener comprehension (See Fig. 2).

**Figure 2. Mono-Directional Communication Model.** This communication model represents a one-way communication model where the speaker transmits an instruction and the listener performs a task.

Knowing the degree of accentedness that most affects the intended spoken message has significant social and clinical implications to help guide clinical decisions. We can better identify candidacy for intervention of accented speech if a breakdown in communication occurs as a result of the speaker’s degree of accentedness, not just because they speak with an accent. Treatment should also focus on accent modification to improve the successful transmission of the spoken message rather than on accent reduction or elimination. Socially, accents are the last frontier of discrimination; therefore, the more we know and understand about speech variability, the better we can communicate and understand one another. The review of the literature provides evidence that speech comprehension is affected by a speaker’s accent especially if the listener is unfamiliar with the L2 accent. In order to gain an insight into our understanding of accentedness, one should focus on the listener’s comprehensibility as in the present study.
3.2 Preliminary Study

A preliminary study was conducted to identify English speakers with varying degrees of accented English ranging from native to heavy accents. Prior to conducting the present study, it was necessary to first determine the degrees of accented English as judged by independent listeners using a 7-point Likert-type Scale. Speakers selected to record the spoken commands from the modified RTT (Lara, 2012) for the present study were identified from the preliminary study results which categorized accents into one of four groups: native, near native, moderate and heavy accented English.

3.2.1 Accent Rating. Twenty participants took part in the preliminary phase of this study. All participants were undergraduate students in a border-town (U.S.-Mexico) university. To recruit participants, undergraduate classes in the speech-language pathology program were visited as well as a student organization meeting. Potential participants were informed of the study's purpose and of their involvement in the study. Interested students provided contact information (name, email address, and phone number) for scheduling purposes. Interested participants were contacted via telephone calls and/or email. Appointments were scheduled two to three days prior to participation.

Thirteen speakers with varying degrees of accented English (native to heavy) from different native language backgrounds were recorded while reading the John D. Rockefeller Passage (Compton, 1999) (See Appendix B). Each speaker recorded between one and five samples. Samples with poor sound quality or excessive pauses/interruptions were excluded until only one of the samples for each of the 13 speakers was selected. The samples were then randomized into four different orders using an online research randomizer (2014).
Participants were met by the investigator in the UTEP Speech, Hearing, and Language Center. They were escorted to a 10 foot by 10 foot room, which contained a table and two chairs. Each participant signed a consent form after being informed about the study's purpose, the risks involved in participation, and the process for rating the audio files. A portable audiometer was used for each hearing screening to rule out possible hearing deficits that could interfere with the audio file presentations. A Dell laptop computer containing the files of the audio recordings was used to present the audio files through a pair of headphones.

Inclusion criteria consisted of passing a hearing screening, being proficient in English, and having the ability to discriminate colors. Upon meeting the inclusionary criteria for this study and after having read, understood and signed the consent forms, the participants were prompted to listen to each audio file in its entirety and then to begin listening to each audio file. After listening to each audio file, participants rated each one of the 13 files. The participants were instructed to rate the speakers’ accents based on a 7-point Likert Scale as suggested by Southwood and Flege (1999). A score of “one” represented a native “Standard American English” accent, whereas a score of “seven” represented a heavy non-native English accent. The participants were told that they could score a speaker with any whole number on the continuum, as they were not restricted to the extreme ends of “one” and “seven.” The entire process took approximately 30 minutes to complete. Upon completion, the participants were thanked for their time and participation; no further incentives for participation were provided.

Table 1 shows the modal scores for each of the 13 prerecorded speech samples obtained from the 20 independent listeners using a 7-point Likert Scale where 1 = native speech and 7 = heavy non-native speech.
Table 1. Mode Distribution in Speaker Rating

<table>
<thead>
<tr>
<th>Speaker (n=13)</th>
<th>Rating Scale Mode (1-7)</th>
<th>Relative Frequency (%)</th>
<th>Accent Category</th>
<th>National Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>100</td>
<td>Native</td>
<td>Colorado</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>100</td>
<td>Native</td>
<td>Texas/Wisconsin</td>
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<tr>
<td>F</td>
<td>1</td>
<td>90</td>
<td>Native</td>
<td>California</td>
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<tr>
<td>C</td>
<td>3, 4</td>
<td>20, 20</td>
<td>Near Native</td>
<td>Texas</td>
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<td>D</td>
<td>2</td>
<td>30</td>
<td>Near Native</td>
<td>Mexico</td>
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<tr>
<td>G</td>
<td>2</td>
<td>45</td>
<td>Near Native</td>
<td>Mexico</td>
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<tr>
<td>H</td>
<td>5</td>
<td>45</td>
<td>Moderate</td>
<td>Mexico</td>
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<tr>
<td>J</td>
<td>4</td>
<td>30</td>
<td>Moderate</td>
<td>Mexico</td>
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<tr>
<td>L</td>
<td>5</td>
<td>30</td>
<td>Moderate</td>
<td>Jamaica</td>
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<tr>
<td>E</td>
<td>4, 7</td>
<td>25, 25</td>
<td>Heavy</td>
<td>China</td>
</tr>
<tr>
<td>I</td>
<td>6</td>
<td>25</td>
<td>Heavy</td>
<td>Mexico</td>
</tr>
<tr>
<td>K</td>
<td>6</td>
<td>35</td>
<td>Heavy</td>
<td>Brazil</td>
</tr>
<tr>
<td>M</td>
<td>6</td>
<td>40</td>
<td>Heavy</td>
<td>Korea</td>
</tr>
</tbody>
</table>

The 13 prerecorded accented speakers were grouped in accordance to equivalent frequency distribution. As a result, four groups were formed; native, near-native, moderate, and heavy. Group one consisted of speakers A, B, and F which were identified as native speakers. Group two was made up of speakers C, D, and G which were identified as near-native speakers. Group three included speakers H, J, and L who were identified as moderate speakers and group four consisted of speakers E, I, K, and M which were identified as heavy speakers.

The purpose for conducting the preliminary study was to identify speakers with varying degrees of accented English as judged by independent listeners to record the auditory commands from the modified RTT necessary for the present study. One speaker was selected from each of the four accent categories. A total of four speakers (two males and two females) were carefully
chosen in an attempt to balance gender representation across each of the four accent conditions. From the native group of speakers, a female speaking SAE from the Midwest was selected. From the near-native group of speakers, a male from the greater El Paso area speaking English as L2 and Spanish as L1 was chosen. A female was chosen from the moderate group speaking Jamaican Patois as her L1 and English as her L2 and from the heavy group, a Korean male who speaks English as L2 and Korean as L1 was selected.

3.3 STUDY DESIGN

The hypotheses were tested using a quasi-experimental design using four repeated measures ANOVA testing for the within-subject main effect of accentedness on response accuracy and for the within-subject main effect of accentedness on response latency (see Table 2, for RMANOVA for accuracy; Table 3, for RMANOVA for latency). A qualitative component using a descriptive qualitative design was also conducted to describe the participants’ perception regarding the completion of the listening task.

3.3.1 Variables

This study contains one independent variable; the degree of accented English across four levels: native, near native, moderate and heavy accent.

Two dependent variables were assessed in this study; the percent of response accuracy and the latency of response obtained from subtests 1, 4, 6, and 7 from the modified RTT (Lara, 2012).
Table 2. Repeated Measures ANOVA for Accuracy.

<table>
<thead>
<tr>
<th>Degree of Accented English</th>
<th>Native Accent</th>
<th>Near Native Accent</th>
<th>Moderate Accent</th>
<th>Heavy Accent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy % (SD)</td>
<td>n=54</td>
<td>93.92(8.86)</td>
<td>n=54</td>
<td>92.77(11.12)</td>
</tr>
<tr>
<td></td>
<td>n=54</td>
<td>90.95(11.37)</td>
<td>n=54</td>
<td>90.92(10.88)</td>
</tr>
</tbody>
</table>

Table 3. Repeated Measures ANOVA for Latency.

<table>
<thead>
<tr>
<th>Degree of Accented English</th>
<th>Native Accent</th>
<th>Near Native Accent</th>
<th>Moderate Accent</th>
<th>Heavy Accent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latency ms (SD)</td>
<td>n=54</td>
<td>8902.36(1735.45)</td>
<td>n=54</td>
<td>7682.82(1720.33)</td>
</tr>
<tr>
<td></td>
<td>n=54</td>
<td>8672.28(2383.09)</td>
<td>n=54</td>
<td>9662.86(2481.80)</td>
</tr>
</tbody>
</table>

This study consisted of a convenience sample of 54 English speaking participants, 15 males and 39 females, who were tested using subtest 1, 4, 6, and 7 from a modified version of the RTT (McNeil & Prescott, 1978; Lara, 2012). This instrument was selected for having well-established reliability and validity measures which contain auditory and linguistic information that is free of contextual cues and cannot be predicted. Speakers with varying linguistic backgrounds and degrees of accented (native, near native, moderate, and heavy) English were selected from the preliminary study. One speaker was selected from each of the accented categories to record simple to complex commands (See Appendix C) under each subtest to be presented auditorily to each participant in random order. Participants’ speech comprehension was assessed using a modified version of the RTT that was presented on a touchscreen computer monitor using a Stimulus Presentation Software (Superlab, 2008) by looking at their correct response rates and physical reaction times. Correct response rates are defined as percent of correct responses and physical reaction times were measured from the end of the auditory
message presented to the time at which the participant touched the screen for their visual choice. Participants completed this phase in 20-35 minutes.

3.4 RESEARCH SAMPLE

3.4.1 Recruitment

Participants were recruited through class presentations with the instructor’s permission and by posting flyers across campus (See Appendix D). All rights were protected and no participant was subject to coercion or undue influence. The primary investigator visited classes on approval of a professor to tell students about the study and invite them to participate. Interested students were given the principal investigator’s contact information if they wanted to participate. If they did not qualify, they were thanked for their interest but informed that they did not qualify for participation in the study. Participants were selected from across the College of Health Sciences, School of Nursing and other Colleges within the university.

Fifty-five participants from the University of Texas at El Paso volunteered for the study. From the 55 participant volunteers, one participant failed to pass the hearing screening and was excluded from further participation in the study. This volunteer was referred for further audiological evaluation.

3.4.2 Sample

Fifty-four participants (15 males and 39 females) met all the requirements to participate in the present study. All of the participants fell in the age range of 18 to 37 years old (M = 23.9 years). More than half of the study participants came from the Speech-Language Pathology Program, and the remainder of the participants came from across various university and College of Health Sciences programs. Nearly 65% were from Speech-Language Pathology, 9.3% were from Health Sciences, 7.4% came from Pharmacy, 5.6% from Psychology, 3.7% came from
Physical Therapy, 3.7% were from Rehabilitation Counseling, 3.7% came from Nursing, and 1.9% from Computer Science.

Each participant came to the Speech, Hearing and Language Center at Campbell Building, and was presented with the informed consent in English for reading. The consent information was reviewed by the principal investigator, and any questions were answered before the participant signed the informed consent.

Participants were scheduled for a 40 minute testing session with the PI at the UTEP Speech, Hearing and Language Center, room 107M. As seen in Appendix E, participants were asked to respond to initial questions to obtain participant demographic information. A hearing screen was then administered before the administration for the version of the RTT (McNeil & Prescott, 1978; Lara, 2012).

Participants were administered four subtests from a modified version of the RTT (McNeil & Prescott, 1978; Lara, 2012). Test stimuli were randomly presented using varying degrees of accented English to assess the participant’s response accuracy and latency. Subtest order of presentation was also randomized among participants to minimize order effect using the Stimulus Presentation Software (Superlab, 2008).

All participants were healthy male/female, monolingual/bilingual adult college students from the different ethnic backgrounds represented at UTEP and in the El Paso community (see Table 4, for UTEP student demographic data and Table 5 for participant racial/ethnic demographic data). Criteria for inclusion in this study consisted of: UTEP student, English speaker, passing a hearing screen and a self-reported ability to see colors. Anyone who did not speak English, failed a hearing screen, or was colorblind was excluded from participating in this study.
Participants were asked to report if they were proficient in English and whether or not they spoke another language besides English. For this investigation, participants were considered monolingual if they reported the ability to speak, listen, read, and write in English.
and were considered bilingual if they reported any ability to speak, listen, read, or write in a language in addition to English. Approximately 76% of the study participants considered themselves bilingual and 24% considered themselves monolingual; however, for the present study the only language requirement was proficiency in English regardless of racial/ethnic background and/or knowledge of other languages.

3.5 Stimuli

The purpose of this study is to compare the performance of English listeners on auditory comprehension tasks in response to native accented English and non-native accented English across different degrees of accentedness (native, near native, moderate and heavy). Several modifications of the RTT (McNeal & Prescott, 1978) were needed to conduct the present study.

The RTT (McNeal & Prescott, 1978) is made up of ten subtests containing ten trials within each subtest and each subtest varies in length and complexity of the commands. The RTT’s mode of presentation was modified for this study. As a behavioral assessment measure, the RTT presents visual stimuli on a table surface using a 4 X 5 matrix. Plastic tokens differing in size (big and little), shape (circles and squares) and color (green, red, blue, black, and white) are used as the visual stimuli. Examinees are asked to touch or move the plastic tokens in response to a spoken command presented orally by the examiner.

For the purpose of the present study, four subtests, 1, 4, 6, and 7, containing ten trials each were selected from the modified RTT (Lara, 2012) that represent simple to complex commands. In this study, all commands of the RTT were modified to begin with “Touch the…”, since the Stimulus Presentation Software (Superlab, 2008) was used to present the visual and auditory stimuli and the participants responded by touching the computer screen in response to the spoken command rather than using the RTT plastic tokens. The presentation of the visual
stimuli consisted of a 3 X 3 matrix using a touch screen monitor and the Superlab Stimulus Presentation Software (Superlab, 2008) was used to systematically present the visual and auditory stimuli. The spoken commands used in this study were prerecorded by four speakers with different degrees of accents who were previously selected from the preliminary study. The presentation of the different degrees of accented spoken commands (native, near native, moderate and heavy) was randomized within each of the four subtests but not across subtests. Once randomization was completed, each participant was presented with the same stimulus items in order within each of the four subtests (See Appendix F for randomization across accent conditions). To minimize order effects, the subtest presentation was also counterbalanced. Four sets varying in order of subtest presentation were used: Set A (Subtests 4, 1, 7, 6), Set B (Subtests 6, 4, 1, 7), Set C (Subtests 6, 7, 1, 4) and Set D (Subtests 7, 4, 6, 1). Participants were sequentially assigned to one of these four sets based on when they participated in the study. For example, participant 1 was presented with subtest Set A; participant 2, Set B; participant 3, Set C; participant 4, Set D; participant 5, Set A and so forth.

3.5.1 Auditory Stimuli.

The present study uses prerecorded spoken commands from four speakers with varying segmental and prosodic features selected from the preliminary study. Superlab Stimulus Presentation Software (Superlab, 2008) was used for randomized presentation of the auditory stimuli within each subtest. Additionally, spoken commands varied in length and grammatical complexity. The spoken commands contained syntactical elements which include the verb “touch,” the conjunction “and,” nouns (circle and square), adjectives (size and color), and prepositions (spatial and directional). Examples of the spoken commands are; “Touch the red square.”, “Touch the big red square and the big white circle.”, “Touch the little white square on the big green circle.”, and “Touch the big green square to the right of the black square.” See
Appendix C for a complete list of the subtests with their respective spoken commands. The auditory spoken commands were presented at a range between 60-68 dB SPL as measured from the audio speakers using a Radio Shack Sound Level Meter. Audio speakers were placed 34 centimeters in front of the participants.

3.5.2 Accuracy of Response

After listening to the recorded command, participants touched the computer screen to select from the visual display of choices. Superlab (2008) calculated percent accuracy of response by dividing the number of the participant’s correct responses by the total number of responses.

3.5.3 Latency of Response

Latency of response was calculated using Superlab (2008) to measure the time in milliseconds from the moment the recorded spoken command ended to the time the participant touched the computer screen to select from the visual display of choices.

3.5.4 Visual Stimuli

Microsoft Format Painter was used to create the visual stimuli in the present study and was saved as .jpg files for use with the Superlab Stimulus Presentation Software (2008). Two different visual stimuli were used in this experiment; an observational white sample and a visual display of choices. The observational white sample is presented as a white square in the middle of a black screen and is designed to ensure that participants are oriented to the monitor. The observational white sample also serves to initiate the beginning of a trial. An example of an observational white sample is provided in Figure 3.
**Figure 3. Observational White Sample.** Participants must first touch the white square to begin the modified version of the RTT portion of the experiment.

The visual display of choices is presented on a 3 X 3 grid. The visual choices are comprised of two different shapes (circles and squares), two different sizes (big and little), and five different colors (green, blue, red, black, and white). An example of a visual display of choices is presented in Figure 4. See appendix G for a complete list of the visual stimuli.

**Figure 4. Visual display of choices.** Visual display of choices using colors and shapes.
3.6 Experimental Procedure

The description of the experimental procedures similar to Lara (2012) were as follows:

The participant was
1. seated comfortably in a 6 X 6 soundproof booth in front of the 21.5” Dell Touch monitor.
2. instructed to place his/her hand on a mark on the edge of the table centered with the monitor at the start of the procedure. The mark is placed at a distance of 34 cm from the touch monitor.
3. instructed to return his/her hand to the mark after touching the visual display appearing on the monitor.
4. instructed to only move the hand to touch the screen when either an observational white sample or visual display of the choices appeared on the monitor.
5. instructed to look at the observational white sample (Fig.3) that appeared on a black screen on the computer monitor.
6. instructed to touch the observational white sample (Fig. 3) to initiate a trial.
7. instructed to listen to the accented auditory command (See Appendix C) and respond to the spoken command by touching the visual choice (See Appendix G) that matches the accented spoken command. This procedure is repeated for each trial and each participant.
3.6.1 Events

A series of sequential events made up a single trial. These events are described in the order in which they occur within each trial. First, the observational white sample (as seen in Fig. 1) was displayed on a black computer screen. Then the participant touched the observational white sample on the computer screen. The accented spoken command (See Appendix F) was randomly presented immediately after the participant touched the observational white sample. This was followed by a blank screen that was displayed for 1000 milliseconds (ms.). Instantly following the 1000 ms., the visual display of choices (as seen in Fig. 4) appeared on the screen. The participant then responded by touching the cell that best portrays the choice that matches the accented spoken command. Once the participant responded, the computer screen went blank for 3000 ms. After the 3000 ms. passed, the observational white sample was displayed on the black computer screen to initiate the next trial.

This cycle was repeated for each trial. Each of the four subtests contained a total of ten trials. Each degree of accentedness (native, near native, moderate and heavy) was represented in each of the subtests. Both the subtests and the degrees of accentedness were randomized for each participant to minimize the possibility that the participant would anticipate the complexity or the degree of accentedness of the spoken commands. Figure 5, is a representation of a trial sequence.
1. Present observational white square.

2. Participant touches observational white square to start the trial.
3. Present Visual Cue for 1000 ms.

4. Present accented auditory command: “Touch the red circle.”

5. Participant RESPONDS.
6. Computer screens goes blank for 3000 ms.
7. Present observational white square.

8. Participant touches the observational white square to initiate the next trial.
9. Continue steps 1 through 8.

**Figure 5. Trial Sequence.** This is a representation of a trial sequence of the modified version of the RTT using Superlab.
3.6.2 Exit Questionnaire

An exit questionnaire was formulated consisting of three open-ended questions that aimed at providing how accented speech affected timing, accuracy of their response, comprehensibility of the accented spoken commands, and what an acceptable degree of accent is for a health care provider. The Exit Questionnaire was administered to participants after completing the RTT portion of the investigation. Participants were provided verbal and written instructions during this last phase of the study (See Appendix H). Completion of the exit questionnaire was not time bound allowing participants to complete their responses at their own pace. After completing the questionnaire, the primary investigator collected the forms from each of the participants and thanked each one for their participation in the study.

3.7 DATA COLLECTION

3.7.1 Data Analysis

In addition to finding the percent correct and latency of response in milliseconds, secondary analyses were explored for statistical significance in response accuracy and/or response latency. Qualitative methods were used to analyze participant experiences from an exit questionnaire.

3.7.2 Statistical Analysis

The hypotheses were tested using a repeated measures ANOVA testing for the within-subjects main effect of accentedness on response accuracy and the within-subjects main effect of accentedness on response latency. Because the relationship between groups is assumed in within-subjects group comparisons, the assumption of sphericity was tested. Inspection and analysis of data was completed in order to check for reliability. Outliers were corrected when required. Data was subjected to statistical analysis using SPSS version 20.
3.7.3 Qualitative Analysis

Descriptive methodology was selected to evaluate Exit Questionnaire responses (See Appendix I) in an attempt to gain insightful accounts of the way participants perceived accentedness (Creswell, 2013). The Exit Questionnaire was used as one of the strategies to obtain perceptual descriptions from the participants immediately after completing the RTT portion of the study. In addition, responses were searched for themes or idiomatic phrases that described their perception of accents and what they felt was an appropriate level or degree of accent.

3.8 Human Subject Protection

Permission to conduct this study was obtained from the University of Texas at El Paso’s Institutional Review Board (See Appendix J) prior to conducting this study. Participants were recruited from the UTEP College of Health Sciences, School of Nursing and other colleges from across campus. Class presentations were conducted in the various college departmental classes. The principal investigator maintained contact with study participants via phone or email.

Participants selected for this study were provided with written and verbal explanation as to the purpose of this study, procedures, benefits and/or risks associated with the experiment. Each participant was given the opportunity to read the informed consent and ask questions about their participation in the study as well as the research project itself. Participants were provided with an explanation as to their right to participate and/or withdraw from the study at any time. Upon satisfying any and all of the participant’s questions, they were asked to sign the informed consent.

Data collection, data entry and data analysis was the responsibility of the principal investigator. All data, including identifying information in both paper and computer format was
kept in a locked cabinet within a locked closet in the principal investigator’s office in room 402 located in the Campbell Building, 1101 N. Campbell St., El Paso, Texas 79902.

Electronic data was stored in a computer that is accessed by a password known only to the principal investigator. Data collected and used for this experiment will be stored for a period of five years after the completion of this study. All data will be destroyed after this five-year time-period.

Any information obtained from any participant was shared only between the principal investigator and his main advisor. This information was used for the sole purpose of this research study. This study was conducted in the Voice and Brain Language Lab which has a door that was closed to maintain the participant’s privacy when filling out forms and/or during the study. For added privacy, the Voice and Brain Language Laboratory is located in an area that can be closed off from others by an additional door that is locked. The faculty running the Voice and Brain lab, the principal investigator, and the Speech-Language Pathology Program director were the only ones who had access to the key for that additional door.

The principal investigator was responsible for collecting and analyzing the data throughout the duration of this study. Participants were identified by a number and a letter code that was used to identify participant data. No video and/or auditory recordings were obtained during this study.

There are no known risks associated with this research as testing procedures are non-invasive. However, participants may have experienced mild fatigue during the testing situation. If participants notified the principal investigator when they experience fatigue, they were provided opportunities to rest. Participants may benefit from this study by knowing the outcome
of their performance in auditory comprehension of accented speech. The data obtained from this study may yield diagnostic and treatment guidelines for use in accent modification therapy.

There were no other specific sites or agencies, other than The University of Texas at El Paso involved in this research project. There were no other IRB approvals, other than The University of Texas at El Paso IRB requested for this project.

3.9 Pilot Study

3.9.1 Modified RTT Testing. A pilot study was conducted following the same experimental design, methods, and experimental procedures described in the present study. A relatively small number of pilot study participants (n=5) were used during in the pilot study in order to assess the equipment and test integrity. Testing was conducted following the experimental protocol. Initial results revealed that the Stimulus Presentation Software (Superlab, 2008) also counts the touching of the white square trigger to initiate the trials as a correct response. Because this is not a testing item, the researcher removed these responses so that participant performance was not artificially inflated. Additionally, subtest 4, which required two responses per command, were scored as two separate responses by the Stimulus Presentation Software (Superlab, 2008). Visual and verbal presentation of test stimuli by Stimulus Presentation Software (Superlab, 2008) was otherwise successful in running the experiment.

Participants tested reported mixed experiences with the different accents. Because pilot participants were conveniently selected from the UTEP Speech-Language Pathology Program, performances were relatively high possibly due to familiarity with the RTT testing instrument.
3.9.2 Pilot Study Limitations

A number of limitations were noted in this pilot study. First, the testing protocol required the instruction of reading the spoken commands as naturally as possible without emphasizing any single word or element within the command so as not to inadvertently cue the listeners. This instruction may have interfered with the natural flow of the speaker’s speech during the reading of the modified RTT command recordings. Secondly, this study consisted of only five participants who helped in testing the integrity of the equipment used for the present study.

3.10 SUMMARY

This study used a modified version of the RTT (McNeil & Prescott, 1978) to assess the participant’s auditory comprehension of spoken commands presented across different levels of accentedness. Four English accents (native, near-native, moderate, and heavy) were used as the independent variable and two dependent variables (response accuracy and response latency) were used. A quasi-experimental design was selected since a convenience sample rather than a randomly selected sample was used. This study compared within subject means using a repeated measures ANOVA for accuracy of response and a repeated measures ANOVA for latency of response. A total sample size of 54 participants (15 males and 39 females) was obtained.

Accuracy of response was measured as percent correct and latency of response was measured in milliseconds from the end of the spoken command until the participant touched the screen to make his selection using the Stimulus Presentation Software (Superlab, 2008) to present and record the responses.

Prior to conducting the present study, a preliminary study was conducted to identify the speakers with different accented English needed to record the modified RTT commands for the pilot study as well as the present study. The pilot study consisted of running a small number of
participants mainly to test the integrity of the equipment before running the actual study participants.
Chapter 4

RESULTS

A review of the literature suggests that when native SAE listeners are exposed to non-native accented English, they are better able to comprehend a more familiar form of accent that is closer to their L1 accent than a non-familiar L2 accent. Other findings revealed that native SAE listeners and non-native ESL listeners respond better to more familiar regional accents than national origin accents, suggesting similar processing of auditory information. When comparing individuals with neurological impairment to non-impaired individuals, researchers also found that both groups performed better with more familiar regional accents than with unfamiliar foreign accents. However, most of the studies conducted and the subsequent findings have relied primarily on the subjective judgments of listeners.

This study used a novel experimental procedure that required an overt physical behavior (touching a computer screen) in response to the accented spoken command from the modified version of the RTT (McNeil & Prescott, 1978; Lara, 2012). Furthermore, this experimental procedure presented the accented spoken commands in a systematic and random way within each subtest of the modified RTT (McNeil & Prescott, 1978; Lara, 2012) to minimize predictability and adaptability of both the speaker and their respective accents. A review of the literature found no studies using an experimental procedure comparable to the one used in the present study.

The main purpose of this study was to compare the performance of English speaking listeners on auditory comprehension tasks addressing accuracy and latency of response to native accented English and non-native accented English across different degrees of accents (native, near native, moderate and heavy). Data collection occurred from December 5, 2014 until February 10, 2015 and was analyzed using SPSS Software version 20.
The central question in studies investigating accented speech is whether the spoken message from a non-native speaker’s accent is understood in whole or in part by listeners. This study attempted to objectively assess the impact of accents on speech comprehension by following simple verbal commands to improve understanding of how, if at all, the degree of the accent influences the listener’s accuracy and latency of response from the spoken message.

The aims of this research were:

Aim 1: To compare response accuracy among English listeners on trials delivering instructions in non-native accented English as compared to native accented English.

Aim 2: To compare response latency among English listeners on trials delivering instructions in non-native accented English as compared to native accented English.

Consideration was also given to acoustic properties of the stimulus items. Results of acoustic analysis were unremarkable and noncontributory to the aims investigated in this study. For further discussion please refer to Appendix K.

4.1 Description of Participants

Fifty-four participants (15 males and 39 females) met all the requirements to participate in the present study. All of the participants fell in the age range of 18 to 37 years old (M = 23.9 years). The participants reflected the demographics of the El Paso community and of the university student body, where the majority of the participants were Hispanic. Nearly 76% of the study participants also considered themselves bilingual and 24% considered themselves monolingual; however, for the present study the only language requirement was proficiency in English regardless of racial/ethnic background and/or knowledge of other languages.
4.2 Results

4.2.1 Statistical Analysis

Response Accuracy. Accuracy of response was recorded and calculated for each of the accented levels for all participants using Superlab Stimulus Presentation Software (Superlab, 2008). The data from each of the 54 individual participants’ responses to each of the accented levels was calculated to obtain group means and standard deviations in percentages (See Table 6 for descriptive statistics).

<table>
<thead>
<tr>
<th>Table 6. Descriptive Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Native Accuracy</td>
</tr>
<tr>
<td>Mild Accuracy</td>
</tr>
<tr>
<td>Moderate Accuracy</td>
</tr>
<tr>
<td>Heavy Accuracy</td>
</tr>
</tbody>
</table>

A repeated measures ANOVA was used to determine significant differences between mean accuracy of response among the four accent conditions (i.e. native, near-native, moderate, and heavy). Planned post-hoc pairwise comparisons were performed to examine specific differences between each level of accentedness.

Mauchly’s Sphericity Test (Mauchly, J. W., 1940) was selected to test the assumption of sphericity in repeated measures ANOVA. The significance levels for sphericity were established at alpha < .05. Mauchly’s test statistic was found to be significant at $p = .003$ concluding that there are significant differences among all of the accented conditions. Therefore, the condition of sphericity was not met. When sphericity is not established, Greenhouse-Geisser corrections (Greenhouse & Geisser, 1959) use an index of deviation to sphericity to correct the number of
degrees of freedom of the F distribution. Because the sphericity assumption was violated, Greenhouse-Geisser corrections were used in this analysis. Planned post-hoc comparisons were completed using the Bonferroni adjustment for multiple pairwise comparisons for the purpose of analyzing response accuracy differences from each of the accented groups when compared to each other.

The study hypotheses were tested for the within-subjects main effect of accentedness on response accuracy. The significance levels were set at alpha < .05. In the tests of within-subjects effects, there was no statistically significant difference \([F (2.55, 135.02) = 2.088; \ p = 0.115, \text{ partial eta-squared } (\eta_p^2) = 0.038]\). Greenhouse-Geisser corrections (Greenhouse & Geisser, 1959) were used to correct sphericity violations since the assumption of sphericity was not met. Test results failed to support the alternate hypothesis that all participants will perform similarly in response accuracy under different accent conditions with 95% confidence level.

Planned post-hoc comparisons were completed using the Bonferroni adjustment for multiple pairwise comparisons by pairing each accent condition to each other comparing the 54 participants’ percent response accuracy within each condition. Although there was no statistically significant difference in within-subjects effects comparing each participants’ accuracy of response across all four accent conditions, there was a statistically significant difference in within subjects pairwise comparisons when comparing accuracy of response between Native accent and Heavy accent \((p = .045)\) (See Table 7 for a summary of pairwise comparisons results).
Table 7. Pairwise Comparisons for Accuracy of Response

<table>
<thead>
<tr>
<th>(I) Accuracy</th>
<th>(J) Accuracy</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval for Difference</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
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<tr>
<td>1</td>
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<td>1.000</td>
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<td></td>
</tr>
<tr>
<td>3</td>
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<td>.195</td>
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<td>3</td>
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<td>1.246</td>
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<td>1.594</td>
<td>1.000</td>
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<td></td>
</tr>
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<td>3</td>
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<td>-1.822</td>
<td>1.716</td>
<td>1.000</td>
<td>-6.527 - 2.882</td>
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<td></td>
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<tr>
<td>4</td>
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<td>1.541</td>
<td>1.000</td>
<td>-4.191 - 4.258</td>
<td></td>
<td></td>
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<tr>
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<td>4</td>
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<td>1.079</td>
<td>.045*</td>
<td>-5.960 - .044</td>
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<tr>
<td>2</td>
<td>4</td>
<td>.033</td>
<td>1.541</td>
<td>1.000</td>
<td>-4.258 - 4.191</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on estimated marginal means
*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Note: 1=Native, 2=Near-Native, 3=Moderate, and 4=Heavy

There were no statistically significant differences when comparing percent accuracy of response between Native accent and Near-Native accent ($p = 1.000$) and Native accent and Moderate accent ($p = .195$). When comparing Near-Native accent to Native, Moderate and Heavy accent, there were no significant differences at ($p = 1.000$). Similarly, Moderate accent comparisons to all other accents did not yield significant differences in response accuracy. Only when comparing Heavy accent to Native accent was there a statistically significant difference ($p = .045$).

Response Latency. Latency of response was recorded and calculated for each of the accented levels for all 54 participants using Superlab Stimulus Presentation Software (Superlab,
To obtain group means and standard deviations in milliseconds, the data from each individual participant within each of the accented levels was calculated. As seen in figure 6, the Native accent condition mean latency score was 8902.36 ms (SD = 1735.45 ms). Under the Near-Native accent, the mean latency score obtained was 7682.82 ms (SD = 1720.33 ms). The Moderate accent condition mean latency score resulted in 8672.28 ms (SD = 2383.09 ms). Under the Heavy accent condition, the mean latency score was 9662.86 ms (SD = 2481.80 ms).

![Mean Latency Response](Image)

**Figure 6. Mean Latency Response.** The mean response latency represents the variance in latency in milliseconds across accents.

To determine significant differences between mean latency of response among the four accent conditions (i.e. native, near-native, moderate, and heavy), a repeated measures ANOVA was performed. Planned post-hoc pairwise comparisons were performed to examine specific differences between each level of accentedness. The significance level for sphericity was established at alpha < .05. Mauchly’s test statistic approached significance at p = .053, but
according to the parameters established, there were no significant differences between conditions; therefore, the condition of sphericity was met.

The study hypotheses were tested for the within-subjects main effect of accentedness on response latency. The significance levels were set at alpha < .05. There was a statistically significant difference \[ F (3, 159) = 17.262; \ p = .000, \ (n_{p}^{2}) = 0.246 \] in the tests of within-subjects effect of accentedness on response latency. Test results did not support the null hypothesis and therefore supported an alternate hypothesis that all participants will perform differently in response latency under different accent conditions with 95% confidence level. A large effect size of \( n_{p}^{2} \) = 0.246 (Murphy & Myors, 2004) of the between subjects variance was obtained indicating that 24.6% of the response latency variance was accounted for by accentedness.

The 54 participants’ response latency in milliseconds was compared within each condition by means of post-hoc comparisons using the Bonferroni adjustment. There were statistically significant differences in multiple pairwise comparisons but especially when comparing the near-native accent to all others (See Table 8 for a summary of pairwise comparison results).
## Table 8. Pairwise Comparisons for Latency of Response

<table>
<thead>
<tr>
<th>(I) Latency</th>
<th>(J) Latency</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.(^b)</th>
<th>95% Confidence Interval for Difference(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower Bound</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>1219.541(^*)</td>
<td>225.054</td>
<td>.000(^*)</td>
<td>602.690</td>
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<tr>
<td>1</td>
<td>3</td>
<td>230.076</td>
<td>294.358</td>
<td>1.000</td>
<td>-576.731</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>-1219.541(^*)</td>
<td>225.054</td>
<td>.000(^*)</td>
<td>-1836.393</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>-989.465(^*)</td>
<td>261.639</td>
<td>.002(^*)</td>
<td>-1706.592</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>-989.465(^*)</td>
<td>261.639</td>
<td>.002(^*)</td>
<td>-1706.592</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>-990.582(^*)</td>
<td>309.345</td>
<td>.014(^*)</td>
<td>-1838.466</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>-990.582(^*)</td>
<td>309.345</td>
<td>.014(^*)</td>
<td>-1838.466</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>1980.047(^*)</td>
<td>251.383</td>
<td>.000(^*)</td>
<td>1291.030</td>
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<tr>
<td>3</td>
<td>2</td>
<td>1980.047(^*)</td>
<td>251.383</td>
<td>.000(^*)</td>
<td>1291.030</td>
</tr>
</tbody>
</table>

Based on estimated marginal means

\(^*\). The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Note: 1=Native, 2=Near-Native, 3=Moderate, and 4=Heavy

A statistically significant difference was found between Native accent and Near-Native accent \((p = .000)\) but not when comparing Native to Moderate and Heavy accents. When comparing Near-Native accent to all other accents; Native, Moderate, and Heavy, there were statistically significant differences in response latency. In comparing Moderate accent to each accent condition, there was no significant difference between Moderate and Native accents but there were statistically significant differences among Near-Native and Heavy accents. Finally, when comparing Heavy accent to each accent condition, there was no statistically significant difference in response latency between Heavy and Native accents. Only when comparing Heavy accent to Near-Native and Moderate accents were the differences significant.
4.2.2 Qualitative Analysis

Exit Questionnaire responses (See Appendix I) were analyzed using descriptive methodology by obtaining experiential descriptions from the participants immediately after completing the RTT portion of the study. Data analysis used reflecting themes or idiomatic phrases that described the participant’s experience with accents and what they felt were appropriate levels or degrees of accent.

Question 1) Describe how accented speech affected the timing and accuracy of your response. Most of the participants were in agreement that timing was more affected by the accent than accuracy. Two main themes identified were the need for increased concentration, and use of strategies such as needing to repeat commands in their head. The following are examples of responses to the above question from different participants:

“The accented speech was harder to understand, therefore, I had to re-think what I desthought I heard the first time.”

“It slowed my timing for sure because I had to really try to focus on what was being said.”

“It took me longer for me to respond to the tasks presented by the accented speech. For the most part, I had to repeat the command in my head so I could process it.”

“I felt like I had to concentrate a bit harder with the heavily accented speech. It took a bit longer to answer the commands.”

“It slowed my timing for sure because I had to try to focus on what was being said.”

“I had to take more time to think in my head what the accented speech said. It did affect my timing making it slower and I’m pretty sure I missed some of the sentences.”
Question 2) *Explain how your ability to understand the spoken commands was affected by the accents you just heard.* Responses were similar to Question 1 since most participants reported that needing to repeat the commands and requiring more concentration affected their ability to understand the spoken commands. The following examples of different participant responses are representative of the trends noted:

“I was more focused on trying to understand than listening to the command.”

“It was harder for me to understand the spoken commands with the accents. I had to repeat it once or twice in my head to make sure I was understanding what was being asked.”

“The accents made it more difficult to understand the commands since more effort was required to try and figure out what the command was rather than using that time to perform the command.”

“On certain accents (not all) it was a bit difficult/tricky to process what was said. I found myself trying to remember the command because the accents were different and a bit distracting.”

“The accents altered the descriptive words causing slight confusion during comprehension of the commands.”

Question 3) *As a future health care provider, what do you believe is an acceptable level/degree of accentedness in health care provider - patient communication? Please explain why.* Participant responses to this question varied widely but most were in agreement that a range from native accent to moderate accent would be an acceptable level with a high agreement that a heavy accent would not be an acceptable level. The following are examples of different participant responses to question three:
“While accented speech is acceptable, if the accent is too heavy, there could be provider-patient misunderstanding. The patient should be able to understand everything that the provider is trying to communicate, especially when it comes to receiving health services.”

“Until now, I never really thought about accents and how it could affect provider-patient communication. After participating, I think only a mild degree of accentedness would be acceptable. If with these short commands, I had a hard time, I can only imagine that it would be more difficult to understand/process entire conversations with someone who had a stronger accent.”

“Moderate would be okay. With the stronger accents it’s harder (not impossible). I would be reluctant to return to that provider.”

“I feel that accentedness can be a real problem. I often have difficulties understanding medications when I am transferring prescriptions. I have issues interpreting heavy accents, but I know many people who are much worse, and will not ever ask to clarify. I believe (especially when dealing with patients) that the degree of accentedness should be very low.”
Chapter 5

DISCUSSION

5.1 Overview

In the context of shifting demographics in the United States and with an increasing multicultural/multilingual workforce, the verbal exchange of information is vital especially between health care providers and patients. Although English is the official language in the United States, many individuals from different national origins speak English with some degree of accent. Before we can address health care provider/patient communication, it is necessary to investigate the potential impact of accented English on speech comprehension and its implications on basic communicative interactions.

This dissertation study compared the performance of English-speaking individual listeners on speech comprehension tasks looking at accuracy and latency in response to native accented English and non-native accented English across different degrees of accents (near-native, moderate and heavy), as defined by independent listeners’ ratings in the preliminary study. The aims of this research were (1) to compare response accuracy among English listeners on trials delivering instructions in non-native accented English as compared to native accented English; and (2) to compare response latency among English listeners on trials delivering instructions in non-native accented English as compared to native accented English. It was hypothesized that among English listeners: (1) response accuracy will be poorer on trials delivering instructions in non-native accented English as compared with native accented English; (2) response accuracy will decrease as the degree of accented non-native English increases; and (3) latency of response will increase with an increase in the degree of accented English.
The research questions were answered, although not necessarily in the predicted direction. In assessing accuracy of response across the four accented English conditions, listeners’ overall performance was similar. However, when the accented conditions were compared to each other, significant differences in response accuracy were found between the native accent condition and the heavy accent condition, suggesting that accents perceived as heavy do impact a listener’s ability to respond correctly. Previous research findings of listeners verifying statements that were true or false found that the native English speakers’ statements were more often correctly identified as true or false than statements from speakers of Mandarin (Munro & Derwing, 1995). Levi, Winters, and Pisoni (2007) argued that to a certain degree, objective intelligibility and subjective accentedness are independent entities of accented speech. Accordingly, the current study used varying degrees of accents as well as different national origin accents, which indicated that listeners’ ability to comprehend accented speech across near-native or moderate degrees of accents is not impacted and that speech comprehension is dependent more on the speaker’s heavy degree of accent rather than on the speaker’s national origin accent.

In assessing latency of response across accented English, listeners’ performance overall was significantly different across the four accent degrees. Munro and Derwing’s (1998) findings suggest that the ideal speaking rate for non-native speakers may be to a certain extent slower than that of native speakers. Because proficiency levels in L2 differ, some non-native English speakers first think in their L1 and then translate to the L2, resulting in a slower rate. Derwing and Munro (1999) further explain that because listener demands increase processing time, listeners tend to rate accented speech as less understandable despite being completely intelligible. The current study revealed that accuracy of response to native accented English was
indeed higher than all non-native accents, but pattern of latency of responses demonstrated that the near-native accented speech required significantly less time to process than even the native English accent.

These findings are consistent with those of Dunton, Bruce, and Newton (2011), which suggests that familiarity of speaker accent can have a significant effect. Interestingly enough, evidence provided herein revealed that latency of response from native accented English commands did not differ from the non-native English accented commands. Instead, significant differences were found from the near-native accented commands in comparison to the listeners’ performance to native, moderate and heavy accented English commands. One possible explanation for these findings is that the near-native accented commands were recorded by a L1 Spanish speaker with English as L2. Perhaps because this near-native form of English is representative of the surrounding community, participants in this study were more familiar with this form of English. The majority of the El Paso population speaks Spanish as their L1, making it the region’s *lingua franca* and making SAE the more foreign form of speech.

Most studies from the 1950s to the 1970s addressed speech intelligibility by concentrating primarily on pronunciation and how the intelligibility of accents was perceived. These studies involved ratings conducted mainly by white, native English speakers in response to Standard American English (Nelson, 2008). In the present study, participant profiles represented both the university’s student demographics and the demographics of the El Paso community, both of which are predominantly Hispanic and bilingual Spanish/English. As such, these findings suggest that the near-native accent is the standard accent in this region and conversely, the native SAE accent may be processed by listeners as if it were a form of non-native accent to the region.
Results from the qualitative component of the study revealed that participants felt that accents affected their timing more than their accuracy. They reported the need to concentrate more on the accented commands and felt the need to use strategies such as repeating the commands in their head before responding to the command. This is similar to results noted in Munro and Derwing (1995), in which response latency data indicated that the Mandarin-accented statements needed additional time to evaluate than the statements from the native speakers of English. Participant responses to the question, as a future health care provider, what is the acceptable level or degree of accent between healthcare providers and patients, varied widely but most were in agreement that a range from native accent to moderate accent would be an acceptable level. Similar findings in Langdon’s (1999) survey indicated that more than half of the participants were in disagreement about what might be an acceptable level or degree of accent. The present findings did show high agreement that a heavy accent would not be acceptable from a healthcare provider. Overall, these qualitative findings support the quantitative findings in the present study that heavy accents do impact the accuracy of response and that accents impact timing of response, particularly in the context of the unfamiliar forms of accents.

5.2 Social Implications

Accent discrimination is one of the last frontiers of discrimination in this country. Despite the fact that there are laws prohibiting discrimination on the basis of national origin which now include national origin accents, loopholes exist in the justice system that circumvent the law. Judges and employers, for example, still base their judgments on subjective measures rather than on objective evidence (Akomolafe, 2013; EEOC, 2014). People with accents have been terminated from employment without ever assessing if or how the accent affected their job
The present study’s objective as well as subjective findings show that accuracy of response does not appear to be significantly affected when listening to near-native or moderate degrees of accents, but only with accents that are perceived as heavy. Furthermore, these findings point out that when listeners increase their concentration and/or silently restate the speaker’s verbal message, they can better understand a non-native English speaker.

Quinn and Petrick (1993) used the differential accent discrimination phenomenon to explicate major differences in how people with non-native accents are treated. They noted that low-status accents are more likely to be interpreted as difficult to understand and are more suggestive of incompetence while high-status accents are more likely to be interpreted as easy to understand and are indicative of competence. Participants from the present study did not appear to have experienced this phenomenon. In fact, the accents used in recording the spoken commands were a mixture of “high and low-status accents” (Quinn & Petrick, 1993): Jamaican Patois, which has British English influence; Korean; Mexican Spanish; and Midwestern Standard American English.

Homegrown accents or dialects that are a result of variations of one’s native language due to geographical areas or cultural groups not associated to national origin are also negatively perceived and are also subject to discrimination. Ingram (2009) points out that, unfortunately, homegrown accents and dialects are not protected under Title VII of the Civil Rights Act of 1964. When looking at response latency, current findings revealed that participants needed less time to process the near-native spoken commands than any other degree of accent, suggesting, as previously noted, that near-native Spanish accented English is the norm or standard in this part of the country, rather than the native SAE accent. Although these findings may apply only to this
geographical region, the near-native Spanish accent is protected under the national origin provision of the law, but a Southern American English accent or Bostonian accent that are also associated geographically have no legal recourse.

There are instances in the literature in which accents, regardless of national origin, are not protected under the law, as in civil aviation. Tiewtrakul and Fletcher (2010) found that voice transmissions between pilots and air traffic controllers of international flights were problematic especially with the use of different English accents. Evidence suggests that communication errors defined by incidents of pilots not understanding occurred significantly more often when both speakers were non-native English speakers, and even more so with multifaceted messages containing numerical data. Although the present study did not find significant differences in the accuracy of the response across the different accent degrees except under the heavy accent condition, findings involving the time to process the spoken accented commands required significantly more time than with a lesser degree of accent. However, in aviation, time is vital for the successful transmission of the message and the strategy of increased focus and replay of the message is not a luxury pilots and air traffic controllers can afford.

5.3 Clinical Implications

In a more culturally and linguistically diverse population, accents have both social and clinical implications that affect the verbal exchange of information, notably between health care providers and patients in the areas of diagnosis, plan of treatment, compliance, and overall patient care across disciplines (cf., Beck, Daughtridge, & Sloane, 2002; Slort, Schweitzer, Blankenstein, Abarshi, Riphagen, Echteld, et al., 2011). This becomes even more apparent in the context of cognitive-linguistic deficits; for example, Bruce, To, and Newton (2012) found that
familiarity of speaker accent significantly affected the accuracy of understanding accented sentences in adult patients with aphasia.

Although results from the present study regarding the overall accuracy of response were not statistically significantly different, in the clinical realm such variations are still important. Potential errors in comprehension may occur from either the patient’s or health care provider’s perspective. Misunderstanding even a single sound within a word can potentially change the speaker’s intended meaning resulting in a listener’s inaccurate understanding of the spoken message. The obligation to ensure that the verbal exchange of information with patients is accurate and understood by both the listener and the speaker is the sole responsibility of the health care provider (Schenker, Lo, Ettinger, & Fernandez, 2008; Fernandez, Schillinger, Warton, Adler, Moffet, Schenker, et al., 2011). Present findings show that allowing additional time for the processing of basic information to fully understand the intended message increases performance in the verbal instruction resulting in increased comprehension. Any misinformation that is perceived, especially in a medical setting where medications or instructions need to be strictly followed, can have grave clinical consequences regardless of statistical significance.

Outside the health care provider-patient communication, the responsibility to ensure that the communication is successful lies on both the speaker and the listener; however, this burden has mainly been placed on the speaker in our society. One possible explanation given the findings in this study is that listeners are not always willing to invest the necessary increased attention and effort to understand speakers with varying degrees of accents. Instead, speakers are left with the burden of modifying their speech for the benefit of the listener.

The American Speech-Language Hearing Association (ASHA, 2014) reported that for some individuals, accents are a source of pride but for others who may not be understood,
accents may be problematic. Some individuals avoid social interactions for fear of not being understood, some experience frustration when constantly repeating themselves, and some find it difficult when they are trying to communicate and people focus more on the accent than on the conversation. These types of communication problems can negatively affect a person’s day-to-day activities, performance in their workplace, educational advancement, and may also affect their self-esteem. As a result of all these negative experiences, many individuals with accents seek the services of speech-language pathologists to help change or modify their accents.

The present findings can help guide clinical decisions in the diagnosis and treatment of accent modification. Although this research involved relatively young healthy college students, the latency of their responses to accented spoken commands supported findings that familiar speaker accents require significantly less processing time than with other forms and degrees of accents. Although overall findings comparing accuracy of response within all group conditions were not significant, specific findings comparing the native accent to the heavy accent condition did find a significant difference in response accuracy. The heavy accent as demarcated in this study resulted in decreased accuracy and increased latency in listeners’ responses to spoken instructions. The present objective data can contribute to the determination if individuals seeking accent modification truly warrant intervention, especially those with lesser degrees of accent.

5.4 Study Limitations

A number of factors may limit the generalizability of the study findings. The limitations included data collection, sample population, and stimuli presentation.

The data in this study was collected using a modified version of the RTT utilizing only subtests 1, 4, 6, and 7. This instrument was selected for having well-established reliability and
validity measures which include auditory and linguistic information that is free of contextual cues and cannot be predicted. Data was collected in a university laboratory under ideal listening conditions rather than in a natural environment with competing auditory input from environmental sounds to objectively answer the study questions, and therefore, generalizability of findings to the general population are limited.

Another limitation involved the participant selection, as this was a sample of convenience. The participant sample pool was limited to university students mainly in the health professions rather than from a cross section of society which would include a variety of educational, socioeconomic and age differences. Although the threat to external validity is present, limiting the sample of participants to college age students minimized possible confounding variables such as potential hearing loss in the older population; English language proficiency among El Pasoans who may code switch from Spanish to English or who may only speak Spanish; certain socioeconomic factors may have limited transportation to and from the research lab; and cultural considerations for minority populations who may distrust the majority establishment.

To avoid the threat of an adaptation effect because of repeated exposures to similar stimuli, participants were exposed to only 10 randomized spoken commands for each of the degrees of accent: native, near-native, moderate, and heavy across the four RTT subtests. Although presentation of the test stimuli was randomized across subtests and within the different degrees of accents to minimize order effect, more exposure to the degree of accents may have increased the adaptation effect resulting in unremarkable findings.

Although these limitations pose a potential threat to the external validity of these findings, this project was still successful since none of these limitations represented fatal flaws.
5.5 Future Research Considerations

Further investigation beyond the current study’s geographical region of the country and use of different national origin accents is warranted. If accuracy and latency of response are impacted at a basic level of information (i.e., simple commands using colors and shapes), the use of health related terminology and instructions would be of particular interest and should be the next step in the investigation, especially given the present data. Furthermore, a finer-grained analysis of the complexity of the RTT stimuli would be of interest since longer and more complex utterances increase cognitive linguistic demands in listeners. As in prior research, further investigation of this topic should be extended to include clinical populations, such as patients with neurological impairments. Such an investigation should include comparison of the communication barriers resulting from accented speech on patient care needs beyond the physician-patient relationship, to include health care provider-patient interactions across health related disciplines.

5.6 Summary and Conclusion

This dissertation study compared the performance of English speaking participants on speech comprehension tasks from a modified version of the RTT (McNeil & Prescott, 1978; Lara, 2012) examining the accuracy and latency in response to native accented English and non-native accented English across different degrees of accents (native, near native, moderate and heavy). Study results show that the overall accuracy of response in listeners was not significantly affected by the degree of the accent, except under the heavy accent condition. Additionally, the results revealed that timing in response to accented commands was significantly different.
The quantitative results presented here were corroborated by a qualitative analysis of the listeners’ experiential descriptions immediately after completing the RTT portion of the study. Those findings show that accuracy of response does not appear to be significantly affected when listening to varying degrees of accents suggesting that the strategy of increased concentration and replay of the spoken message in the listener’s head is effective for the successful comprehension of the spoken message. Additionally, because less time was need to process the near-native accent commands in comparison to the others, it is this author’s opinion that these findings are indicative of the familiarity to this area’s regional accent. Further research is needed to expand these results to include a diverse representation of speakers and listeners in our present society.
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## Appendix A, ICAO Rating Scale

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<tr>
<th>Level</th>
<th>Pronunciation</th>
<th>Structure</th>
<th>Vocabulary</th>
<th>Fluency</th>
<th>Comprehension</th>
<th>Interactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expert 6</td>
<td>Pronunciation, Stress, rhythm, and intonation, though possibly influenced by the first language or regional variation, almost never interfere with ease of understanding.</td>
<td>Relevant grammatical structures and sentence patterns are determined by language functions appropriate to the task.</td>
<td>Both basic and complex grammatical structures and sentence patterns are consistently well controlled.</td>
<td>Vocabulary range and accuracy are sufficient to communicate effectively on a wide variety of familiar and unfamiliar topics. Vocabulary is idiomatic, nuanced, and sensitive to register.</td>
<td>Able to speak at length with a natural effortless flow. Varies speech flow for stylistic effect, e.g. to emphasize a point. Uses appropriate discourse markers and connectors spontaneously.</td>
<td>Comprehension is completely accurate in nearly all contexts and includes comprehension of linguistic and cultural subtleties.</td>
</tr>
<tr>
<td>Extended 5</td>
<td>Pronunciation, Stress, rhythm, and intonation, though possibly influenced by the first language or regional variation, rarely interfere with ease of understanding.</td>
<td></td>
<td>Both basic and complex grammatical structures and sentence patterns are consistently well controlled. Complex structures are attempted but with errors which sometimes interfere with meaning.</td>
<td>Vocabulary range and accuracy are sufficient to communicate effectively on common, concrete, and work related topics. Paraphrases consistently and successfully. Vocabulary is sometimes idiomatic.</td>
<td>Able to speak at length with relative ease on familiar topics, but may not vary speech flow as a stylistic device. Can make use of appropriate discourse markers or connectors.</td>
<td>Comprehension is accurate on common, concrete, and work-related topics and mostly accurate when the speaker is confronted with a linguistic or situational complication or an unexpected turn of events. Is able to comprehend a range of speech varieties (dialect and/or accent) or registers.</td>
</tr>
<tr>
<td>Operational 4</td>
<td>Pronunciation, Stress, rhythm, and intonation, though possibly influenced by the first language or regional variation but only sometimes interfere with ease of understanding.</td>
<td></td>
<td>Basic grammatical structures and sentence patterns are used creatively and are usually well controlled. Errors may occur, particularly in unusual or unexpected circumstances, but rarely interfere with meaning.</td>
<td>Vocabulary range and accuracy are sufficient to communicate effectively on common, concrete, and work related topics. Can often paraphrase successfully when lacking vocabulary in unusual or unexpected circumstances.</td>
<td>Produces stretches of language at an appropriate tempo. There may be occasional loss of fluency on transition from rehearsed or formulaic speech to spontaneous interaction, but this does not prevent effective communication. Can make a limited use of discourse markers or connectors. Fillers are not distracting.</td>
<td>Comprehension is mostly accurate on common, concrete, and work-related topics when the accent or variety used is sufficiently intelligible for an international community of users. When the speaker is confronted with a linguistic or situational complication or an unexpected turn of events, comprehension may be slower or require clarification strategies.</td>
</tr>
<tr>
<td>Pre-Operational 3</td>
<td>Pronunciation, Stress, rhythm, and intonation, though possibly influenced by the first language or regional variation and frequently interfere with ease of understanding.</td>
<td>Basic grammatical structures and sentence patterns associated with predictable situations are not always well controlled. Errors frequently interfere with meaning.</td>
<td>Vocabulary range and accuracy are sufficient to communicate on common, concrete, or work-related topics but range is limited and the word choice often inappropriate. Is often unable to paraphrase successfully when lacking vocabulary.</td>
<td>Produces stretches of language, but phrasing and pausing are often inappropriate. Hesitations or slowness is language processing may prevent effective communication. Fillers are sometimes distracting.</td>
<td>Comprehension is often accurate on common, concrete, and work-related topics when the accent or variety is used sufficiently intelligible for an international community of users. May fail to understand a linguistic or situational turn of events.</td>
<td>Responses are sometimes immediate and informative. Can initiate and maintain exchanges with reasonable ease on familiar topics and in predictable situations. Generally inadequate when dealing with an unexpected turn of events.</td>
</tr>
<tr>
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<tr>
<td>Elementary 2</td>
<td>Pronunciation, Stress, rhythm, and intonation, though possibly influenced by the first language or regional variation and usually interfere with ease of understanding.</td>
<td>Shows only limited control of a few simple memorized grammatical structures and sentence patterns.</td>
<td>Limited vocabulary range consisting only of isolated words and memorized phrases.</td>
<td>Can produce very short, isolated, memorized utterances with frequent pausing and a distracting use of fillers to search for expressions and to articulate less familiar words.</td>
<td>Comprehension is limited to isolated, memorized phrases when they are carefully and slowly articulated.</td>
<td>Response time is slow, and often inappropriate. Interaction is limited to simple routine exchanges.</td>
</tr>
<tr>
<td>Pre-Elementary 1</td>
<td>Performs at a level below the Elementary level.</td>
<td>Performs at a level below the Elementary level.</td>
<td>Performs at a level below the Elementary level.</td>
<td>Performs at a level below the Elementary level.</td>
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Appendix B, John D. Rockefeller Passage

John D. Rockefeller did three amazing things. First, he acquired probably the greatest fortune in all history. He started out in life digging potatoes under the hot sun for four cents an hour. In those days, there were not half a dozen men in all the United States who were worth even one million dollars. Eventually, John D. managed to collect a fortune said to be anywhere from one to two billion dollars. And yet, the first girl he fell in love with refused to marry him. The reason given was because her mother refused to allow her daughter to "throw herself away" on a man who had such poor prospects.

The second amazing thing that John Rockefeller did was to give away more money than anyone else has done in history. And the third thing about this man was that he lived to be eighty-two. He was one of the most hated men in America. He got lots of letters from people threatening to kill him. He had to be protected day and night by armed body guards. He endured the heavy nervous and physical strain of building up and bossing all his big Empire. It is well known that the strain of business killed Harriman, the railroad man, at sixty-one, and that Woolworth was finished with his life at sixty-seven. But John Rockefeller made a far greater fortune and still lived many years longer (Compton, 1999).
Appendix C, Modified RTT Commands

Subtest 1

1. Touch the black circle.
2. Touch the red circle.
3. Touch the blue square.
4. Touch the green square.
5. Touch the white circle.
6. Touch the green circle.
7. Touch the black square.
8. Touch the white square.
9. Touch the blue circle.
10. Touch the red square.

Subtest 4

1. Touch the big green square and the little black square.
2. Touch the big black square and the little red circle.
3. Touch the big blue circle and the little green square.
4. Touch the big white circle and the little blue square.
5. Touch the little blue square and the big black circle.
6. Touch the little green circle and the big red square.
7. Touch the little black circle and the little white square.
8. Touch the little white square and the big green circle.
9. Touch the little red circle and the big blue circle.
10. Touch the big red square and the big white circle.
Subtest 6

1. Touch the big red square in front of the big white circle.

2. Touch the big blue circle before the little green square.

3. Touch the little green circle under the big red square.

4. Touch the big black square above the little red circle.

5. Touch the little black circle below the little white square.

6. Touch the little blue square behind the big black circle.

7. Touch the big green square by the little black square.

8. Touch the big white circle next to the little blue square.

9. Touch the little red circle beside the big blue circle.

10. Touch the little white square on the big green circle.

Subtest 7

1. Touch the black circle to the left of the white square.

2. Touch the red square to the left of the white circle.

3. Touch the black square to the right of the red circle.

4. Touch the blue circle to the left of the green square.

5. Touch the green circle to the left of the red square.

6. Touch the white square to the right of the green circle.

7. Touch the red circle to the right of the blue circle.

8. Touch the white circle to the right of the blue square.

9. Touch the blue square to the left of the black circle.

10. Touch the green square to the right of the black square.
Appendix D, Recruitment Flyer

UTEP
College of Health Sciences
Interdisciplinary PhD Program

WE NEED YOU!

You are asked to take part in a research study to understand the impact of accented English on speech comprehension.

What is involved in the study?

- If you agree to take part in this study, the research team will ask you to listen to an audio recording and follow simple to complex commands as well as respond to three questions.

Who can participate in the study?

- Must be proficient in English (monolingual or bilingual)
- Must not be color blind,
- Must pass a hearing screening
- Must be between 18 to 40 years old

How long will it take?

- Approximately 100 university students/faculty/staff from UTEP will be recruited for this study. Your involvement will last approximately 40-50 minutes.

Who do I contact?

- If you decide to enroll in this study, please contact the primary investigator:

  Benigno (Benny) Valles, M.S., CCC-SLP
  Campbell Building Room 107M
  1101 Campbell St.
  El Paso, Texas 79902
  Office: 915-747-7209
  Cell Phone: 915-867-4274
  Email: bvalles@utep.edu

Thank you for your time!
Appendix E, Participant Demographic Information

Participant Demographic Information

Participant Number __________________________ Date __________________

Name: __________________________________________ Date of Birth: __________

Age: ________

Gender: ________

Color Blind (yes/no): __________

Hearing Screening (Pass/Fail): __________

College of Health Science Program of Study/Department: __________________________

Classification: ___Undergraduate ; ___Graduate

Race/Ethnicity: ______________________________________________________________

Place of Birth (City, State, Country): __________________________________________

Number of years in the U.S.: __________

Have you ever lived outside the U.S? ________ If so, for how long? ________________

Do you consider yourself fluent in English? ________

Do you speak/understand another language besides English? ________ If YES, what is/are the other language(s) including English?

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<td>English</td>
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From Marian et al. (2007): Bilingual LEAP Questionnaire
### Appendix F, Randomized Accent Subtest Trials

<table>
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<td>MLD Sub1 T10</td>
<td>HVY Sub1 T10</td>
<td>HVY Sub1 T10</td>
</tr>
</tbody>
</table>

Note: NAT = Native, MLD = Near Native, MOD = Moderate and HVY = Heavy. Trials were randomized using Research Randomizer retrieved on June 4, 2014 from www.randomizer.org/form.htm
Appendix H, Exit Questionnaire

Exit Questionnaire

Participant #: ______________  Date: ______________

Please respond to the following questions with as much detail as possible. If you need additional space for your answers, additional blank forms will be provided.

1. Describe how accented speech affected the timing and accuracy of your response.

2. Explain how your ability to understand the spoken commands was affected by the accents you just heard.

3. As a future health care provider, what do you believe is an acceptable level/degree of accentedness in health care provider - patient communication? Please explain why?
Appendix I, Exit Questionnaire Responses

Exit Questionnaire

Participant #: _01-56______ Date: ______________

Please respond to the following questions with as much detail as possible. If you need additional space for your answers, additional blank forms will be provided.

1. Describe how accented speech affected the timing and accuracy of your response.

   - Accented speech affected the timing of my response in some cases but I do not feel that it impacted my accuracy in responding to the commands.
   - I felt some of the speakers accents were slightly difficult to understand and made my ability to understand their commands a little hard. I kept trying to hear this request and found it slightly difficult.
   - The one that sounded Chinese was a little difficult to understand.
   - 04D: The accented speech took more effort for my memory to process along with a delay in response.
   - I noticed that it took me a little while longer to process what the person with the accent said. Some accents were very hard to understand. There were some very thick accents as well.
   - Accented speech can somewhat affect a delay in comprehension to respond.
   - I had to pay close attention to the accented speech. I found it more difficult to process than just plain English.
   - Accented speech was harder to understand and required more time for me to process. The speech that was accented often confused me and I had to reflect on the input.
   - It wasn’t so much accent as much as how quick they were presented. Faster presentation was harder.
- The accented speech made me have to try to replay the commands in my head so I could remember what they said, thus my timing was a little slower.

- The lower the pitch the lower was my response.

- Different accents I am not used to, took me a harder time to process.

- It affected my timing because I took a longer time to comprehend what the speaker was saying.

- I feel like I had to concentrate a bit harder with the heavily accented speech. It took a bit longer to answer the commands.

- Accented speech affected the understanding of what the person was trying to say (so did the speed of saying it).

- I think that throughout the test it did in a way affect the accuracy in my response because I could hear and understand most of them but then the second part where they were saying “touch Blue circle and ________? This second part I could not really understand it was too fast.

- The accented speech was harder to understand, therefore, I had to re-think what I thought I heard the first time.

- It didn’t affect my timing very much. The more heavy accents said the command slower, so I was able to answer right away. But the less heavy accents said the command quicker so it took more time for me to understand and follow the command.

- It took a while longer to process the command. I had to get the main things they were asking for throughout the rest and try to remember what to touch.
I discovered paying closer attention to the accented speech for better accuracy. I am unaware of the response time for the accented speech. There was one demonstration that I knew I missed due to a faster rate of speech which did not seem to be accented.

It took longer for me to respond to the tasks presented by the accented speech. For the most part, I had to repeat the command in my head so I could process it. It could’ve affected my accuracy with the task but I think it mostly affected my timing.

The accented speech delayed the timing of my response because I took longer to process what the person was saying. I don’t feel like it affected the accuracy of my response because once I processed what they were saying, I was able to answer with no problem.

I did not have any problem understanding the accents in this test.

I believe it caused a delay in my reaction time more than accuracy. I felt I had to restate the command to myself to clarify/actually wait to hear the entire command before being sure of the actual command.

There was some accents that spoke fast and low, it difficult to understand what they were asking.

Its slower to process the meaning of what the speaker is saying. I have to really think about it rather than just respond automatically.

The accented speech resulted in an increase in response time due to trying to process the command. It also may have affected accuracy since some commands I couldn’t understand and had to guess.

It slowed my timing for sure because I had to really try to focus on what was being said.

Thinking of what was said last was making me forget what they said at first.

The deeper the accented the more time it took for me to think about what was actually said.
-I didn’t think I had much difficulty w/the accented speech. It was easier for me to remember the commands if they were spoken slowly, regardless of accent.

-The accent definitely had an effect on the timing of my response. It took me much longer to answer and required much more concentration.

-Accented speech somewhat affected the timing as I had to really concentrate on what was being said and had to eventually replay what was said.

-It slowed the timing of the response and made me second guess the accuracy.

-Hearing an accent is something that always makes me take a while to get. Every time I hear someone talk in English whether it be a heavy or light accent, I always have trouble making out what is said. I will repeat it to myself a couple of times to make sure it makes sense. I had to do it a couple of times during the course of the study; as oppose to someone who speaks English with a foreign accent.

-When I had to follow the commands from the accented speech it felt as if my responses were less accurate and took longer. I believe this was due to me having trouble understanding some of the accents that were presented to me as well as trying to figure out what was said.

-Faster if I was listening closely; slower, less accurate if listening lightly.

-At first it was hard for me to follow the instructions in an unknown accent, but once I got used to it, it became easier so I got a little faster and more accurate.

-The thicker the accent the more time it takes to process the information and be able to understand the command.
- The more accented the speech, the longer my timing of my response was. My accuracy was probably not the best, either.

- Not to bad-but on the Asian accent it was just a little delayed.

- Accents that I personally am not used to hearing changed the amount of time and accuracy by making me spend more time to think about what my next move was going to be.

- When I came across a heavy accent, I had to slow down and be more aware of the instructions that were being given to me.

- I believe my accuracy was good but what was affected by the accented speech was my speed. I had to think a little longer when the accented speech would give a command.

- The speech with heavy accents required me to repeat the phrase in my head and slowed down timing and accuracy.

- The accented speech made me think about what they were saying for longer, making my reaction time slower.

- The accented speech did not really affect the timing and the response because when the command was given it was given slow so it gave me time to think about what it was asking.

- I had to take more time to think in my head what the accented speech said. It did affect my timing making it slower and I’m pretty sure I missed some of the sentences.

- Accents new to me affected how fast I’d respond to the command.

- Some of the accents were tough to understand but on simple tasks it wasn’t as difficult.
-My response time was definitely slower and less accurate when listening to the commands in accented speech.

-With a heavy accent I really had to think about what they had said, compared to a light accent where I would understand right away.

-I believe it took me a little bit longer to process instructions when given through a heavy accent. This could have also lead to some confusion at times because I had enough time to wonder if I had heard correctly or misheard, thus decreasing my accuracy.

-The accented speech proved difficult to understand and I certainly felt its impact on my performance. Still, this impact was not always negative. When the accented speech was rather slow, I felt that it often helped in my focus and retention.

-For the heaviest accents, it took longer for me to interpret the question, and I had to concentrate more.

-Depending on the given accent, it took longer to mentally process the commands. As a result, it took a little longer to figure out what was meant by the command.

2. **Explain how your ability to understand the spoken commands was affected by the accents you just heard.**

-I feel that I understood each command but had to recap the commands with stranger accents before responding.

-I felt some of the speakers accents were slightly difficult to understand and made my ability to their commands a little hard. I kept trying to hear their request and found it slightly difficult.

-After a bit into the study it became easier to understand.
- The accents with which I was least familiar were harder to understand and follow quickly.

- It think I got some answers wrong, because it took me a while to actually hear and understand what their commands were if they had thick accents that were hard to understand.

- It wasn’t difficult to understand the spoken commands as it was to remember the commands.

- It made it more difficult to interpret. You had to listen very carefully. It was more challenging.

- I felt that those commands with accents were harder to understand during 2 or more commands. Non-accented speech allowed me to answer at a faster rate without having to process longer.

- The accents were difficult when they were spoken quickly.

- Those who had a harsher accents were much more difficult to understand thus making me have to try harder to remember what they said.

- The faster they spoke and with more accent it was difficult to understand command.

- I was more focused on trying to understand than listening to the command.

- My ability to understand the accented spoken commands was fairly decent. I understood the commands but it took a little time to adjust to the different accents.

- I was able to understand all of the commands, but the heavily accented ones took me a bit longer to process.

- The ability to understand the commands was “OK” because at the end I did understand, tried to make out of my own understanding what is being said.

- It did affect my ability to understand the commands with some accents, especially when they gave you or tell you different things at the same time.

- Again, the accented speech caused me to re-evaluate my initial thought of what was being said.
Well at first if threw me off, I only understood half of the command. But when the same accent was presented again, I was able to focus more and slowly understand what they were saying.

The 1st accent threw me off. I had to really focus to understand the commands with accents.

After the first couple of commands, I mentally repeated the commands to better assist my judgment. I found myself identifying color first, then listening to the shape to comprehend what I would be selecting on the screen. I was very deliberate with my process of order.

It was harder for me to understand the spoken commands with the accents. I had to repeat it once or twice in my head to make sure I was understanding what was being asked.

Some of the accents made the commands a little harder to understand than others. There was some that had a really thick and heavy accents so I had to really slow down to process what they were saying.

I understood every person fine.

I don’t think it affected much—except a delay in being sure of the command it required me to be more patient and accurately assess the command. The commands that were less accented were almost second nature.

The accents affected the commands by sometimes not make very clear were they were asking.

Some words I was not able to understand which led me to either guessing or abstracting the main words I was able to understand and take a guess on what to select.

The accents made it more difficult to understand the commands since more effort was required to try and figure out what the command was rather than using that time to perform the command.

I was able to understand the spoken commands, but I had to focus more attention on what was being (said).

It was harder to understand thicker accents. I had to think more about what was said with them.
-My ability was affected in a way that it took more time to complete the commands because I had to repeat the voice and command in my head.

-I didn’t notice much difficulty. If the commands were spoken slowly, I noticed better response time.

-I think I could understand all of the commands. However, it took more concentration.

-On certain accents (not all), it was a bit difficult/tricky to process what was said. I found myself trying to remember the command because the accents were different and a bit distracting.

-It took me a few seconds longer to understand what was said. I had to concentrate more to comprehend.

-The accents really threw my ability to understand off. There were some people who would mumble and slur their words that it honestly sounded as if they were impaired or drunk. The accents really also made me take my time and have to double check with my judgment before I made a final decision.

-The accents I heard made it difficult to understand the spoken commands and it took longer to interpret what was said.

-One accent read sounded like white - all else easy.

-Like I said in the previous question, I couldn’t understand the accent so well so it was a little hard for me to follow the commands but the more you hear it, the more you get used to it.

-Again, the thicker accents made it more difficult to understand the command.

-My ability to understand the more accented spoken commands was lessened. I found myself having to think more about what was being commanded of me.

-More thought was put behind my response.
-It was a challenge to understand the commands given, though it was “do-able.” More focus was needed.
-There was times when I was not completely sure of the commands I was given.
-I was able to understand fine, it would just take me a while with the heavier accents.
-The accents altered the descriptive words causing slight confusion during comprehension of the commands.
-I had to listen a lot more closely to the accented commands, making it harder to remember what they were saying.
-The commands were a little difficult to do when the recording said them too fast because of the very detailed command. Other than that, the accent did not have much impact.
-Most accents were understandable to me, I only had trouble with what I assume was an African accent. The other accents were fine.
-The accents could give different emphasis to different pronunciations.
-It was a bit harder to understand but I feel like I did okay.
-The color names were difficult to understand and some of the accents required more effort to process.
-My ability was affected because with the heavy accents I had to think about their first words which would sometimes make me miss their next words.
-I felt that my ability to understand the spoken commands was somewhat hindered by the heavy accent, but only because I had to listen more attentively. Once I figured out the speech pattern, it made it easier to understand the spoken commands.
-As a resident assistant, I am quite use to listening to accents seeing as how much of the complex is made up of Brazilian students. As a result, I do believe I had a bit of an advantage.
- For one of the accents, I would not have understood what he was saying if I wasn’t given the option.

- I had a difficult time understanding accents where less annunciation was used. It caused the words to blend together for me and made it hard for me to figure out the command.

3. **As a future health care provider, what do you believe is an acceptable level/degree of accentedness in health care provider – patient communication? Please explain why?**

- A mild accent would be best for emergency-type situations. However, a severe accent would be acceptable if the individual who is receiving the message has time to process.

- I feel that as a health care provider the degree of accentedness shouldn’t be too high. If the patient is having a difficult time understanding the commands that the health care provider is giving them, then that may affect their treatment.

- I believe an acceptable level would be one that is at least understandable. In order to communicate properly both parties must be able to understand each other.

- I find, as a healthcare provider, accentedness should be reduced, if possible or desired. To treat patients in a certain language, such as English proficiency along with intelligibility are very important and an accent may affect the efficiency of treatment if the patient has difficulty understanding the accent.

- As long as the message is understood then the accent isn’t a big problem. If it’s too thick to where you can’t understand anything then that becomes a problem.

- An acceptable level should be, at least intermediate when it comes to a health care provider-patient communication. Because some medical terminology may be difficult to understand, even
when given instruction from a health care provider and some things need to be very clear and precise.

-I believe there is no level/degree of acceptability. This is our job to work with people and patients of all level types whether it be severe or mild.

-I believe that all care providers should have reduced accents to deliver good communication with their patients. If the care provider is hard to understand then other professionals and patients may miss-interpret the information.

-Accentedness shouldn’t matter, but speaking with a healthcare provider, it should be enough so that your client understands you. The client shouldn’t have to work so hard to guess what you are saying.

-I believe no accent is the acceptable level in speech therapy because you are trying to teach a person how to speak properly and if you yourself have an accent the patient will not learn properly.

-As a health provider, it is important to have a slow/calm tone of voice in order for the patient to understand what they are being told.

-As long as I am or other are able to understand what is being spoken it is fine. However, there are some accents that are really hard to understand and affect the service provided, so it is important to be understood.

-A high level of acceptance is needed. An SLP still has to treat patients with an accent or different dialect. SLPs need to be able to tell the difference between a language difference from a language disorder, an accent or dialect being a language difference not disorder. There is not a definite Standard American English. Health care providers need to be tolerant of all accents.
While accented speech is acceptable, if the accent is too heavy, there could be provider-patient misunderstanding. The patient should be able to understand everything that the provider is trying to communicate, especially when it comes to receiving health services.

Accentedness as a provider should be understandable to the rest of the people and try and work it out if possible misunderstanding. As a patient might want to ask them to explain themselves, as much as can without any misinterpretation of what the patient needs.

I really believe that as a future health provider we need to be proficient in our language, especially since we would be working with people with speech disorders and our level of accent should be understandable.

There definitely needs to be a mutual level of understanding if the accent is too difficult to understand, it’d be harder to provide therapy, or understand what the therapist is wanting you to do.

It needs to be at a level where the patient can understand the health care provider. Meaning that the health care provider needs to have an accent that is easy to understand and the patient doesn’t have to ask to repeat will be more stress if they can’t really understand the health care provider. And that could lead to negative confrontation b/w the patient and provider.

I think as long as majority of your patients can understand you, you are fine. But if not, you should probably try to get accent reduction. Miscommunication between health care provider and patient can go really bad no matter what field of healthcare.

A moderate accentedness would be acceptable. There may be difficulties for the patient if the healthcare provider is unable to demonstrate the correct articulation/production in therapy, if the accent is too heavy.
Until now, I never really thought about accents and how it could affect provider-patient communication. After participating, I think only a mild degree of accentedness would be acceptable. If with these short commands, I had a hard time, I can only imagine that it would be more difficult to understand/process entire conversations with someone who had a stronger accent.

-I think that any level or degree of accentedness has to be acceptable because when you become a care provider, you don’t always have the chance to choose your patient. If they have a heavy accent you can’t turn them down or not provide therapy because of their accent. As health care providers, we have to adjust to different accents and provide therapy based on their accents.

-I think that as long as the accent is clear enough then the health care provider will be able to speak to his patients and have them understand well enough for treatment.

-For most places but especially in an area like El Paso – a rather high degree of comprehension is necessary. There is already a significant chance of a full language barrier – making servicing patients difficult – being able to work with accents on various levels helps. It’s very much a part of the job/ a necessary skill.

-As a health care provider, I think they need to have a type of standard accent. An accent that most people or the patient could understand.

-As long as the provider can speak and produce the sounds of the patient, it should be okay. But if for example there’s a heavily accented Spanish speaker with a heavily accented AAVE speaker that would not work so well.

-I believe a slight to moderate accent is acceptable due to the fact the patient has to be able to understand the individual and a person can typically get by with a slight-moderate accent. A person with a heavy accent may just add to the confusion our patients may already be facing.
I think it’s okay to have a small degree of accentedness in health care provider and patient communication. Living in a border city we see this a lot. I think there just has to be patience between both health care provider and patient.

A health care provider should be able to understand most accents at least a little because it is important to be able to understand what a patient is asking for.

An acceptable level would be a mild accent, but personally it would all depend on where the person is, if they have a heavy Spanish accent in Mexico where Spanish is spoken constantly then, it would be acceptable.

As long as the individuals can understand each other and language barrier does not exist, I don’t see it posing a significant problem. It might depend on what you’re treating the patient for.

It’s hard to say a certain level, since it’s subjective. However, it may be difficult to place a person with a heavy accent with certain clients. I only had difficulty with the most heavily accented command. The others didn’t affect my response as much.

I believe if there is a miscommunication between health care provider and patient at ANY moment, there should be either a translator or some kind of individual (3rd party) to aid in explanation.

Some accent is fine as long as words are pronounced clearly. That way, patients can understand what is being said to them while still being culturally sensitive to the health care provider.

Going into a career in law enforcement, the level of accentedness plays a huge role. If I were to work with somebody with a accent, a light accent would be acceptable to me. I am pretty decent in speaking, hearing, and writing in Spanish so I could make out most words. Also, living in a city where the majority of people have Mexican decent made me adapt to their accents to the point where it doesn’t affect me that much. On the other hand, somebody from Japan or India
speaking English which I feel I heard in the study threw me off so if I were to work with somebody who had an accent from there could honestly negatively impact the both of us. Because in my situation we can be in a situation that can easily turn into a life or death type of thing. For example, if I were to work with someone from Bhutan and we were trying to prevent a hostage situation, the accent from Bhutan could throw off somebody and instead of resolving the situation, it can cause a life.

-I believe that in the health care field you will encounter lots of accents due to many health care providers being foreign so a high level of accentedness should be acceptable as long as the patient is still able to understand the health care provider and his or her directions.

-If patient/HC provider can understand each other, with one repetition infrequently. Communication between both must be accurate for effective care.

-I think that as long as it becomes easier to understand as time passes by, then it’s okay. If what the health care provider is saying is really unintelligible, then it becomes a problem. I think people can get used to accents as long as they don’t come in the way of the message trying to be delivered.

-As long as the patient can fully understand you, despite the accent, I feel that accents can be acceptable. Getting your point across to the patient is extremely important.

-I believe that no matter what level of accent a patient has, we as healthcare providers should in no way deem their needs as “less important.”

-Major English and minor Spanish-Because in our area that’s all we need.

-Accents are great! Though depending on what language is spoken more of in the area a health care provider is working in, it would be wise to practice over and over to be understood.
-I would say something mild, not too heavy would be acceptable. It is important to be able to understand what the health care provider is saying the first time and not second guess yourself.

-Heavy accents would be unacceptable because I would have to sometimes guess what was said.

-I believe all accents are acceptable as long as the health care providers ensures that the patients, patient’s family, and other health care providers understand what is being conveyed.

-I think really strong accents are obviously harder to understand, but at the same time, I do not think people should be discriminated against for their accents. You may have to try harder or listen more closely, to understand them, but most of the time you can.

-An acceptable degree of accentedness to me would be fine as long as the pronunciation of the words is comprehensible and maybe said slowly.

-As a health consumer, I would not want to have a doctor whom I can’t understand. I would not want to keep asking the doctor to repeat himself/herself. As long as I can understand the doctor without me thing too much about it, I guess that could be fine.

-The amount of accentedness would be enough as I heard today. The accent although new can be adapted to with enough time.

-Moderate would be okay. With the strong accents it’s harder (not impossible). I would be reluctant to return to that provider.

-I don’t think that accentedness should be too much of a problem. Given the time and patience I think any degree can be overcome to the point of intelligibility.

-I believe that heavy accents like some that I heard on this test are not acceptable. This test was telling me to do simple things and I still had trouble understanding. In real life, most people are health illiterate and the accent is making it worse. With heavy accents, providers should have a translator to make things easier to understand.
I believe a moderately heavy accent would be acceptable; however, a translator would probably be the best option. Many patients that we see may already be hindered in understanding English (may be ESL-English as a second language patients) and having an accent may make communication with these patients much more difficult.

The health care provider should be able to understand all that their patient is saying. That should be the standard.

I feel that accentedness can be a real problem. I often have difficulties understanding medications when I am transferring prescriptions. I have issues interpreting heavy accents, but I know many people who are much worse, and will not ever ask to clarify. I believe (especially when dealing with patients) that the degree of accentedness should be very low.

I think that it is appropriate to have a thick accent as a health care provider, but I think great attention must be paid to whether or not the patient has a comprehension or understanding of what is being said. It might require repeating words or speaking more slowly.
Appendix J, IRB Approval

THE UNIVERSITY OF TEXAS AT EL PASO
Office of the Vice President for Research and Sponsored Projects
Institutional Review Board
El Paso, Texas 79968-0587
phone: 915 747-8841 fax: 915 747-5931

FWA No: 00001224

DATE: November 14, 2014

TO: Benigno Valles, MS
FROM: University of Texas at El Paso IRB

STUDY TITLE: [487624-3] The Impact of Accented English on Speech Comprehension
IRB REFERENCE #: 487624-3
SUBMISSION TYPE: Amendment/Modification

ACTION: APPROVED
APPROVAL DATE: November 14, 2014
EXPIRATION DATE: October 27, 2015
REVIEW TYPE: Expedited Review

Thank you for your submission of Amendment/Modification materials for this research study. University of Texas at El Paso IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This study has received Expedited Review based on the applicable federal regulation.
Please remember that informed consent is a process beginning with a description of the study and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the study via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All SERIOUS and UNEXPECTED adverse events must be reported to this office. Please use the appropriate adverse event forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

Please report all NON-COMPLIANCE issues or COMPLAINTS regarding this study to this office. Please note that all research records must be retained for a minimum of three years after termination of the project.

Based on the risks, this project requires Continuing Review by this office on an annual basis. Please use the appropriate renewal forms for this procedure.

If you have any questions, please contact Christina Ramirez at (915) 747-7693 or cramirez22@utep.edu. Please include your study title and reference number in all correspondence with this office.

cc:
I. Title: The Impact of Accented English on Speech Comprehension

II. Investigator (co-investigators)
Benigno Valles, M.S., CCC-SLP & Bess Siron-Taylor, Ph.D., CCC-SLP

III. Hypothesis, Research Questions, or Goals of the Project
Hypothesis 1: Participants will demonstrate a difference in response accuracy between the native accent speech commands and the non-native accent speech commands in a modified version of the Revised Token Test (RTT) (McNeal & Prescott, 1978).
Hypothesis 2: Participants will demonstrate higher accuracy of response under native and near native accented speech commands than under the moderate and heavy accented speech commands in the modified RTT.
Hypothesis 3: Latency of response will increase with an increase in the degree of accented English.

The aim of this project is to identify whether a difference in accuracy of response exists between native and non-native accented speech and what degree if any of accented speech impacts auditory comprehension of speech. When accents affect the spoken message, a breakdown in communication may result in a delay or inaccuracy of the intended message therefore; justifying the need for accent modification intervention to increase successful transmission of the accented speaker's spoken message.

Background and Significance:
Human communication manifests in many forms, including verbal and nonverbal means. We use language as the primary mode for communication and speech as the means of language expression for most people. Although our speech contains increased amounts of variability both within and across speakers, it still serves as a consistent and reliable means with which to convey complex and intricate linguistic meaning (Owens, Metz, & Farinella, 2011).

Speech perception and speech comprehension are often not accurately or consistently distinguished. Perception and comprehension are two separate processes that work together to convey the speaker's message to the listener. Speech intelligibility is what we perceive from the spoken message's acoustic signal and speech comprehension is the idea or thought that is understood from the spoken message within a communicative interaction (Lindemann, 2000, 2002). If the central auditory mechanism of hearing has developed normally, humans have the ability to cope with variability, at least to some degree, of the spoken message (Flowers, 1983). This ability to identify the same sound across different speakers, pitches, and other changing environmental factors is referred to as perceptual constancy (Bauman-Waegner, 2012).

Linguists have identified three sources that may help explain language variations (Lippi-Green, 1997, 2012):
• Language-internal pressures, arising in part from the mechanics of production and perception of language.
• Language-external pressures, influences on language, as a social behavior subject to normative and other formative social pressures.
• Variation arising from language as a creative vehicle of free expression.

For the purpose of this study, language-internal pressures and language-external pressures will be our focus. Language-internal pressures propose that human neurological and vocal mechanisms used for speech production and perception are structurally and physiologically universal and because of this, there is great similarity in the way we produce and perceive the sounds of a language in the absence of physical or neurological impairments. Each language uses some of the available sounds but not all (Lippi-Green, 1997). Sounds that survive, because of language-external pressures, become part of the child’s language and are arranged into language-specific systems where each sound stands in relation to the other sounds.

Secondly and most importantly when referring to accents, language-external pressures, which are the influences on language from our social surroundings, help in developing, shaping, and maintaining a set of language behaviors subject to normative and other formative social pressures that will eventually manifest in accents and/or dialects. Although children are born with the ability to produce a finite set of possible sounds, they eventually restrict themselves to the sounds they hear being used around them. This process is the same for all speakers regardless of linguistic, cultural or ethnic backgrounds (Lippi-Green, 1997). Lippi-Green (1997, 2012) describes two major types of accents; first language accent (L1) and second language accent (L2).

L1 accent is simply a structured variation in the native language. In other words, all native speakers of English have some variation usually due to some geographic area, a melding of one or more areas or due to membership within a given cultural, ethnic or social group. L1 accents may sometimes be referred to as regional accents or dialects (Ingram, 2009).

The second type of accent, L2 accent, is manifested when a native speaker of a language acquires a second language, in this case English, and the speaker’s native language phonology breaks through into the target language (Lippi-Green, 1997, 2012). Although L2 accents are entirely different than L1 accents, both are influenced by language-external pressures in the same way; however, L2 accents have linguistic characteristics or traits associated with the individual’s national origin.

Jakobson and Halle (1955, 1971) described their distinctive features theory which helps us define the boundaries of sound variability within a language’s sound inventory. Consonant sounds are typically described by the presence or absence of voicing, place of articulation, and manner of production. Vowels, which are produced with a more open vocal tract, tend to be described (in relation to the oral cavity) in terms of lingual height, advancement, tension and are also described as
being rounded or unrounded (in relation to the oral opening). Each sound, therefore, has its own distinctive features that define it. A change in any one or more segmental features may result in sound distortion or depending on the features involved, may change the intended sounds entirely resulting in what people perceive as accent.

The U.S. Congress passed the Civil Rights Act in 1964 to prohibit discrimination on the basis of race, color, national origin, sex (including pregnancy), and religion in employment, education, and access to public facilities and public accommodations, such as restaurants and hotels. The employment provisions of the law are often referred to as Title VII in the U.S. Code (EEOC, 2014). In 1987, The Equal Employment Opportunity Commission (EEOC) further defined national origin to include linguistic characteristics (referring to L2 accents) of a national origin. Unfortunately, only L2 accents are protected under this law (EEOC, 1987 cited in Ingram, 2009).

Since the 1950s, research addressing the communication needs of individuals with accents has been ongoing in the areas of linguistics, foreign language instruction, and English as a second language. Sikorski (2005) points out that the field of speech-language pathology has actively been addressing the communication needs of individuals with accents going back only to the 1980s. She suggests that our profession look outside our field of speech-language pathology for more relevant research. The American Speech-Language-Hearing Association (ASHA) (1997) issued a recommendation on students and professionals who speak English with accents and non-standard dialects indicating that these individuals who speak with an accent or a non-standard dialect are able to make appropriate diagnostic decisions or are capable of achieving appropriate treatment outcomes because there is no research to prove otherwise. However, Langdon (1999) points out that there is also no research data to support ASHA’s position either.

To further understand the accentedness phenomenon, scales have been used to obtain global measures of foreign accents and measure the degree to which the accents of non-native speakers differ from that of native speakers of a language (Southwood & Flege, 1999). Munro (1993) stated that there were no standards that had been developed for rating accented speech and still, to this date, no standards have been established. Southwood and Flege (1999) found that at least when rating Italian native speakers, English-speaking listeners segmented accentedness into equal intervals suggesting that a linear scale was an effective method for the rating of accents.

Going beyond comparing accents and in an effort to understand its effects, Munro and Derwing (1995) conducted a study that looked at the effect of foreign accent on sentence processing time by using a sentence verification task where listeners assessed the truth value of the statements presented and assigned accent and comprehensibility ratings. Results indicated that the native English speakers’ utterances were correctly verified more often than those of the Mandarin speakers’ and response latency data indicated that the Mandarin-accented
utterances required more time to evaluate than the utterances of the native English speakers.

Because accented speech is fundamentally a perceptual phenomenon, one needs to consider the nature of the listening task which can affect the perception of the accented speech. Munro and Derwing (1998) hypothesized that accented speech heard at a reduced rate would sound less accented and more comprehensible than at a normal rate of speech. Their findings suggest that the optimal speaking rate for non-native speakers may be somewhat slower than that of native speakers. Given that non-native speakers typically speak slower than native speakers, the strategy of intentionally speaking slower-than-normal rate was not generally beneficial as a way of increasing comprehensibility and improving accentedness.

In general, most previous studies have concentrated on single parameters of English such as vowel duration, fundamental frequency in relation to intonation, or temporal measure of speech production. More recently, Kang, Rubin and Pickering (2010) studied the suprasegmental measures of accentedness and judgments of language learner proficiency in oral English and found that suprasegmental measures as a whole account for 50% of the variance in oral proficiency and comprehensibility ratings. These findings add to our understanding of this complex phenomenon as a whole in terms of segmental and prosodic features involved in the production of accented speech (Lippi-Green, 2012).

Other studies have looked at the effects of regional, ethnic, and international dialects of English on comprehension. Major, Fitzmaurice, Bunta and Balasubramanian (2005) investigated whether listeners experienced more difficulty with regional, ethnic, and international dialects of English than with Standard American English (SAE). Their findings revealed that ESL listeners and native English listeners scored lower on listening comprehension tests listening to ethnic and international dialects of English than on listening to regional accents. In looking at regional dialects and SAE, there was no significant difference in listening scores.

Limited information exists on the effects of nonnative speech on treatment and evaluation of individuals with communication deficits in the diverse areas serviced by speech-language pathologists (Langdon, 1999). Langdon conducted a survey relating to foreign accent, intelligibility, and implications for successful service delivery on bilingual speech-language pathology (SLP) clinicians in California to gather opinions on how clinicians’ foreign accent impacts speech and language delivery of services for native speakers of a given language. Survey results indicated that more than half of the respondents are still in disagreement about what might be the correct level of accentedness (Langdon, 1999).

Dunton, Bruce, and Newton (2011) similarly investigated the impact of unfamiliar speaker accent on auditory comprehension in adults with aphasia and found that individuals with aphasia made significantly more errors in a spoken sentence comprehension task with an unfamiliar accent than with a familiar one. Bruce,
To, and Newton (2012) also looked at the impact of regional and foreign accent on comprehension in adults with aphasia. Their findings appear to support results from the Major, Fitzmaurice, Bunta and Balaubramanian (2005) study where listeners fared better with regional accents than non-native accented speech on simple tasks in ideal listening conditions.

**PURPOSE OF STUDY**

Previous research involving acoustic correlations of intelligibility or comprehensibility of accented speech has depended mainly on potentially subjective raters rather than on computer-assisted instrumentation for systematic presentation and randomization of task stimuli when measuring the effects of accentedness. The purpose of this study is to collect objective data on the impact of accented English on speech comprehension using a modified computerized version of the RTT. This study will use a one-directional communication approach to minimize listener bias by having listeners perform relatively simple tasks under controlled listening conditions rather than using subjective judgments in a rating scale to evaluate auditory comprehension of the accented speech.

**IV. Research Method, Design, and Proposed Statistical Analysis:**

This study will consist of a convenience sample of 100 participants who will be tested using subtest 1, 4, 6, and 7 from a modified version of the RTT. This instrument was selected for having well established reliability and validity measures which contain auditory and linguistic information that is free of contextual cues and cannot be predicted. Speakers with varying L2 accents and degrees of accentedness (native, near native, moderate, and heavy) were selected from phase one of the pilot study (IRBNet ID 487624-2) conducted by the primary investigator in the spring of 2014. A speaker was selected from each of the accented categories to record simple to complex commands under each subtest to be presented auditorily on a computerized version of the RTT to each participant in random order. Participants’ speech comprehension will be assessed using SuperLab 4.5 Software by looking at accuracy and latency of response. Participants should complete this phase in 45-50 minutes.

A quasi-experimental design using repeated measures ANOVA to test for main effects on the degree of accentedness on response accuracy and the degree of accentedness on latency of response will be used.
Table 1. Repeated Measures ANOVA for Accuracy of Response.

<table>
<thead>
<tr>
<th>Degree of Accented English</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native Accent</td>
</tr>
<tr>
<td>Near Native Accent</td>
</tr>
<tr>
<td>Moderate Accent</td>
</tr>
<tr>
<td>Heavy Accent</td>
</tr>
<tr>
<td>Accuracy (%)</td>
</tr>
<tr>
<td>n=100 mean(SD)</td>
</tr>
<tr>
<td>n=100 mean(SD)</td>
</tr>
<tr>
<td>n=100 mean(SD)</td>
</tr>
<tr>
<td>n=100 mean(SD)</td>
</tr>
</tbody>
</table>

Table 2. Repeated Measures ANOVA for Latency of Response.

<table>
<thead>
<tr>
<th>Degree of Accented English</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native Accent</td>
</tr>
<tr>
<td>Near Native Accent</td>
</tr>
<tr>
<td>Moderate Accent</td>
</tr>
<tr>
<td>Heavy Accent</td>
</tr>
<tr>
<td>Latency (ms)</td>
</tr>
<tr>
<td>n=100 mean(SD)</td>
</tr>
<tr>
<td>n=100 mean(SD)</td>
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<tr>
<td>n=100 mean(SD)</td>
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<tr>
<td>n=100 mean(SD)</td>
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</tbody>
</table>

Data Analysis Plan

The hypotheses will be tested using a repeated measures ANOVA testing for the within-subject effect of accentedness and the between subjects main effect of sex on response accuracy and response latency. Skewness and kurtosis ranges will be measured for each variable to confirm that the assumption of normality is not violated. Because there are more than two levels in the repeated measures factor, sphericity will have to be established.

V. Human Subject Interactions

**A. Sources of potential participants.** A total of 100 English listeners (male and female) potential participants’ ages 18 to 40 years old will be recruited for the study from the University of Texas at El Paso (UTEP). Participants will be selected from across the College of Health Sciences and School of Nursing. Participants will be recruited through class presentations with the instructor’s permission and by posting flyers across the college. All rights will be protected and no participant will be subject to coercion or undue influence. We expect data collection to begin in November 2014 and be completed by December 2015.

Participants will be excluded from the study if they have a history of hearing problems, are color blind, and if they do not speak English. It is expected that the majority of the participants will fall between the age range of 18 to 40 years old with equal representation of male and female participants. It is also expected that the majority of the participants may be Hispanic but that is not a requirement of the study. Consent forms in English will be provided to potential participants in
the Speech, Hearing and Language Center at Campbell Building, 1101 N.
Campbell St., El Paso, Texas 79902.

B. Procedures for the recruitment of the participants. The primary
investigator may visit classes on approval of a professor to tell students and
faculty about the study and invite them to participate. Interested participants will
be given contact information for the Speech, Hearing and Language Center at
Campbell Building if they would like to participate. If they do not qualify, they
will be thanked for their interest but informed that they do not qualify for
participation in the study (See Appendix B).

C. Procedure for obtaining informed consent. Each participant will come to
the Speech, Hearing and Language Center at Campbell Building and will be
presented with the informed consent for reading and review by the PI or Co-
investigators. Any questions will be answered before the participant signs the
informed consent.

D. Research Protocol. Participants will be scheduled for a 50 minute testing
session with the PI at the UTEP Speech, Hearing and Language Center.
Participants will be administered four subtests from a modified version of the
RTT. Test stimuli will be randomly presented using varying degrees of accented
English to assess the participant’s accuracy and latency of response.

All participants will be healthy male/female adult college students from different
ethnic backgrounds. Criteria for inclusion consist of English language
proficiency, passing a hearing screen and having the ability to see colors. Anyone
who does not speak English or fails to pass a hearing screen, or is color blind will
be excluded from participating in this study.

E. How will you protect the privacy and confidentiality of participants?
Individual data will not become available to the public in any way. Data being
entered in electronic form or in a hard copy form will be identified with a number
to ensure participant anonymity. The researcher shall not report or present
individuals’ data. Data will only be presented and reported in a group format.
Data collection will take place at the UTEP Speech, Hearing and Language
Center.

F. Discuss the procedures that will be used to maintain the confidentiality of
the research data. Participation in the study will be confidential. Following
consent for the study, all records pertaining to the participants will be labeled with
an identification number and not with a name. Data records will be stored in a
locked file cabinet in a locked closet in room 402 at the Campbell Building. Only
the principal investigator, Mr. Valles, will have access to this information. All
have completed training on human subjects’ research and confidentiality. The
results of this research study may be presented at meetings or in publications;
however, the identity of participants will not be disclosed in those presentations.
G. Please describe your research resources. Research resources for this project include clinic space, audio recorders and memory devices, microphones, headphones, and an audio booth. Funding for resources is provided by the primary investigator, Mr. Valles.

VI. Potential risks. Potential risks for the participants in this study are minimal. Participants may become bored or tired from the tasks. Testing sessions will not last more than 50 minutes with breaks in between each presentation to minimize this risk. Loss of confidentiality of participants’ responses is a risk. However, all data will be kept in a locked file in a locked closet or on a password protected server to minimize this risk. If information is revealed about child abuse or neglect, or potentially dangerous future behavior to others, this information will be reported to the proper authorities.

VII. Potential benefits. There are no other direct benefits to the participants for taking part in the study. However, participation will contribute to the understanding of the effects of accented speech on auditory comprehension.

VIII. Sites of agencies involved in the research project. Research activities will take place at the University of Texas at El Paso.

IX. If the project has had or will receive review by another IRB, indicate this. This project will take place at UTEP and will not be reviewed by another IRB.
References


The University of Texas at El Paso (UTEP) Institutional Review Board

Informed Consent Form for Research Involving Human Subjects

Protocol Title: The Impact of Accented English on Speech Comprehension

Principal Investigator (co-investigators): Benigno Valles, M.S., CCC-SLP & Bess Sirmon-Taylor, Ph.D., CCC-SLP

UTEP: Speech-Language Pathology

Introduction
You are being asked to take part voluntarily in the research project described below. Please take your time making a decision and feel free to discuss it with your friends and family. Before agreeing to take part in this research study, it is important that you read the consent form that describes the study. Please ask the study researcher or the study staff to explain any words or information that you do not clearly understand.

Why is this study being done?
You have been asked to take part in a research study to assess the impact of accented English speech on a person’s ability to follow simple to complex verbal commands.

Approximately 100 university students from the University of Texas at El Paso will be enrolling in this study. If you decide to enroll in this study, your involvement will last around 50 minutes.

What is involved in the study?
If you agree to take part in this study, the research team will ask you to listen to an audio recording and follow 40 simple to complex commands from a modified version of the Revised Token Test (RTT; McNeal & Prescott, 1978). Your responses consist of pointing to a token by shape (circle or square), color (white, green, blue, red, and black) and size (big and little). You will be asked to answer three questions after completing the modified RTT testing.

What are the risks and discomforts of the study?
There are no known risks associated with this research study. The study may include risks that are unknown at this time.

What will happen if I am injured in this study?
The University of Texas at El Paso and its affiliates do not offer to pay for or cover the cost of medical treatment for research related illness or injury. No funds have been set aside to pay or reimburse you in the event of such injury or illness. You will not give up any of your legal rights by signing this consent form. You should report any such injury to Mr. Benigno Valles at (915) 747-7209 or bvalles@utep.edu, or Dr. Sirmon-Taylor at 915-747-7278 or bsfjordbak@utep.edu, and to the Institutional Review Board (IRB) at UTEP at (915-747-8841) or irb.orsp@utep.edu.
Are there benefits to taking part in this study?
There will be no direct benefit to you for taking part in this study. This research may help us understand the degree to which an accent affects the spoken message resulting in a breakdown in communication and therefore justifying accent modification therapy.

What other options are there?
You have the option not to take part in this study. There will be no penalties involved if you choose not to take part in this study.

Who is paying for this study?
There is no external funding.

What are my costs?
There are no direct costs. You will be responsible for travel to and from the research site and any other incidental expenses.

Will I be paid to participate in this study?
You will not be paid for participation in this study.

What if I want to withdraw, or am asked to withdraw from this study?
Taking part in this study is voluntary. You have the right to choose not to take part in this study. If you do not take part in the study, there will be no penalty. If you choose to take part, you have the right to stop at any time. However, we encourage you to talk to a member of the research group so that they know why you are leaving the study. If there are any new findings during the study that may affect whether you want to continue to take part, you will be told about them.
The researcher may decide to stop your participation without your permission, if he or she thinks that being in the study may cause you harm.

Who do I call if I have questions or problems?
You may ask any questions you have now. If you have questions later, you may call Mr. Benigno Valles at (915) 747-7209 or bvalles@utep.edu, or Dr. Simon Taylor at 915-747-7278 or bsfjordbak@utep.edu.

If you have questions or concerns about your participation as a research subject, please contact the Institutional Review Board (IRB) at UTEP at (915)-747-8841 or by email at irb.orsp@utep.edu.

What about confidentiality?
Your part in this study is confidential. None of the information will identify you by name. The rating forms will be secured and locked in a file and identified by a number. The audio recordings and informed consent forms will be stored separately to ensure confidentiality.

Mandatory reporting
If information is revealed about child abuse or neglect, or potentially dangerous future behavior to others, the law requires that this information be reported to the proper authorities.
Authorization Statement

I have read each page of this paper about the study (or it was read to me). I know that being in this study is voluntary and I choose to be in this study. I know I can stop my participation in this study at any time without penalty. I will get a copy of this consent form now and can get information on results of the study later if I wish.

Participant Name: ___________________________ Date: ______________

Participant Signature: ________________________ Time: ______________

Consent form explained/witnessed by: ________________________________

Signature

Printed name: ________________________________

Date: ______________ Time: ____________________
Appendix K, Acoustic Analysis

Acoustic information was analyzed using PRAAT (Boersma & Weenink, 2014) by randomly selecting one representative sample of the 40 commands from the modified RTT to compare three acoustic properties (Pitch, Intensity, and Duration) from among each of the selected speakers representing each of the accent categories in the preliminary study (see Table below for a summary of acoustic comparisons of a single command).

Acoustic Comparison of a Single Command across conditions.

<table>
<thead>
<tr>
<th>Speakers</th>
<th>Gender</th>
<th>Pitch (Hz)</th>
<th>Intensity (dB)</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean (75-500 Hz)</td>
<td>Mean (50-100 dB)</td>
<td>Mean Seconds</td>
</tr>
<tr>
<td>Native</td>
<td>Female</td>
<td>238.7</td>
<td>72.0</td>
<td>1.6</td>
</tr>
<tr>
<td>Near-Native</td>
<td>Male</td>
<td>150.8</td>
<td>73.5</td>
<td>1.3</td>
</tr>
<tr>
<td>Moderate</td>
<td>Female</td>
<td>160.9</td>
<td>69.7</td>
<td>1.0</td>
</tr>
<tr>
<td>Heavy</td>
<td>Male</td>
<td>106.4</td>
<td>70.7</td>
<td>2.1</td>
</tr>
</tbody>
</table>

As expected, the female pitches were higher than the male pitches. When comparing intensity, both native and near-native speakers were louder than the moderate and heavy speakers. However, in comparing average duration times in seconds for a single command, the male with a heavy accent was the slowest at 2.1 seconds, followed by the female with a native accent at 1.6 seconds, then the male with a near-native accent at 1.3 seconds and finally, the female with a moderate accent was the fastest at 1.0 second. Because the acoustic properties vary across speakers and across accent degrees, these findings did not contribute to the accent description or change the outcome of the study.
VITA

Benigno Valles, Jr. was born, raised and educated in El Paso, Texas. He is the son of Benigno and Abigail Valles and is the youngest of five siblings. Benigno is a 1987 graduate of S.F. Austin High School. He served his country in the US Army from 1988 to 1991. Benigno attended the Defense Language Institute Foreign Language Center, School of Central European Languages at the Presidio of Monterey, California where he learned to speak German. His military occupational skill was as an electronic warfare, signal intelligence, German, Spanish voice interceptor. Benigno is a veteran of the 1991 Persian Gulf War and after being honorably discharged, he enrolled at UTEP in January 1992. He graduated with a Master of Science in Speech-Language Pathology in 1996. In 1997, he completed his clinical fellowship year in Odessa, Texas where he was the first and only bilingual speech-language pathologist in the history of the Permian Basin. He returned to El Paso and worked at several local hospitals, school districts, and also served in the board of directors for the El Paso Learning Disabilities Advocacy Organization before returning to UTEP in January 2001 as a lecturer. In 2004, Benigno established the Bilingual (English/Spanish) Speech Language Pathology Certificate for the Speech-Language Pathology Program at UTEP.

While pursuing his doctoral studies in the Interdisciplinary Health Sciences Ph.D. Program, Benigno served as the clinical director of the UTEP Speech-Hearing and Language Center. He taught graduate and undergraduate classes, supervised graduate students in the clinic as well as externships, and he has presented at state and national conferences.

Benigno is a member of the local, state, and national Speech-Language-Hearing Associations. At the state level, he served three years in the Cultural and Linguistically Diverse
Task Force of the Texas Speech-Language-Hearing Association. Benigno’s research interests are in multicultural/multilingual communication disorders.

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