PERCEPTION OF FOREIGN ACCENTED SPEECH: THE ROLES OF FAMILIARITY

AND LINGUISTIC TRAINING

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This paper seeks to address the issue by examining two factors that potentially affect a listener's perception of foreign accented speech: degree of familiarity (as acquired through a work or personal environment) and amount of English as a Second Language (ESL) or linguistic training. Speech samples were recorded from 18 international students from Hispanic, Asian, and Middle-eastern backgrounds and across all proficiency levels as designated by their academic English program. Six native English speakers were also recorded to serve as a basis for comparison. Listeners were drawn from two pools: people with ESL and/or linguistic training ($n = 42$) and laypersons with no such specialist training ($n = 36$). After completing a background questionnaire to assess familiarity with foreign accented speech, each listener rated all 24 speech samples on the dimensions of comprehensibility, degree of accent, and communicative ability. Results indicate that participants with ESL/linguistic training rate foreign accented speech more positively on all three dimensions than laypersons with no such training. Additionally, degree of familiarity with foreign accented speech is positively correlated with how participants rated the accented speech samples. A number of highly significant interactions between these and other factors including sex of the speaker, proficiency level of the speaker, and L1 family of the speaker were found as well.

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INTRODUCTION

In the ever-globalizing United States, it would be difficult to find even a handful of people who have never conversed or interacted with a speaker whose native language is not English. Whether this interaction was with a neighbor, a store employee, a friend, a student, for a business transaction, or graciously helping out a lost tourist, I'm positive we can all recall at least one experience. According to the 2007 United States Census, there has been a 140% increase in people who speak a language other than English at home over the past 30 years, growing from 23 million in 1980 to almost 55.5 million in 2007 (Kominsky & Shin, 2010). With an increase in immigration to the United States over the past decade (Camarota, 2005), native speakers of English encounter more and more speakers whose first language is not English. Very often, such people speak English with varying degrees of a foreign accent.

Davies (2003) defines a native speaker as one who acquires a language early, before puberty. A native speaker "knows" another native speaker partly based on intuition, a set of linguistic and pragmatic indicators that are unique to a language and shared cultural knowledge. Foreign accented speech (FAS) can be defined as non-pathological speech produced by second language (L2) learners that differs in systematic ways from the speech characteristics of native speakers of a given dialect (Munro, 1998).

Upon asking any given interlocutor about their experiences interacting with a person speaking foreign-accented English, one would receive a wide range of opinions, feelings and ratings on different aspects such as degree of accent, comprehensibility, and overall communicative success. For many people these experiences are positive, leaving them with a sense of increased cultural-awareness and appreciation for linguistic diversity. Unfortunately, this is not always the case. After researching this topic and taking into account anecdotal

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evidence from observations and my own personal experiences, it can be said that communicating (or attempting to) with a person speaking foreign-accented English can be a negative experience for a variety of reasons. An accent may impede comprehension and frustrate both participants in the conversation. A number of language attitude studies also indicate that negative cultural stereotypes may be associated with FAS (Baugh, 2000; Lambert, 1966; Lippi-Green, 1997; Matsuda, 1991; Munro & Derwing, 2006; Rubin, 1992).

In the introduction to her master's thesis, Sato (1998) details an unpleasant personal experience as a non-native speaker of English. She received a rather rude and blunt reply from a travel agent when she called to inquire about a plan ticket to Japan. Later the same day, a friend of hers (a native speaker of English) called the travel agent back to ask the same question. However, she was given very different information than Sato. Sato attributes this travel agent's rude reaction and withholding of information to a negative attitude that the agent must have had toward the way she sounded.

In her paper Voices of America, Mari Matsuda (1991) provides countless examples of negative reactions to FAS and the unfortunate consequences for the non-native English speakers that may follow. One such example is the story of Manuel Fragante. Fragante took a civil service examination as part of a job application along with 700 other applicants. This well-educated and intelligent man received the highest score on the test out of all the applicants and was ranked first on the list of candidates for the job. After an interview, Fragante was turned down for the clerk job at the Department of Motor Vehicles. As you can imagine, Fragante was puzzled about the outcome. Upon inquiry as to why he was rejected, he was told that he was not hired for the job because of his heavy Filipino accent.

In order to understand what may account for differences in interactions with foreign-accented English speakers, numerous studies have been conducted over the past forty years. Some factors cited as potentially having an effect on the perception of foreign-accented speech include sex of the speaker, positive or negative attitude toward a particular accent (in association with the perceived culture of origin), intelligibility, degree of accent, comprehensibility, and familiarity with a particular accent (Callan et al., 1981; Munro & Derwing, 1995b; Piske et al., 2001).

In the present study, I examine how familiarity with FAS through formal linguistic or ESL training or other experiences affects how a native English-speaking listener will rate samples of FAS. This study also seeks to investigate other factors that may influence one's perception of FAS: sex of the speaker, L1 or native language of the speaker, the speaker's proficiency in English, and rating areas including degree of accent, comprehensibility, and communicative ability (Piske et al., 2001).

The term "degree of accent" refers to how strong one perceives a foreign accent to be. In this study, answers range from no accent at all to very strong accent. "Comprehensibility" has been defined different ways across different studies (Gas & Varonis, 1984; Smith, 1992), I employ "comprehensibility" as it is defined by Derwing and Munro (1997): referring to judgments on a rating scale of how difficult or easy an utterance is to understand. The last rating area, communicative ability, I define as the level of success a non-native speaker would experience in clearly communicating with a native speaker.

In the next chapter, I discuss prior research related to the factors investigated in the current study: sex of the speaker, influence of a speaker's perceived L1, proficiency of the speaker, degree of accent (or accentedness), comprehensibility, communicative ability and

familiarity. Research questions conclude this chapter. Following this is the Methods section in which I detail the procedure for the study along with the results. Lastly, I conclude with a discussion of the results and their possible implications.

LITERATURE REVIEW

Sex of the Speaker

A number of studies have cited the sex of the speaker to be a factor affecting a listener's perception of foreign accented speech (FAS) (Asher & Garcia, 1969; Tahta et al., 1981, Thompson, 1991; Purcell & Suter, 1980). One such study was done by Gallois and Callan (1981 & 1982). It was based on Kramer's (1987) research about stereotypes attached to male and female speech. They found that Greek-Australian, Anglo-Australians, and Italo-Australian males and females' evaluative reactions to speech samples varied depending on the sex of the speaker. Greek-Australians rated male speakers more favorably on degree of accent than females while Anglo-Australians rated female speakers more positively.

In a perceptual speech study, Flege, Munro and Mackay (1995) found that female native Italian speakers who began learning English as a second language earlier in life were rated better at pronunciation than their male native Italian-speaking counterparts when matched for age of learning. However, when they took a look at speakers (also matched for age of learning) who began to acquire English as a second language later in adolescence, the reverse was found. Male speakers were rated as having better English pronunciation than their female counterparts.

Preston (1963) investigated evaluative reactions toward female and male speakers of English and Canadian French by anglophones and francophones employing the matched guise technique. The matched guise technique was first used by Lambert et al. (1966) to study of stereotypes held by bilingual French Canadians. Bilingual participants are recruited to record sample texts in two languages. Raters are unaware that the speaker is bilingual and has produced two speech samples which are thus evaluated as if recorded by two different speakers. Because each speaker provides two samples, listeners' judgments about personality traits of the speaker

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can be correlated with a bias toward or against an accent or particular language. Results showed that female speakers were rated more positively in their English guises than their French guises on personality traits including perceived level of self-confidence, intelligence, dependability and courage. Sato (1998) cites this study and claims that the effect of the speakers' sex was so strong that it overrode the language effect.

To investigate the effect of English-language experience on non-native English speakers' production and perception of English vowels, Flege, Bohn and Jang (1997) conducted a study with male and female speakers who had L1s of German, Spanish, Mandarin and Korean along with 10 native English speakers. The non-native speakers were assigned to groups depending on their amount of exposure to English upon arrival in the United States as either relatively experienced or inexperienced. Subjects productions of English vowels /i ɪ ɛ æ/ were identified (or not identified) by native English speakers. In contrast to the prior studies discussed, the researchers found that sex of non-native English speakers did not prove to be a significant factor in male or female speakers' intelligibility scores [$F(1,68) = 1.03$, $p > 0.10$], nor did sex significantly interact with any other factor in the study.

L1 of the Speaker

Perceived L1 or ethnicity of a speaker (since the two often go hand-in-hand) has been shown to have an effect on a listener's ratings of FAS. As the aforementioned language attitude studies have shown, poorer ratings of FAS can often time be the result of a negative stereotype associated with a particular foreign accent or FAS in general. Callan and Gallois (1983) state that "accented speech is often a readily recognizable cue to group membership, and an important determiner of the personality judgments of ingroup and outgroup members." In their 1981 study,

the two researchers found the FAS of immigrants (with different L1s and ethnicities) to Australia received lower ratings than did standard Australian speech by native Anglo-Australian listeners.

These results projected Callan and Gallois into their next study to investigate whether or not speakers of Greek-accented English would receive lower ratings than standard Australian English when rated by native Anglo-Australians (1983). Female and male high school-aged listeners judged samples of standard Australian English and Greek-accented Australian English on personality dimensions including solidarity and status. As predicted, Anglo-Australian subjects rated Greek-accented speech negatively. However, male listeners tended to favor standard Australian English more than female listeners.

Ladegaard (1998) conducted a study to investigate whether or not English learning students in Denmark, a non-English-speaking country that broadcasts a large amount of American media, would prefer the standard British (RP) accent, which is traditionally taught in Danish EFL classrooms, over the standard American accent (SA), which is traditionally taught in EFL classrooms in neighboring country Sweden. To do this, Danish EFL students first filled out a questionnaire to gauge their attitudes about British and American culture and their respective standard pronunciations. Next, the students read a passage of prose designed to bring out the differences in RP and SA accents in order to assess their pronunciation. These two tasks combined allowed Ladegaard to see if their attitudes toward a certain dialect pronunciation corresponded with their linguistic behavior. Despite the potential influence of American media in Denmark, Danish students still rated the pronunciation of the RP dialect more positively than the pronunciation of the SA dialect of English.

The ability to distinguish between the speech of a native speaker of a given language and the FAS of a speaker with a different L1 develops at an incredibly early age, even before a child

may possibly become aware of linguistic stereotypes (Kinzler et al., 2007). In a 2011 study, Kinzler et al. presented four and five year old children with conflicting visual information about the function of an object. This information was presented to the children by an informant who, prior to giving information about the object, spoke in the native accent of the children (American English) and another informant whose L1 was Spanish and spoke English with a Spanish accent. To ensure that the children's trust was not affected by voice quality or visual appearance, the informants were bilingual and thus allowed Kinzler et al. to employ the matched guise technique (Lambert, 1966). Results indicate that children trusted and sought further information from the informant who was perceived to share their native L1, the speaker with a native English accent, over the informant who they perceived to have a different L1.

Using judgments of FAS from speakers across three different L1s: English, Cantonese and Ukranian, Sato (1998) discovered that a speaker's L1 has a significant effect on personality ratings including intelligence, confidence, kindness, and sociability. Overall personality ratings of FAS across the three L1s differed depending on the listener group: listeners from an urban high school, a rural high school, and university students. Speakers with an L1 of English received the highest ratings regardless of listeners' location. Ukranian L1 speakers and Cantonese L1 speakers received the lowest ratings. Additionally, speakers whose L1 was not English received significantly lower ratings in degree of accent and intelligibility than native English speakers.

Proficiency of the Speaker

Few studies have investigated how an English learner's level of proficiency as designated by a standardized test like the Test of English as a Foreign Language (TOEFL) or the

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International English Language Testing System (IELTS) or by an intensive English program may interact with their degree of FAS as perceived by listeners. Although level of proficiency was not a main investigated factor in the study, Bent and Bradlow (2003) found that low-proficiency (as designated by the Northwestern University Foreign Accented English Speech Database) non-native English speakers with L1s of Chinese and Korean were rated as less intelligible in their speech recordings by native English-speaking listeners than a native speaker or the high-proficiency Korean and Chinese speakers. Interestingly, when the task was done again with native Chinese listeners, high-proficiency native Chinese and Korean speakers received similar intelligibility ratings when compared to the native English speaker. All speakers classified as high-proficiency received higher intelligibility ratings than the low-proficiency speakers. When native Korean listeners performed the same task yet again, similar results were found for all high-proficiency speakers, but only the native Korean speakers showed any sort of difference in rating between high and low proficiency. Perhaps native Korean listeners were more attuned to the Korean accented English. These findings were indicative of a talker-listener interaction during speech communication.

Bailey et al. (1984) discuss the issue of how to address the assessment of foreign teaching assistants' (TA) oral proficiency in English. They argue for a local assessment of oral proficiency at each university rather than using the scores from the TOEFL or IELTS tests to assign a foreign TA to an English proficiency level because these tests do not include an oral communication portion. Often, foreign TAs who often will self-rate as being "fluent" or "very good" speakers of English are marked down in their English speaking abilities by the American students in their classes. An improved system for proficiency assessment might allow universities to select foreign TAs with a higher level of proficiency in English and thus may

improve American students' perception of their foreign TAs' abilities to communicate in English.

Degree of Accent

Accentedness is nearly inevitable in the speech of late L2 learners, according to Flege et al. (1995). For this reason, degree of accent or accentedness is a commonly evaluated dimension in perceptual studies of FAS. Munro and Derwing have done several perceptual FAS studies which required participants to rate speech samples across various dimensions, one of which being degree of accent. In their 1995 study, the team found that degree of accent was not necessarily related to response time when participants had to evaluate the truth value of statements by Mandarin and English native speakers.

Results of their 1997 study had similar implications, suggesting that having a strong foreign accent does not necessarily impede comprehension. In this study, 26 native English listeners rated FAS samples from speakers with L1s of Cantonese, Japanese, Polish and Spanish on intelligibility, perceived comprehensibility and accentedness. In each case, the ratings that speakers received for degree of accent were much more negative than those received for comprehensibility. Comprehension ratings were even more negative still than those for intelligibility.

Age of the listener has been shown to potentially have an effect on degree of accent ratings. Scovel (1981) found that children between the ages of 5 and 10 years old were less able to detect a foreign accent than older children or adults. Perhaps this is because adults have become more attuned to the phonemes in their own L1 over time. For this reason, the present study employed only adult listeners.

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Ryan, Carranza and Moffie (1977) conducted an experiment to investigate the possible relationship between degree of accent and personality traits. After listening to several FAS samples, a group of college students rated each sample on several personality traits like status and solidarity and degree of accent. Ryan et al. found a positive correlation between degree of accent ratings and personality traits. As the degree of accent ratings for speakers became more negative, so did their ratings on solidarity and social status. Brennan and Brennan (1981) had highly similar findings.

The current study investigates degree of accent as a potential factor in the perception of FAS. Although the current study does not investigate factors affecting degree of accent of an L2 English speaker, it is important to mention findings from the vast amount of literature on the topic. A comprehensive review of the literature on factors affecting degree of accent in non-native speakers was published by Piske, Mackay and Flege in 2001. Among the cited factors listed are: age of L2 learning, length of residence, sex of the learner, amount of formal instruction, level of motivation to acquire the target language, language learning aptitude, and amount of language use. Any number of these factors may have played a role in the degree of accents manifested in the speech of the various speakers in the current study.

Comprehensibility

Comprehensibility is another commonly evaluated dimension in perceptual speech studies. As mentioned in the previous section, many studies have found that FAS is often quite comprehensible to native English speakers (Chastain,1980; Guntermann, 1978; Munro & Derwing, 1995, 1997, 2005; Olsson, 1973; Piazza, 1980).

For her thesis, Sato (1998) conducted a perceptual FAS study with speakers of Ukranian, Cantonese and English. Speech samples from all three L1 groups were evaluated on personality traits, accentedness and comprehensibility by a group of students from a rural area high school, an urban area high school, and another group enrolled in a linguistics university course at the University of Alabama. Results indicate that comprehensibility ratings were correlated with both personality trait ratings and to a lesser degree, accentedness for Cantonese and Ukranian speakers.

A number of factors may affect the scores a listener assigns to a speaker for comprehensibility. Gilbert (1980) conducted an experiment to investigate ways to possibly facilitate intonation pattern recognition. He investigated the types of errors most commonly displayed by different proficiency levels. Results show that in the FAS of a beginning learner, phonological factors are highly correlated with comprehensibility. Additionally, these salient errors were found to be "irritating" by native English listeners.

<div align="center">Communicative Ability</div>

The most common rating dimensions in language attitude studies of FAS include solidarity, status, likely occupation, competence, social attractiveness (Brennan & Brennan, 1981; Callan, 1981 & 1983; Cargile, 1997; Ladegaard, 1998; Lambert, 1960; Lippi-Green, 1997; Nesdale & Rooney, 1996; Rubin & Smith, 1990; Trowell, 2007) and other areas including comprehensibility, intelligibility, and degree of accent (Derwing & Munro, 1995, 1995b, 1997; Flege, 1988, 1992, 1999; Jongman et al., 2003; Levi, 2007; Major et al., 2002; Magen, 1998; Piske et al., 2001; Sato, 1998; Weil, 2001). Communicative ability, as it is defined in this thesis, is a largely unstudied area in the evaluative rating of FAS.

Ludwig (1982) mentions that success of a communicative act is not solely dependent on linguistic accuracy. Instead, the success of an interaction between a non-native speaker and a native speaker is also affected by the attitude of both the interlocutor and the non-native speaker. Therefore, listeners' ratings of communicative ability in the present study may very well be affected by attitude toward the voice that they hear.

Familiarity

Studies citing familiarity as a factor in the perception of FAS include Gass and Varonis (1984). Transcription tasks performed by native English speakers showed that familiarity with non-native English speech, a certain accent, a certain speaker, and knowledge of spoken subject matter all had an effect on the intelligibility of FAS. In the next few years, more studies followed with similar results (Derwing & Munro, 1997; Munro & Derwing, 1995b; Southwood & Flege 1999; Wingstedt & Schulman, 1987), each indicating that familiarity with FAS may improve listeners' comprehensibility and/or intelligibility judgments of accented speech samples. Increased familiarity with FAS through training has also been found to improve overall interaction with and attitude toward non-native English speakers (Derwing et al., 2002; Sato, 1998).

In more recent years, evidence in favor of a learned positive effect on perception of FAS has come from studies of perceptual adaptation in listeners. In a series of experiments by Nygaard and Pisoni (1998), listeners were "trained" by listening to recorded isolated word speech samples from 10 speakers to become familiar with their accents. When tested later with speech samples, listeners were better at identifying novel isolated words when the recordings came from speakers they had become familiar with than when the samples were produced by

unfamiliar voices. However, in experiment two, when trained with sentence-length speech samples, listeners were not as able to identify isolated words in familiar and unfamiliar voices. During a third experiment, listeners were trained with sentence-length recordings and tested with sentence-length recordings of familiar and unfamiliar voices. Nygaard and Pisoni found that this training or perceptual learning improved intelligibility for words in sentences.

Weil (2001) provides more evidence for perceptual adaptation to FAS. In this study, listeners in a training group took a speech intelligibility pre-test to assess pre-training perception. Next, the training group heard speech samples from a single speaker of Marathi-accented English over four training sessions using an assortment of speech intelligibility tests and were then given a post-test to rate speech intelligibility. Listeners in a no training group participated in only participated in the post-test. The post-test consisted of speech samples from either the voice used in training, a different voice with a Marathi accent, or a different voice with a different accent than that of the one used in training. Weil found that the listeners in the perceptual training group showed higher intelligibility rates in the post-test than in the pre-test. A similar result was found when results of the no training group post-test were compared with those of the training group.

With the goal of discovering whether or not exposure to variability in accents of one language group could positively influence perception of FAS of one speaker, Bradlow and Bent (2003) conducted a study using Chinese-accented English. Native English listeners were members of either a training group which received training via exposure to one or many accented speakers over two days, or members of a control group which received no training or simple task training with a native English speaker. The speaker used for the perceptual training was also one of the Chinese-accented test speakers thereby creating a talker-specific condition as well. Post-test results following training with a single Chinese-accented speaker were equivalent to post-test

results from members of the control group which underwent task training with a native English speaker. This suggests that a task familiarity effect may have come into play during this study. In spite of this, post-test results following training with multiple speakers were significantly more positive than those following either the single talker training or the task specific training with an English speaker. These results were equivalent to post-test results following talker-specific training. This study indicates that listeners' talker-independent perception of Chinese-accented English can be improved with exposure to a variety of Chinese speaker accents.

As a result of the previous study, Bradlow and Bent (2008) became interested in talker-dependent and talker-independent perceptual adaptation to FAS. In a first experiment, native English listeners were tested on their talker-dependent ability to recognize Chinese and Slovakian-accented English sentences that varied in their baseline intelligibility scores. Experimenters compared sentence recognition accuracy between exposure to single and multiple-talker presentations. Results of the experiments found that listeners' intelligibility ratings improved with increased exposure regardless of baseline intelligibility scores. Although, as one may assume, Bradlow and Bent found that the amount of exposure required to arrive at sufficient familiarity decreased as baseline intelligibility scores increased. Additionally, significant perceptual learning was found to occur for all talkers, even those with very low baseline intelligibility scores. This suggests that a low number of words initially recognized in a sentence will not inhibit perceptual learning. To test English listeners' talker-independent adaptation to FAS, listeners had to transcribe Chinese (post-test one) and Slovakian-accented (post-test two) English sentences containing noise by multiple speakers in two training sessions over two days. After the second training session, a post-test was administered. Experimenters found that when exposed to multiple speakers of Chinese-accented English, native English

listeners exhibit talker-independent adaptation to the speech. Results of a second post-test with the Slovakian-accented speech suggest that exposure to any one foreign accented doesn't necessarily facilitate the recognition of foreign accents in general.

In response to growing evidence for the improved perception of FAS through training, Clarke (2000) set out to find improved tasks for perceptual learning of foreign accented speech. A two experiment study was conducted to determine whether perceptual learning tasks using foreign-accented voices from several speakers would improve the perception of a new voice sharing the same accent. To do this, each listener was first presented with eight different sentence-length speech samples to become familiar with the accent. Participants then listened to two voices produce the same sentence and within 500 ms after the second voice, had to rate how similar the two speech samples were. A second experiment was conducted because it was not clear from the first whether or not the perceptual training was effective. Clarke used a slightly modified version of the initial similarity judgment task; three voices were used instead of two. Interspersed with the similarity judgment task were transcription trials. Listeners had to transcribe new, one sentence samples from each of the eight voices. The two task assessment method of experiment two was more successful in accounting for changes in perception than the similarity judgment task in experiment one.

While there are a growing number of studies, including those previously discussed, which demonstrate a perceptual benefit to listeners trained by exposure to FAS, only a few have tried to measure the precise amount of training that a listener actually needs to become familiar with it. One such study is that of Clarke and Garrett (2004) from the University of Arizona who tracked perceptual processing of foreign accented speech by measuring the change in native English listeners' reaction times to visual probe words within the first few moments of exposure. Three

experiments were conducted. In the first, participants had to respond to sentences in either Spanish-accented English or native English. Any kind of practice effect in the task was ruled out. However, to control for the possibility that listeners might have come up with a strategy for listening to the accented speech, experiment two added in noise to the non-accented English to make it more difficult to understand. Lastly, experiment three was conducted to see if rapid adaptation to speech with a much less familiar accent (Chinese) could occur. Spanish-accented English, used in experiment one, is commonly heard around Tucson, AZ. Testing participants with Chinese-accented English would ensure that any rapid perceptual adaptation was not the result of a pre-existing familiarity effect with Spanish speaker accents. Results showed that while processing speed is initially slower for FAS, it quickly improves with less than one minute of exposure to a few sentence-length samples.

Perceptual learning also has its benefits for speakers as well. In 1996, Bradlow and Pisoni et al. investigated the effects of perceptual identification and speech production training on Japanese adult speakers of English. This training concentrated on the /r/ and /l/ English phonemes, which so many Japanese English speakers often have trouble with. Speakers were trained in 45 sessions spanning 3-4 weeks. During these sessions, participants were given perceptual identification tasks with immediate feedback of words containing /r/ and /l/ phonemes spoken in American English. Comparison between pre-training and post-training tests showed that participants improved significantly in perceived identification of /r/ and /l/ phonemes. Additionally, post-training speech samples containing the target phonemes were rated more positively by English listeners than recordings made before the perceptual training.

Derwing, Munro and Wiebe (1997) conducted a study with a group of ESL students to determine if their pronunciation would improve after training. Students participated in a 12 week

program focusing on global production skills. When untrained English-speaking raters were presented with pre and post-training speech samples of the ESL students, their blind judgments revealed that the ESL students' pronunciation had improved significantly as a result of the training sessions. A transcription task of the ESL student speech samples performed by native listeners showed improvement in speaker intelligibility as well.

Perceptual learning tasks have proven effective in improving speech intelligibility and production by briefly increasing listeners' familiarity with FAS or speakers' familiarity with target sounds. Additionally, there is evidence that the improved speech intelligibility scores for FAS that often accompany short periods of perceptual learning are resistant to decline over time (Eisner & McQueen, 2006; Kraljic & Samuel, 2005).

An even more deep-rooted familiarity with FAS may come to listeners through a multitude of experiences that span longer lengths of time such as living or working in an environment with non-native English speakers, or study abroad. Familiarity with FAS may also be acquired independently of living environment through ESL methodology or linguistic training.

Besides a brief mention as a possible factor in listener perception (e.g., Piper and Casin, 1988), there is little to no literature examining the effective of familiarity with FAS that comes from linguistic or ESL methodology training on speech intelligibility. In a paper that surveys the university training of ESL teachers, Collier (1985) lists common preparation courses including: ESL methodology, phonology/morphology/syntax of English as well as other languages, first and second language acquisition, ESL assessment, and other linguistics courses involving phonetic training. Despite the studies that cite naïve or phonetically untrained native speakers of English as reliable raters of speech intelligibility (e.g. Brennan et al., 1975; Giles, 1972; Flege,

1984; Flege & Fletcher, 1992; Flege et al., 1995), one could assume that people familiar with FAS through either ESL and linguistic training or exposure from living and work environment would prove to be a more positive rater of speech intelligibility than a listener who is unfamiliar with FAS and/or has had no linguistic training.

As an ESL teacher who has completed a large number of foreign language, linguistic and ESL methodology courses, I am interested to see if this training plays a significant role in the familiarity with and perception of FAS. To do this, I have designed a study that compared intelligibility, degree of accent, and communicative ability ratings between laypersons with no linguistic training but possibly a degree of FAS familiarity through their living or work environment to another group of listeners who have all had some kind of linguistic or ESL methodology training. Potential factors affecting the perception of FAS including speaker sex, L1 family of the speaker, and proficiency of the speaker were investigated as well. This study aimed to answer the following researching questions: 1. Are participants with ESL/linguistic training more likely to rate FAS more positively than participants with no linguistic training? 2. Are participants who have a higher degree of familiarity and experience with FAS more likely to rate FAS more positively than participants who have a lower degree of familiarity and experience with FAS?

METHODS

Speech samples of 24 speakers from a variety of ethnic backgrounds and English proficiency levels were digitally recorded and subsequently uploaded into an online survey. Listeners who varied in their amount of linguistic and/or English as a Second Language (ESL) methodology training and degree of familiarity with foreign accented speech (FAS) were asked to take the survey and answer questions about each speech sample. The results were statistically analyzed.[1]

Speakers

A popular method in speech recording in studies involving FAS is the matched guise technique. However, according to Callan et al. (1983), the risk in using matched guises is that investigators may not always have a perfect match in the voice qualities of speakers in their two recordings. For this reason, the current study did not employ the matched guise technique.

Two groups of speakers were selected for speech recording: 18 international students enrolled in an intensive English program at the University of North Texas and 6 native English speakers. The international student group consisted of 9 males and 9 females ages 18 to 42 who were recruited from all proficiency levels of their intensive English program. The 3 most fluent male and 3 most fluent female speech samples were chosen from each proficiency level (low, intermediate and high) in order to address the research questions. A fluent reading can be defined as one that is maximally comprehensible to listeners, fluid, and free of pauses or hesitations. Of these 6 speech samples from each proficiency level, 3 major groups of international students in the United States (Fisher, 2009) were each represented by one male and one female speaker:

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[1] This is a UNT IRB approved study (#11-388).

students from Hispanic countries (Mexico, Venezuela, Colombia), Asian countries (China, South Korea, Japan, Taiwan) and Middle Eastern countries (Saudi Arabia, Kuwait, Libya) in order to test for any bias toward or against a particular accent (Brennan & Brenan, 1981; Callan et al., 1983; Derwing & Munro, 2005; Fayer & Krasinski, 1987; Sato, 1991) or a male or female speaker (Gallois & Callan, 1981). A chart of speakers by proficiency level and L1 background is shown in Table 1.

Table 1

Speaker Chart

		English Proficiency Level		
L1 Family	Native speaker	Low proficiency	Intermediate proficiency	High proficiency
English	3 males, 3 females			
Hispanic		1 male, 1 female	1 male, 1 female	1 male, 1 female
Asian		1 male, 1 female	1 male, 1 female	1 male, 1 female
Middle Eastern		1 male, 1 female	1 male, 1 female	1 male, 1 female
Totals:	6 native speakers	18 international students		

The identification of native English speech by native English speakers serves as an important basis for making comparisons of comprehensibility and degree of accent in FAS (Flege & Fletcher, 1992). Thus, 6 native English speakers, 3 males and 3 females ages 20-27, were included in this study. All are from the south central United States and are native English speakers.

Stimulus Text and Recording

Because all of the FAS speakers are enrolled in an intensive English program in hopes of later studying in an American university, the stimulus text used is one similar to something they may encounter in a university course. A short, academic reading passage, see below, was selected from an English for academic purposes website (Heavenridge & Rockwell, 1999) and slightly modified to produce more fluent readings by non-native English speakers of low and intermediate proficiency. The letter strings (e.g. DNA, A, C, G, T) in this passage provide listeners with opportunities to hear letters of the English alphabet pronounced in isolation.

> Every person is different because of human genes. Genes are made up of molecules called DNA. There are four different chemicals in DNA called A, C, G, and T. The letters can be combined in many different ways. All 3 billion in the correct order gives a human body the information to grow from an embryo into a unique human being.

Each of the 24 speakers did 3 recorded readings of the passage. The most fluent reading of each participant was used in the study. Non-native English speakers were given the opportunity to ask questions about word pronunciation or meaning before the recordings. All speakers were digitally recorded in a quiet room using a Cyber Acoustics AC-850 headset and boom microphone and a Dell webcam program with the camera blacked out for anonymity. The .wmv files were then uploaded onto the internet and embedded into the online questionnaire (see Figure 1).

Listeners

Two groups of listeners were recruited for this study: 1. a combination of linguists and ESL teachers who have all had some kind of formal linguistic and/or ESL methodology training, and 2. employees in another department at the university who do not have any linguistic and or/ESL methodology training and who may or may not have any sort of familiarity with FAS. A

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total of 78 listeners participated in this study: 42 with linguistic and/or ESL training and 36

listeners without. All listeners were native English speakers with no hearing impairments.
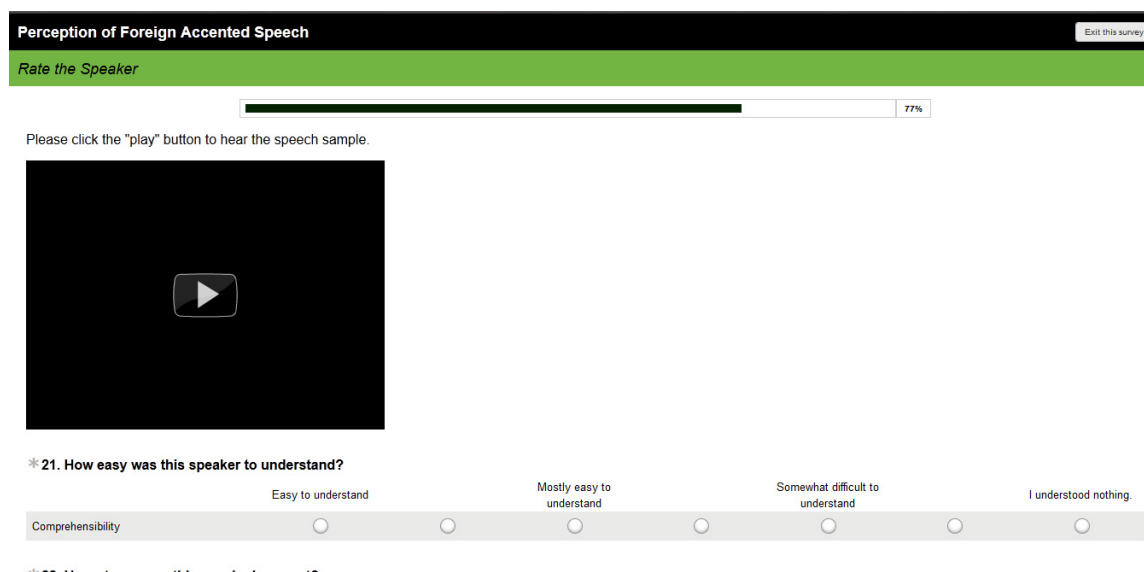
Figure 1. Rater Questionnaire View 1.

Procedure

Listeners first answered questions to determine their amount of linguistic or ESL

methodology training and degree of familiarity with FAS from work or their living environment

(see Appendix A). Upon completion of the background questions, a page appeared on the screen

explaining to listeners that they would hear 24 recordings from different speakers all reading the

same passage. Speech samples were randomized to control for order effects. An orthographic

display of the stimulus text was shown on the instructions page so that listeners would start the

survey with a basis for comparison among accents.

After listening to each recording, they were instructed to answer the three questions that

followed, only paying attention to the voice of the speaker, not the subject matter (see Figure 2).
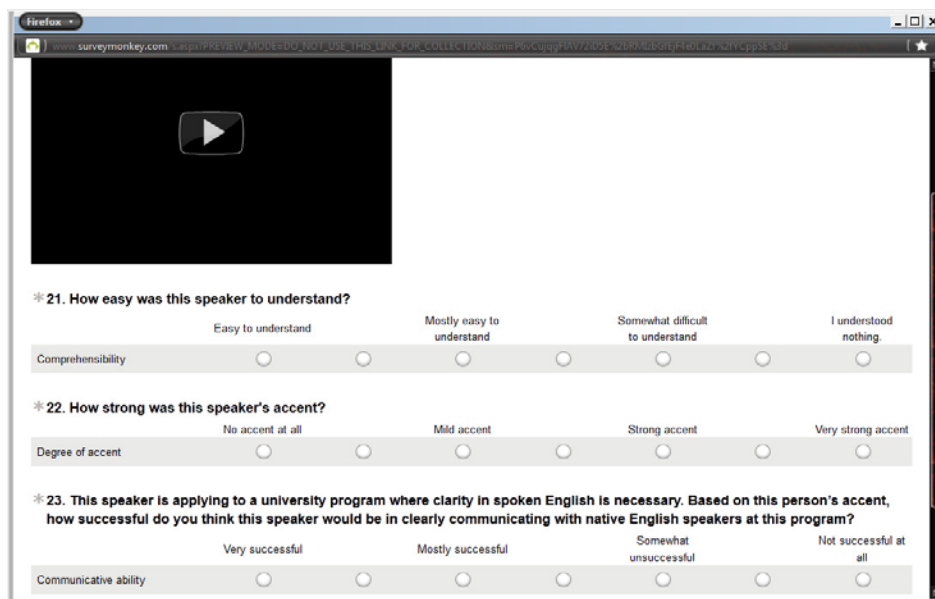
Figure 2. Rater Questionnaire View 2.

Coding

After the online questionnaires had been completed, the results were entered into an

Excel sheet and organized into questionnaire sets. The results of one full questionnaire (the

rating of all 24 speech samples) constitute a set by one rater (see Table 2). Sets were listed in

order of rater number. The questionnaire sets list speech sample in the order in which they were

uploaded to the website, before randomization. For every questionnaire set, the following data

were listed: speech sample name, sex of the speaker (male or female), proficiency level of the

speaker (native, low, middle or high), L1 family of the speaker (American, Asian, Hispanic, or

Middle-Eastern), number of the rater, rating area (degree of accent, comprehensibility, and

communicative ability), the actual rating assigned (on a scale of 1-7), whether or not the rater

had any linguistic training, and raters' level of familiarity with FAS (low, middle or high).

In order to prepare the ratings for statistical analyses, listener ratings on the Likert scales

were converted to numbers. Comprehensibility ratings were converted to a numerical scale

where *easy to understand* = 3 and *I understood nothing* = -3. Similarly, degree of accent was assessed on a scale with values from -3 to 3 (*no accent at all* = 3 and *very strong accent* = -3) as was communicative ability (*very successful* = 3 and *not successful at all* = -3).

Table 2

Questionnaire Coding Set

Set #	Speaker Name	Sex	Proficiency Level	L1 Family	Rater #	Rating Area	Score	Specialist	Familiarity level
1	cf1	F	native	Amer.	1	comp	1	no	low
2	cf1	F	native	Amer.	1	accent	1	no	low
3	cf1	F	native	Amer.	1	comm	1	no	low

RESULTS

The ratings by listeners were submitted to a multi-factorial ANOVA with sex speaker, proficiency speaker, L1 family speaker, rating area (i.e., comprehensibility, communicative ability, and accent), and the raters' level of familiarity with foreign accented speech (FAS) as independent variables. The numerical ratings of perceived degree of foreign accent, comprehensibility and communicative ability were the dependent variable. Insignificant predictors and interactions were discarded in a step-wise model selection process, so the ANOVA model reported here is the final model which only contains significant predictors and interactions.[2] The overall final model suggests a strong correlation between all above-mentioned independent variables and the ratings ($F_{25, 4186}$=73.61; $p<.001$***) that accounts for over 30% of the overall variance (multiple adjusted R^2=.3054). Each of the aforementioned factors was found to have a statistically significant effect on listener rating: sex speaker ($F_{1, 4186}$ = 93.754; $p < .001$***), proficiency speaker ($F_{2, 4186}$ = 226.936; $p < .001$***), L1 family speaker ($F_{2, 4186}$ = 131.844; $p < .001$***), rating area ($F_{2, 4186}$ = 282.597; $p < .001$***), and familiarity of the rater ($F_{2,4186}$ = 91.482; $p < .001$***).

Overall, male speakers received higher scores across the three evaluative dimensions (mean = 0.4207) than female speakers (mean = 0.085). A positive correlation between proficiency speaker and rating score was found (mean low proficiency = -0.1959; mean intermediate proficiency =0.2457; mean high proficiency = 0.7087). Similarly, familiarity and rating score correlated positively (mean low familiarity = -0.1959; mean medium familiarity = 0.3586; mean high familiarity = 0.4169). Mean rating values by L1 family speaker reveal that Asian speakers received the lowest evaluative ratings (mean = -0.1368) followed by Hispanic

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[2] The ANOVA was calculated in *R* using the function Anova from the `library(car)` with the additional argument `type="III"`.

speakers (mean = 0.3768); speakers of the Middle Eastern L1 family received the highest ratings (mean = 0.5185). All native English speakers were at ceiling in their ratings and thus will not be discussed in detail.

In fact, the final ANOVA model suggests that every independent variable is engaged in significant interactions; so strictly speaking, we need to consider these interactions rather than the significant main effects. Sex speaker and proficiency speaker interacted significantly ($F_{2, 4186}$ = 45.129; $p < .002***$), as did sex speaker and L1 family speaker ($F_{2, 4186} = 18.025$; $p < .001***$), proficiency speaker and L1 family speaker ($F_{4, 4186} = 15.247$; $p < .001***$), L1 family speaker and rating area ($F_{4, 4186} = 2.399$; $p < .048*$), and rating area and familiarity of the rater ($F_{4, 4186} = 8.5547$; $p < .001***$).

The aforementioned interactions will be discussed in detail and accompanied by a table to summarize the means for each. Graphical representations of the means can be found in Appendix C.

Results of the interaction between sex speaker and proficiency speaker reveal that while there is no difference in average ratings of male and female high proficiency speakers, female speakers at intermediate level and particularly at low level of proficiency are rated significantly lower than their male peers. Pairwise post-hoc comparisons with Tukey's HSD tests[3] confirm that the most reliable differences between means arise between male and female speakers at low and intermediate levels of proficiency; the difference of means between male speakers at low and intermediate proficiency level is not statistically significant. Table 3 provides an overview of the corresponding mean values.

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[3] All results of the pairwise comparisons of means using the Tukey HSD test are provided in Appendix B

Table 3

Mean Ratings for Sex Speaker and Proficiency Speaker

Sex Speaker	Proficiency Speaker		
	Low	Intermediate	High
Female	-0.6	0.1	0.7
Male	0.2	0.3	0.7

Sex speaker and L1 family speaker significantly interacted such that male speakers received higher ratings than their female counterparts regardless of their L1 family background. As Table 4 below shows, Asian speakers received the lowest ratings overall, followed by Hispanic speakers and then Middle-Eastern speakers. Middle-Eastern male speakers were rated highest by far; male Hispanic speaker also received comparatively high ratings. A post hoc Tukey HSD test showed that only the interactions between female and male Asian speakers as well as female Hispanic and Middle-Eastern speakers did not contribute to overall significance.

Table 4

Mean Ratings for Sex Speaker and L1 Family Speaker

Sex Speaker	L1 Family Speaker		
	Asian	Hispanic	Middle Eastern
Female	-0.2	0.2	0.2
Male	-0.1	0.5	0.8

Proficiency speaker and L1 family speaker also interacted significantly: low proficiency Asian speakers received the lowest ratings by far when compared with Hispanic and Middle-Eastern speakers at the same proficiency level. Moreover, as Table 5 summarizes, even at intermediate and high proficiency levels, Asian speakers obtain average ratings around 0, while their Hispanic and Middle-Eastern peers receive significantly higher ratings. The Middle-Eastern speakers receive even higher ratings than the Hispanic speakers.

Table 5

Mean Ratings for L1 Family Speaker and Proficiency Speaker

Proficiency Speaker	L1 Family Speaker		
	Asian	Hispanic	Middle Eastern
Low	-0.5	0	-0.1
Intermediate	0	0.3	0.5
High	0.1	0.9	1.2

A highly similar picture emerges in the interaction of L1 family speaker and rating area. Asian speakers received the lowest rating scores on all three rating dimensions, speakers of the Middle Eastern L1 family received the highest rating scores, and Hispanic speakers received scores between the two. Table 6 provides an overview of the mean ratings. Tukey HSD tests indicate that the means of Hispanic and Middle-Eastern speakers at intermediate and high proficiency levels do not differ significantly.

Table 6

Mean Ratings for L1 Family Speaker and Rating Area

L1 Family Speaker	Rating Area		
	Accent	Communicative Ability	Comprehensibility
Asian	-0.7	0.2	0.1
Hispanic	-0.3	0.6	0.8
Middle Eastern	-0.1	0.7	0.9

Lastly, the interaction between familiarity and rating area revealed that raters with the lowest level of familiarity with FAS rated speakers lowest across all three rating areas, followed by raters with a medium level of familiarity and finally by raters with the highest level of familiarity with FAS. As Table 7 shows, ratings for degree of accent were always lower than those for communicative ability and comprehensibility, and especially low when raters reported only low familiarity with FAS. For communicative ability and comprehensibility, in contrast,

raters regularly or frequently exposed to FAS gave significantly higher ratings than raters

reporting only rare exposure to FAS.

Table 7

Mean Ratings for Rating Area and Familiarity

Rating Area	Familiarity		
	Low	Medium	High
Accent	-0.5	-0.4	-0.2
Communicative Ability	0.1	0.8	0.6
Comprehensibility	0.1	0.7	0.8

DISCUSSION

This study set out to examine how familiarity affects perceptions of foreign accented speech (FAS). In regards to the first research question, "Are participants with English as a Second Language (ESL)/linguistic training more likely to rate FAS more positively than participants with no linguistic training?", the answer is yes. For this study, raters with ESL/linguistic training were assigned to the "high" degree of familiarity group. Raters with a high degree of familiarity with FAS gave significantly higher ratings on degree of accent, comprehensibility and communicative ability than raters who have little exposure to FAS. However, the mean scores for raters with fairly regular exposure to FAS (medium group) gave very similar ratings to the raters in the high familiarity group with ESL and/or linguistic training. In fact, the medium familiarity group gave speakers higher scores for communicative ability than did the group with ESL and/or linguistic training.

This may be because ESL instructors and linguists are more attuned to FAS and thus more critical in their judgments of FAS as part of their job. ESL instructors strive to help their students grow in their English abilities on a daily basis. In order to do this, they must provide a great deal of constructive criticism to allow students to discover the areas in which they need improvement to achieve maximum communicative ability with a native speaker. Many linguists come into contact on a regular basis with non-native speakers of English as well and may also be more critical in their perception of communicative ability.

The second question this study sought to investigate was "Are participants who have a higher degree of familiarity and experience with FAS more likely to rate FAS more positively than participants who have a lower degree of familiarity and experience with FAS?" Results indicate that, yes, degree of familiarity with FAS does play a significant role in the evaluation of

non-native English speakers. These findings are consistent with the familiarity studies mentioned in Chapter Two of this thesis. The largest difference was found between participants with a low degree of familiarity with FAS and participants with either a medium or high degree of familiarity. Raters who rarely interacted with non-native English speakers found the FAS samples to be significantly less comprehensible than raters in the two higher familiarity groups. Additionally, they perceived the non-native speakers to have a stronger degree of accent and scored them lower on communicative ability.

While the results of this study suggest that familiarity with FAS does play a significant role in the evaluation of non-native English speech, it shows that a number of other factors and interactions prove to be significant as well. Sex of the speaker was a significant factor in the perception of FAS in that male speakers consistently received higher ratings than female speakers regardless of L1 family and in low and intermediate proficiency levels. Male and female speakers of high proficiency received very similar ratings. The studies discussed in Chapter Two of this thesis demonstrate sex of the speaker to be a significant factor in the perception of FAS; however, none have investigated the interactions between sex and other factors as has been done in the current study.

L1 family of the speaker (Asian, Hispanic, or Middle Eastern), and the interaction with proficiency level proved to be another significant interaction that impacts the perception and evaluation of FAS. Asian speakers received the lowest scores by far across low, intermediate, and high proficiency levels. This may be because the stimulus text contained sounds that are often problematic for Asian learners of English like the retroflex and lateral liquids in "molecules" and "embryo" (Ohata, 2004). Hispanic speakers in intermediate and high

proficiency levels received much higher scores than their Asian counterparts and slightly lower ones than speakers of the Middle Eastern L1 family.

This complex interplay of sex, L1 background, and proficiency level is of crucial relevance for ESL teachers. Anecdotally, I have noticed that I perceive some of my students in higher proficiency levels as having stronger accents and to be less comprehensible than some of my students in lower proficiency levels. This may indicate that improved abilities in the suprasegmental features of language, like prosody and intonation, which may improve with increased practice as a student makes gains in proficiency, may play a strong role in the perception of FAS in addition to degree of accent (Anderson-Hsieh, Johnson, & Koehler, 1992; Johansson, 1978, Palmer, 1976).

L1 family of the speaker was found to have a large impact on numerical ratings of degree of accent, comprehensibility and communicative ability. Asian speakers were rated as having drastically stronger accents than speakers of the Hispanic or Middle Eastern L1 families. Moreover, they received significantly lower comprehensibility ratings than Hispanic or Middle Eastern speakers.

It is noteworthy that despite relatively low means for each L1 family on degree of accent, each group was found to have significantly higher ratings for communicative ability and comprehensibility. In fact, mean ratings for all speakers show that a strong degree of FAS did not prohibit speakers from receiving much higher and very similar scores for comprehensibility and communicative ability. These findings, that FAS does not necessarily impede comprehension or ability to successfully communicate with a native English speaker, are consistent with those of (Munro & Derwing, 1997, 1999, 2005).

Areas for Further Research

Ludwig (1982) states that "the success of a communicative act is not only a function of linguistic accuracy but is largely dependent upon the attitudes of both the interlocutor and the L2 user." In this study, participants did not have a chance to listen to any sort of conversation between the speakers and a native English speaker. Instead, they had to make a judgment on speakers' FAS. Future research could investigate how speech samples in different contexts (e.g. a video of a native speaker conversing with a non-native speaker) potentially produce differences in communicative ability ratings.

A study done by Callan et al. (1981) suggests that sex of the listener may play an important role in the perception and rating of FAS. The current study investigated significant interactions between sex of the speaker and other factors but did not examine interactions between sex of the listener and other factors. Further research could investigate potential effects of sex of the listener on ratings of FAS.

IMPLICATIONS AND CONCLUSIONS

The results of this study suggest that one's degree of familiarity with foreign accented speech (FAS), amount of English as a Second Language (ESL) or linguistic training, sex of the speaker, L1 family of the speaker, and proficiency level of the speaker each have a significant effect on the perception of FAS. Not only are the aforementioned factors significant individually, but they produce statistically significant interactions in FAS perception.

Participants in this study with a low level of familiarity with FAS rated speakers as having stronger accents, less comprehensible, and less likely to have successful communication with a native speaker than did participants with medium and high levels of familiarity with FAS. These results along with those from other studies (Munro & Derwing, 2006; Derwing, Rossiter & Munro, 2002) imply that people's attitudes toward FAS and their interactions with non-native English speakers may improve as a result of more frequent exposure, practice, or training. Many of the participants in the low familiarity group indicated that their infrequent interactions with non-native English speakers occurred in a work-related environment. Therefore, it may be beneficial for companies with international clients and employees to provide some sort of training to familiarize their staff with FAS. Business interactions and relationships between co-workers could improve as a result.

ESL teachers could also benefit from tasks or training designed to familiarize themselves with FAS. Although I have been an ESL teacher for a while, I still have trouble understanding some of my students on a daily basis because of their accent. (I teach for a program with many different native languages represented). Even ESL teachers with more experience could benefit from training to better familiarize themselves with the many accents they encounter every day.

Public school teachers could also greatly benefit from this type of "accent awareness training." In an article about the plight English language learners face in American public education, Flynn & Hill (2005) provide data to illustrate significant growth in the number of English learning students from 1990 to 2000 across many different states: Colorado (+163%), Kansas (+87%), Nebraska (+ 350%), and South Dakota (+264%) just to name a few. FAS awareness training may facilitate more effective communication between public school teachers and the increasing number of non-native English-speaking students in their classrooms.

Negative stereotypes are often associated with FAS, even if on a sub-conscious level. Munro & Derwing (2006) suggest that pre-service teachers go through conscious-raising activities to determine whether or not they unconsciously have negative attitudes toward FAS. Becoming aware of such feelings and learning how to improve them could help teachers improve interactions with non-native English speaking students.

A final implication of this study lies in the area of language pedagogy. Speakers received degree of accent ratings that were significantly more negative than those for comprehensibility and communicative ability. This implies that having a foreign accent does not necessarily impede comprehension or communicative ability with a native speaker. Therefore, when helping students improve their communicative abilities, foreign accent reduction should not necessarily be the most important. Instead, ESL teachers should focus on helping students become effective at communicating in English by focusing on pronunciation, prosody and intonation (Munro & Derwing, 2005).

APPENDIX A

QUESTIONNAIRE

1. Please list the amount of contact you presently have with people whose first language is not English:

   Daily   A few times a month   None

   1   2   3   4   5

2. If you are now or ever have been regularly exposed to speakers whose native language is not English, please list the approximate age(s) at which this became a regular occurrence. (Note: "exposure" simply refers the act of listening to non-native English speakers, not necessarily speaking with them.)

   _____

3. If you currently or have ever had regular contact with non-native English speakers, how many speakers did you regularly come in contact with?

4. What was the native language(s) of the speaker(s) you had regular contact with?

5. Was this regular contact with a non-native English speaker(s) in a work or personal environment?

6. Do you feel that contact with non-native English speakers is a positive or negative experience? Please explain.

7. Have you ever taken a foreign language course(s)? If so, please list the language(s), and length of time.

8. Have you ever taken a linguistics course(s)? If so, please list the course title(s), and length of time.

9. Have you ever taken an ESL methodology course(s)? If so, please list the course title(s), and length of time.

10. Have you ever completed any formal ESL pedagogy/methodology or cultural awareness training? If so, please list the kind of training and its purpose (ex: for work).

11. If you are or have ever been an ESL instructor, please list the countries in which you have taught

and the length of service in each

APPENDIX B

TUKEY HSD PAIR-WISE COMPARISONS OF MEANS

GENDER_SPEAKER

	diff	lwr	upr	p adj
male-female	0.3357075	0.2677343	0.4036807	0

PROFICIENCY_SPEAKER

	diff	lwr	upr	p adj
b_intermediate-a_low	0.4415954	0.3420396	0.5411513	0
c_high-a_low	0.9045584	0.8050026	1.0041142	0
c_high-b_intermediate	0.462963	0.3634072	0.5625188	0

L1_SPEAKER

	diff	lwr	upr	p adj
hispanic-asian	0.5135328	0.41397695	0.6130886	0
middle_eastern-asian	0.6552707	0.55571484	0.7548265	0
middle_eastern-hispanic	0.1417379	0.04218208	0.2412937	0.002453

RATING_AREA

	diff	lwr	upr	p adj
communication-accent	0.8696581	0.77010231	0.9692139	0
comprehensibility-accent	0.948718	0.84916214	1.0482738	0
comprehensibility-communication	0.0790598	-0.020496	0.1786156	0.150026

FAMILIARITY_RATER

	diff	lwr	upr	p adj
b_medium-a_low	0.4899792	0.38046972	0.5994886	0
c_high-a_low	0.5483245	0.44924391	0.6474051	0
c_high-b_medium	0.0583454	-0.0393177	0.1560084	0.340625

GENDER_SPEAKER:PROFICIENCY_SPEAKER

	diff	lwr	upr	p adj
female:b_intermediate-female:a_low	0.7393162	0.56810738	0.9105251	0
male:a_low-female:a_low	0.7905983	0.61938943	0.9618072	0
male:b_intermediate-female:a_low	0.9344729	0.76326407	1.1056818	0
female:c_high-female:a_low	1.2891738	1.11796493	1.4603827	0
male:c_high-female:a_low	1.3105413	1.13933245	1.4817502	0
male:a_low-female:b_intermediate	0.0512821	-0.1199268	0.2224909	0.957134
male:b_intermediate-female:b_intermediate	0.1951567	0.02394783	0.3663656	0.014778
female:c_high-female:b_intermediate	0.5498576	0.37864869	0.7210664	0
male:c_high-female:b_intermediate	0.5712251	0.40001621	0.7424339	0
male:b_intermediate-male:a_low	0.1438746	-0.0273342	0.3150835	0.157792
female:c_high-male:a_low	0.4985755	0.32736664	0.6697844	0

	diff	lwr	upr	p adj
male:c_high-male:a_low	0.519943	0.34873416	0.6911519	0
female:c_high-male:b_intermediate	0.3547009	0.18349199	0.5259097	1E-07
male:c_high-male:b_intermediate	0.3760684	0.20485951	0.5472772	0
male:c_high-female:c_high	0.0213675	-0.1498413	0.1925764	0.999255

GENDER_SPEAKER:L1_SPEAKER

	diff	lwr	upr	p adj
male:asian-female:asian	0.1054131	-0.0657958	0.276622	0.495042
female:middle_eastern-female:asian	0.4031339	0.23192504	0.5743428	0
female:hispanic-female:asian	0.4202279	0.24901906	0.5914368	0
male:hispanic-female:asian	0.7122507	0.54104185	0.8834596	0
male:middle_eastern-female:asian	1.0128205	0.84161165	1.1840294	0
female:middle_eastern-male:asian	0.2977208	0.12651193	0.4689297	0.000011
female:hispanic-male:asian	0.3148148	0.14360595	0.4860237	2.5E-06
male:hispanic-male:asian	0.6068376	0.43562874	0.7780465	0
male:middle_eastern-male:asian	0.9074074	0.73619854	1.0786163	0
female:hispanic-female:middle_eastern	0.017094	-0.1541149	0.1883029	0.99975
male:hispanic-female:middle_eastern	0.3091168	0.13790795	0.4803257	4.1E-06
male:middle_eastern-female:middle_eastern	0.6096866	0.43847775	0.7808955	0
male:hispanic-female:hispanic	0.2920228	0.12081393	0.4632317	1.78E-05
male:middle_eastern-female:hispanic	0.5925926	0.42138373	0.7638015	0
male:middle_eastern-male:hispanic	0.3005698	0.12936094	0.4717787	8.7E-06

PROFICIENCY_SPEAKER:L1_SPEAKER

	diff	lwr	upr	p adj
a_low:middle_eastern-a_low:asian	0.3568376	0.12859167	0.5850835	4.45E-05
b_intermediate:asian-a_low:asian	0.4380342	0.20978825	0.6662801	1E-07
a_low:hispanic-a_low:asian	0.465812	0.23756603	0.6940579	0
c_high:asian-a_low:asian	0.5619658	0.33371988	0.7902117	0
b_intermediate:hispanic-a_low:asian	0.741453	0.51320706	0.9696989	0
b_intermediate:middle_eastern-a_low:asian	0.9679487	0.73970278	1.1961947	0
c_high:hispanic-a_low:asian	1.3333333	1.1050874	1.5615793	0
c_high:middle_eastern-a_low:asian	1.6410256	1.41277971	1.8692716	0
b_intermediate:asian-a_low:middle_eastern	0.0811966	-0.1470494	0.3094425	0.973789
a_low:hispanic-a_low:middle_eastern	0.1089744	-0.1192716	0.3372203	0.864333
c_high:asian-a_low:middle_eastern	0.2051282	-0.0231177	0.4333741	0.118785
b_intermediate:hispanic-a_low:middle_eastern	0.3846154	0.15636945	0.6128613	6.4E-06
b_intermediate:middle_eastern-a_low:middle_eastern	0.6111111	0.38286518	0.839357	0
c_high:hispanic-a_low:middle_eastern	0.9764957	0.74824979	1.2047417	0
c_high:middle_eastern-a_low:middle_eastern	1.284188	1.0559421	1.512434	0
a_low:hispanic-b_intermediate:asian	0.0277778	-0.2004682	0.2560237	0.999989
c_high:asian-b_intermediate:asian	0.1239316	-0.1043143	0.3521776	0.755928
b_intermediate:hispanic-b_intermediate:asian	0.3034188	0.07517287	0.5316647	0.001251

	diff	lwr	upr	p adj
b_intermediate:middle_eastern-b_intermediate:asian	0.5299145	0.3016686	0.7581605	0
c_high:hispanic-b_intermediate:asian	0.8952992	0.66705321	1.1235451	0
c_high:middle_eastern-b_intermediate:asian	1.2029915	0.97474552	1.4312374	0
c_high:asian-a_low:hispanic	0.0961539	-0.1320921	0.3243998	0.929459
b_intermediate:hispanic-a_low:hispanic	0.275641	0.04739509	0.503887	0.005655
b_intermediate:middle_eastern-a_low:hispanic	0.5021368	0.27389082	0.7303827	0
c_high:hispanic-a_low:hispanic	0.8675214	0.63927543	1.0957673	0
c_high:middle_eastern-a_low:hispanic	1.1752137	0.94696774	1.4034596	0
b_intermediate:hispanic-c_high:asian	0.1794872	-0.0487588	0.4077331	0.262231
b_intermediate:middle_eastern-c_high:asian	0.4059829	0.17773697	0.6342288	1.3E-06
c_high:hispanic-c_high:asian	0.7713675	0.54312159	0.9996135	0
c_high:middle_eastern-c_high:asian	1.0790598	0.85081389	1.3073058	0
b_intermediate:middle_eastern-b_intermediate:hispanic	0.2264957	-0.0017502	0.4547417	0.053641
c_high:hispanic-b_intermediate:hispanic	0.5918803	0.36363441	0.8201263	0
c_high:middle_eastern-b_intermediate:hispanic	0.8995727	0.67132672	1.1278186	0
c_high:hispanic-b_intermediate:middle_eastern	0.3653846	0.13713868	0.5936306	2.48E-05
c_high:middle_eastern-b_intermediate:middle_eastern	0.6730769	0.44483099	0.9013229	0
c_high:middle_eastern-c_high:hispanic	0.3076923	0.07944637	0.5359382	0.000978

L1_SPEAKER:RATING_AREA

	diff	lwr	upr	p adj
hispanic:accent-asian:accent	0.3867521	0.1585062	0.6149981	5.5E-06
middle_eastern:accent-asian:accent	0.6367521	0.4085062	0.8649981	0
asian:comprehensibility-asian:accent	0.8141026	0.58585663	1.0423485	0
asian:communication-asian:accent	0.8589744	0.63072842	1.0872203	0
hispanic:communication-asian:accent	1.3333333	1.1050874	1.5615793	0
middle_eastern:communication-asian:accent	1.4401709	1.21192501	1.6684169	0
hispanic:comprehensibility-asian:accent	1.4935897	1.26534381	1.7218357	0
middle_eastern:comprehensibility-asian:accent	1.5619658	1.33371988	1.7902117	0
middle_eastern:accent-hispanic:accent	0.25	0.02175407	0.4782459	0.019614
asian:comprehensibility-hispanic:accent	0.4273504	0.19910449	0.6555964	3E-07
asian:communication-hispanic:accent	0.4722222	0.24397629	0.7004682	0
hispanic:communication-hispanic:accent	0.9465812	0.71833526	1.1748271	0
middle_eastern:communication-hispanic:accent	1.0534188	0.82517287	1.2816647	0
hispanic:comprehensibility-hispanic:accent	1.1068376	0.87859167	1.3350835	0
middle_eastern:comprehensibility-hispanic:accent	1.1752137	0.94696774	1.4034596	0
asian:comprehensibility-middle_eastern:accent	0.1773504	-0.0508955	0.4055964	0.277781
asian:communication-middle_eastern:accent	0.2222222	-0.0060237	0.4504682	0.063478
hispanic:communication-middle_eastern:accent	0.6965812	0.46833526	0.9248271	0
middle_eastern:communication-middle_eastern:accent	0.8034188	0.57517287	1.0316647	0
hispanic:comprehensibility-middle_eastern:accent	0.8568376	0.62859167	1.0850835	0
middle_eastern:comprehensibility-middle_eastern:accent	0.9252137	0.69696774	1.1534596	0

	diff	lwr	upr	p adj
asian:communication-asian:comprehensibility	0.0448718	-0.1833741	0.2731177	0.999561
hispanic:communication-asian:comprehensibility	0.5192308	0.29098483	0.7474767	0
middle_eastern:communication-asian:comprehensibility	0.6260684	0.39782244	0.8543143	0
hispanic:comprehensibility-asian:comprehensibility	0.6794872	0.45124124	0.9077331	0
middle_eastern:comprehensibility-asian:comprehensibility	0.7478633	0.51961731	0.9761092	0
hispanic:communication-asian:communication	0.474359	0.24611304	0.7026049	0
middle_eastern:communication-asian:communication	0.5811966	0.35295065	0.8094425	0
hispanic:comprehensibility-asian:communication	0.6346154	0.40636945	0.8628613	0
middle_eastern:comprehensibility-asian:communication	0.7029915	0.47474552	0.9312374	0
middle_eastern:communication-hispanic:communication	0.1068376	-0.1214083	0.3350835	0.877046
hispanic:comprehensibility-hispanic:communication	0.1602564	-0.0679895	0.3885023	0.419671
middle_eastern:comprehensibility-hispanic:communication	0.2286325	0.00038654	0.4568784	0.049225
hispanic:comprehensibility-middle_eastern:communication	0.0534188	-0.1748271	0.2816647	0.998434
middle_eastern:comprehensibility-middle_eastern:communication	0.1217949	-0.1064511	0.3500408	0.773312
middle_eastern:comprehensibility-hispanic:comprehensibility	0.0683761	-0.1598699	0.296622	0.991318

RATING_AREA:FAMILIARITY_RATER

	diff	lwr	upr	p adj
accent:b_medium-accent:a_low	0.1637807	-0.0872854	0.4148467	0.526158
accent:c_high-accent:a_low	0.3301587	0.10300228	0.5573152	0.000229
communication:a_low-accent:a_low	0.6111111	0.35714248	0.8650797	0
comprehensibility:a_low-accent:a_low	0.6375661	0.38359751	0.8915348	0
communication:c_high-accent:a_low	1.1761905	0.94903403	1.4033469	0
comprehensibility:b_medium-accent:a_low	1.237013	0.98594695	1.488079	0
communication:b_medium-accent:a_low	1.3178211	1.06675503	1.5688871	0
comprehensibility:c_high-accent:a_low	1.3873016	1.16014514	1.614458	0
accent:c_high-accent:b_medium	0.1663781	-0.0575285	0.3902846	0.338508
communication:a_low-accent:b_medium	0.4473305	0.19626441	0.6983965	1.3E-06
comprehensibility:a_low-accent:b_medium	0.4737855	0.22271944	0.7248515	2E-07
communication:c_high-accent:b_medium	1.0124098	0.78850327	1.2363164	0
comprehensibility:b_medium-accent:b_medium	1.0732323	0.82510283	1.3213618	0
communication:b_medium-accent:b_medium	1.1540404	0.90591091	1.4021699	0
comprehensibility:c_high-accent:b_medium	1.2235209	0.99961438	1.4474275	0
communication:a_low-accent:c_high	0.2809524	0.05379593	0.5081088	0.003998
comprehensibility:a_low-accent:c_high	0.3074074	0.08025096	0.5345639	0.000913
communication:c_high-accent:c_high	0.8460318	0.64930849	1.042755	0
comprehensibility:b_medium-accent:c_high	0.9068543	0.68294771	1.1307608	0
communication:b_medium-accent:c_high	0.9876623	0.76375579	1.2115689	0

comprehensibility:c_high-accent:c_high	1.0571429	0.8604196	1.2538661	0
comprehensibility:a_low-communication:a_low	0.026455	-0.2275136	0.2804237	0.999997
communication:c_high-communication:a_low	0.5650794	0.33792292	0.7922358	0
comprehensibility:b_medium-communication:a_low	0.6259019	0.37483584	0.8769679	0
communication:b_medium-communication:a_low	0.70671	0.45564392	0.957776	0
comprehensibility:c_high-communication:a_low	0.7761905	0.54903403	1.0033469	0
communication:c_high-comprehensibility:a_low	0.5386243	0.31146789	0.7657808	0
comprehensibility:b_medium-comprehensibility:a_low	0.5994469	0.34838081	0.8505129	0
communication:b_medium-comprehensibility:a_low	0.6802549	0.42918889	0.931321	0
comprehensibility:c_high-comprehensibility:a_low	0.7497355	0.522579	0.9768919	0
comprehensibility:b_medium-communication:c_high	0.0608225	-0.163084	0.2847291	0.99553
communication:b_medium-communication:c_high	0.1416306	-0.082276	0.3655371	0.569511
comprehensibility:c_high-communication:c_high	0.2111111	0.01438786	0.4078344	0.024632
communication:b_medium-comprehensibility:b_medium	0.0808081	-0.1673214	0.3289376	0.984985
comprehensibility:c_high-comprehensibility:b_medium	0.1502886	-0.073618	0.3741951	0.485141
comprehensibility:c_high-communication:b_medium	0.0694805	-0.154426	0.2933871	0.989037

APPENDIX C

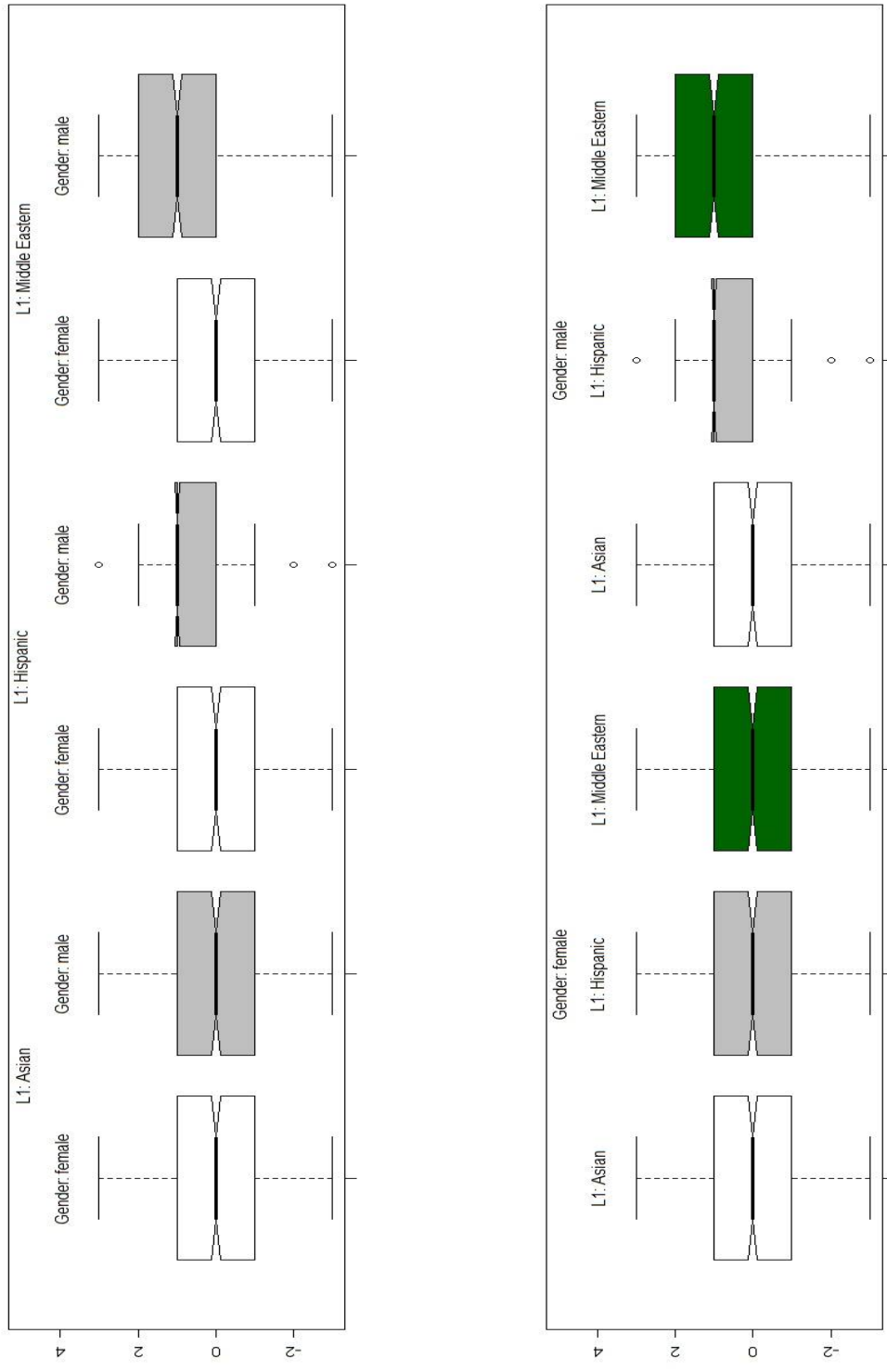GRAPHICAL REPRESENTATIONS OF INTERACTIONS

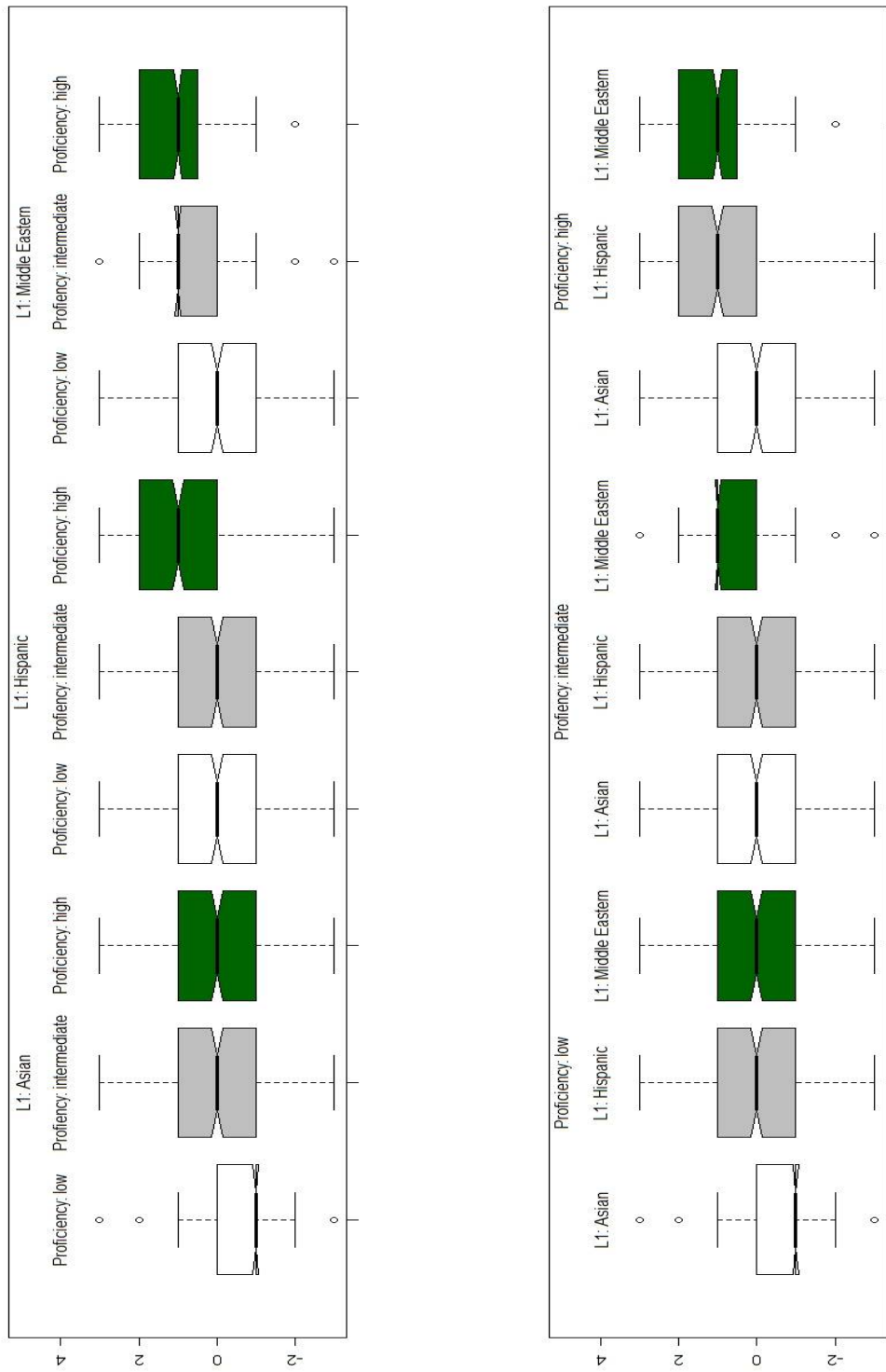*Figure C.1*. Boxplot for sex speaker and L1 family speaker.

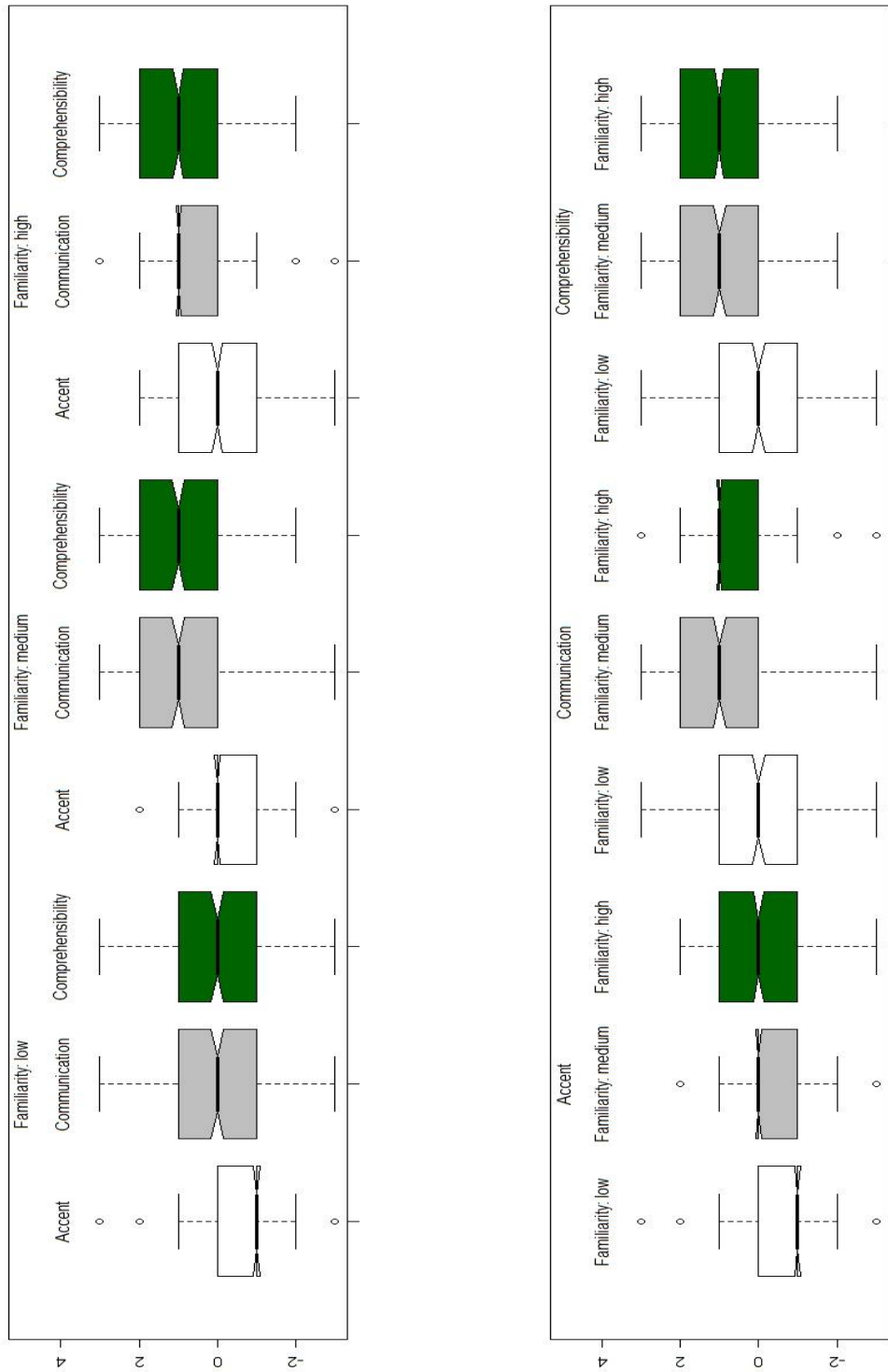*Figure C.2*. Boxplot for proficiency speaker and L1 speaker.

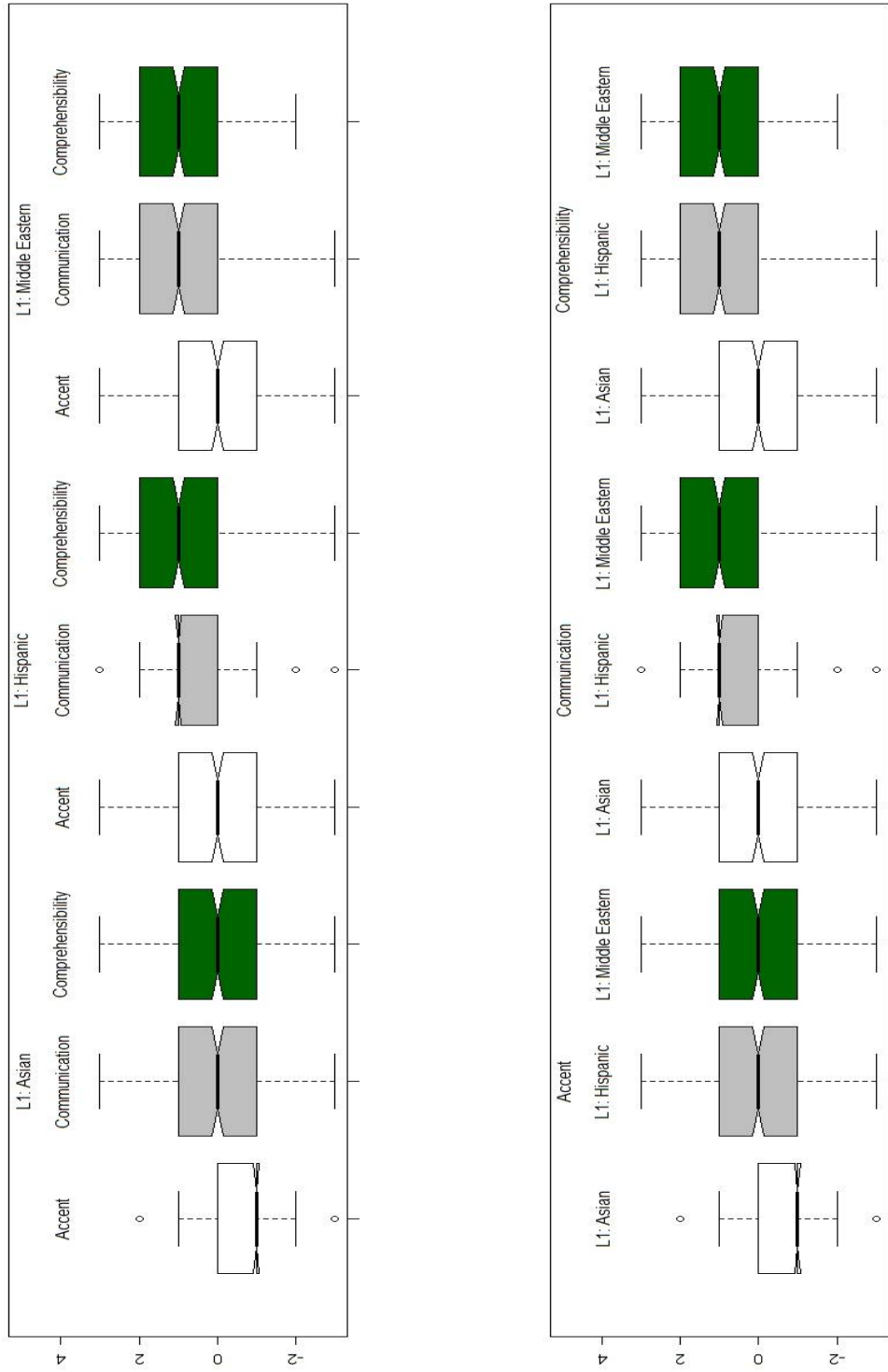*Figure C.3.* Boxplot for rating area and familiarity rater

Figure C.4. Boxplot for rating area and L1 speaker

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