The Role of Self-judgment and Other-perception in English Pronunciation Attainment by Adult Speakers of Spanish

by

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Abstract

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Adviser: Barry J. Zimmerman

This study examined a causal model of second language pronunciation acquisition based on Zimmerman's (2000) model of self-regulatory skill development. The roles of other-perception and self-judgment in learning to produce a nonnative phoneme contrast were experimentally manipulated and the effect on production was measured. Participants were adult native speakers of Spanish who were living in the United States and learning English. Forty participants were randomly assigned to one of five groups: perception training and self-judgment, perception training and no self-judgment, no perception training and self-judgment, no perception training and no self-judgment and a no-treatment control group. Pretest and posttest measures included an elicited production task and identification perception tasks of a native English speaker's (other-perception) and participants' own productions (self-judgment). An imitative measure of production was also obtained from participants. It was hypothesized that perception training was a necessary component of developing accurate self-judgment skill that would then lead to improvements in production skill. Posttest results showed significant differences among the perception training groups on the phoneme identification task (when spoken by a

native speaker of English) but not on the measures of production or self-judgment. Results on the imitative production task showed a significant effect of perception training and self-judgment conditions. Educational implications discussed include the use of classroom time for pronunciation instruction that emphasizes the development of phonetic categories and having students judge their own attempts at pronouncing nonnative phoneme contrasts.

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CHAPTER 1

Introduction

The development of accurate second language speech production in adults is an issue of continuing interest to teachers and researchers alike. How is it that some adults learn to speak a second language with almost no accent while others are heavily accented? For some, an accented way of speaking can be exotic, even romantic, while for others it is a source of distress. Accented speech can impede communication and be detrimental to work and social relationships. Some aspects of accented speech have to do with the speaker's rhythm, stress, and phonemic patterns in pronouncing a second language. The speaker's first language often plays an important role in the phonemic patterns of second language pronunciation.

The present study focuses on the phonemic elements of second language speech development in adults. A phoneme is defined as the smallest unit of recognizable speech sound and is used in this study as the unit of measure for accurate speech production (Crannell, 2000). Phonemic mispronunciations are often the most noticeable and stigmatizing aspect of second language speakers. Studies have shown that native speakers are quick to notice phonemic mispronunciations and may make stereotyped judgments based on phonetic errors such as the common French substitution of the English / ð / as in *the* like / z / as in *zebra* (Flege, 1981).

It is often difficult for learners to perceive nonnative phonemes that do not occur in their first language (L1) (Miyawaki, Strange, Verbrugge, Liberman, Jenkins, & Fujimura, 1975). The difficulty has been attributed to categorical perception problems. (Flege, 1981). Categorical perception problems arise when a learner incorrectly perceives

a nonnative phoneme (i.e., not occurring in L1) as a closely related phoneme that does occur in the L1. For example, the English phoneme / y /, like the y in yes, does not occur in the Spanish language. However, Spanish has a related English phoneme / j /, like the j in juice. Therefore, adult Spanish speakers who are learning English often mispronounce the English phoneme / y / (like yes) as / j / (like juice). This substitution error in production is thought to be a result of perception difficulties that arise from the interference of the Spanish phonological system during the learning of the new English system of phonemes.

Frequently, problems in second-language (L2) phoneme production are addressed by having the learner develop a new category for the novel phoneme through perception exercises. DiOrio (1987), in a description of a French language classroom, writes "students need ear training before they can try to say anything more than the most rudimentary sentences.... They must be able to distinguish between 'puer' and 'deux' and in the nasal sounds between 'tant' and 'ton'" (p.85). This approach, however, is not always successful and has led many researchers to conclude that perception difficulties are not a cause of production errors. However, what many of these studies fail to account for is the learners' ability to accurately perceive the phonemes when spoken by *themselves.* It is important for learners to correctly perceive phonemes when spoken by themselves if they are to improve production.

Much has been written about the relationship between phonemic perception and production in both first and second language acquisition. Some researchers have hypothesized that correct production cannot develop without accurate phoneme perception while other researchers have hypothesized that production influences the

development of perception (Borden, Gerber & Milsark, 1983; Champagne-Muzar, Schneiderman & Bourdages, 1993; Dalby & Kewley-Port, 1999; Goto, 1971; Jones, 1997; Leather & James, 1987; Major, 1987; Neufeld, 1980; Sheldon & Strange, 1982). The research literature is filled with debates over whether phonemic perception ability precedes accurate production or that accurate production occurs before or simultaneously to phonemic perception. In a review of the current literature, Rochet (1995) states "because there has been considerable controversy about whether perception training leads to production improvement rather than the other way around, further research is needed in this area (p. 404).

Due to the controversy surrounding the issue of perception and production, many researchers have noted the need for additional research. Furthermore, many have called for a more thorough examination of the role of the learner in the acquisition process. (Acton, 1984; Beddor & Gottfried, 1995; Bongaerts, van Summeren, Planken & Schils, 1997; Borden, Gerber & Milsark, 1983; Chamot & O'Malley, 1996; Ellis, 1994; Flege, 1981; Green & Oxford, 1995; Henning, 1966; Jones, 1997, Lane & Schneider, 1963; Oxford & Crookall, 1989; Pennington, 1998; Pimsleur, 1963; Schmidt, 1990; Yule, Damico & Hoffman, 1987; Yule, Hoffman & Damico, 1987). For example, Rochet (1995) observes, "although research in second language (L2) speech has been very active in the past few years, the relationship between the perception of L2 speech sounds and their production by nonnative speakers is still far from understood" (p. 379). As far back as 1967, Weiner wrote "an important question which has not been touched on earlier in this paper is the relationship of the ability to distinguish sounds uttered by someone else (external model discrimination) to the ability to monitor one's own sound production

errors, and the relation of both to articulatory proficiency. This is a topic which has been mentioned in discussions for many years, but has not been studied in any systematic sense" (p. 26). The present study addresses these issues in an experimental format.

Instructional Issues in Second Language Pronunciation

The uncertainty of how second-language pronunciation ability develops in adults has greatly affected classroom practices. Pronunciation instruction has changed over the decades from one method to another and then back again to the first. The legitimacy of teaching pronunciation and whether or not a learner benefits from instruction are two of the most prominent questions in the pedagogy literature (Pennington, 1998). The interpretation of this question frames if, how and when pronunciation will be taught. In the early 1900's, classroom instruction focused on the grammatical and structural elements of the language with little emphasis on oral competency (Arteaga, 2000). Pronunciation instruction shifted direction beginning in the 1940's and continued into the 60's with the advent of the audiolingual method (Morley, 1991). During this time period, correct pronunciation was viewed as an achievable goal. Language laboratories became popular as a place where students could practice speaking the language and were given instruction in specific phonological elements of the language (Arteaga, 2000). Students often practiced other-perception (listening to others) and production in the laboratory because it was believed that other-perception ability could help improve production. Students also practiced producing the language and were sometimes asked to compare their utterances with those of a native speaker in a type of self-judgment activity. However, this type of structured pronunciation instruction soon gave way to the looser method based on a communicative approach. It emphasized instead meaning-

making and the social nature of language. It was thought that learners acquired language unconsciously through meaningful activities and that conscious monitoring of speech (self-judgment) would take away from the meaning of the language (Arteaga, 2000). Teachers became reluctant to correct incorrect pronunciations and encouraged students to speak freely without concern for accurate phonemic pronunciation. There is an obvious conflict here because a speaker who is unintelligible will not be able to communicate meaningfully with others. Interestingly, a recent survey of ESL students' views revealed

teachers and students with a scientifically tested method for teaching and learning pronunciation of a second language.

The present study is designed to examine the relationships among self-judgment, other-perception and production in adults learning a second language. These terms will be defined below and it should be noted that speech production and pronunciation are used as synonyms throughout the paper.

Limitations of Prior Research on Phonetic Pronunciation

Previous research examining the relationships among other- and self-judgment and production of phonemes has been varied and inconclusive. A few of the limitations of this body of research will be discussed below. These limitations include: 1) different measures of phonemic perception, 2) different measures of speech production and, 3) no clear theoretical framework of how accurate speech production develops in relation to phonemic perception. The different measures of perception and production that have been used present a problem when comparing studies. As will be described below, the measures assess perception and production differently and often confound the abilities being measured.

Measurements of phonemic perception ability generally consist of three types: *phoneme discrimination, phoneme evaluation,* and *phoneme identification. Phoneme discrimination* tasks measure the ability of the listener to make same-different judgments about speech sounds. For example, a listener might be asked to judge whether the auditory stimuli **bed** and **dead** are the same or different in terms of initial phoneme. In tests of *phoneme evaluation*, a listener is asked to make judgment of right or wrong. For example, a listener may be given a picture of rice and presented with a sound stimuli of

lice and asked whether the word was pronounced correctly or not. A *phoneme identification* task asks the listener to identify or label a sound using a nonverbal stimulus such as a picture, letter, or symbol. These different methods of assessing phonemic perception are not comparable. The *phoneme discrimination* (same-different) task asks the listener to compare two sounds using short-term auditory memory. The listener hears two sounds and judges them using the representation held in short-term memory. In contrast, the *phoneme evaluation* (right/wrong) and *phoneme identification* (labeling) methods require the listener to process a sound and compare it to a representation held in long-term memory.

These differences are important in cross-language research (listeners hear a stimulus from a nonnative language) on phonemic perception ability because of the influence of first language (L1) on phonemic perception. Flege's (1981) model of categorical representation states that phonemes not present in a listener's first language but occurring in the L2 may be perceived according to their similarity to first language phonemes. A native Spanish speaker listening to English phonemes may score differently on each type of task because of the demands of each task. For example, the listener may score higher on the discrimination (same-different) task than either the evaluation (right/wrong) or the identification (labeling) because of differences in task difficulty level. The listener may use short-term memory and compare two phonemes to make an accurate same-different judgment, but may not be able to evaluate or identify the phoneme because he/she has not formed a new perceptual category essential for evaluation and identification.

Another important distinction in measures of phoneme perception is the use of *other-produced stimuli* (other-perception) and *self-produced stimuli* (self-judgment). The ability to accurately perceive novel L2 phonemes (i.e., phonemes not present in L1) when produced by native L2 speakers involves establishing a new phonemic category. This new phonemic category, separate from the similar L1 categories is then stored in long-term memory. The other-perception task involves comparing the L2 stimuli to the "standard" representation of the phoneme held in long-term memory. The same is true for the self-judgment task where the learner must compare his/her own production of the phoneme to a standard held in long-term memory. It is hypothesized that self-judgment ability enhances the learner's production of the phoneme because the learner is able to make adjustments to speech based on his/her self-judgment. However, the relationship between the self-judgment and other-perception has not been adequately explored in previous research. The present study uses instances of both other and self-produced speech when measuring phoneme perception ability.

An additional limitation of previous research involves the measurement of speech production. Some researchers use *imitation* to gather speech production information. For example, a speaker may be asked to repeat a word or phoneme, and this imitative response is used as evidence of speech production ability. This imitated speech may not accurately measure the production capabilities of the learner because the imitated speech sample is confounded by perception abilities. For example, if a participant is asked to repeat a word, the repetition is based on how the learner processes the aural input. The two possible outcomes, pronounced correctly or incorrectly, of the imitated word may not accurately capture the "true" production ability of a learner. If a learner is presented with

the aural stimulus **rice** but perceives it as **lice** (an error common in Japanese speakers learning English), the speech production will be scored as incorrect since the learner will mimic lice and not rice. The imitation task is not a valid index of production because the subject may be able to say rice if he or she perceived it correctly. A second measure of speech production involves asking the participant to name pictures or read words. This *elicited* speech sample is used to measure speech production ability. This measure appears to more accurately assess the production ability because the learner is not presented with an aural cue that may affect the pronunciation.

A Social-cognitive View of Speech Acquisition

The current research literature also lacks a clear theoretical framework that describes how second language speech production develops in adult learners. As discussed earlier, very few researchers have examined the distinction between phonemic perception ability in both other-produced and self-produced speech. Few studies have looked at the relationships among the perception of other- and self-produced phonemes and production abilities. In this study, I propose a social-cognitive model of pronunciation acquisition in adult learners of a second language.

The proposed study is based on Zimmerman's (2000) model of the development of self-regulatory competence. The theory states that second-language learners must be able to accurately perceive nonnative L2 phonemes when spoken by *others* and then develop an internal standard representation of the phoneme. Learners are then thought to use this internalized standard of correct L2 phonemes (developed through listening to others and receiving feedback) to compare their own attempts at production. The learner's production is then shaped by both his/her other-perception *and* self-judgment

abilities. It is the addition of this self-correction ability, mediated by the perception abilities that make the self-regulation of second-language pronunciation possible. Based on this model of skill development, a theory of second language speech production skill is proposed where the ability to correctly produce sounds in a second language is influenced by the ability to correctly identify the sounds in the speech of others (other-perception learned through observation) and mediated by the ability to correctly identify the sounds in one's own speech (self-judgment during the self-control phase). A pictorial representation of this theory appears in Figure1.

The Development of Self-Regulatory Competence

The development of self-regulatory learning is conceptualized as a process occurring over four phases: observation, emulation, self-control, and self-regulation. In the *observation* phase the learner observes a model and develops a framework for the skill to be learned. The learner begins to identify the major features of the skill and can distinguish between a correct and incorrect instance of skill enactment as performed by a model. The next phase, *emulation*, occurs when the learner begins to emulate the performance of the model in an effort to learn the skill herself. During this phase, the learner is beginning to develop his/her own skill as learned through observation of a model but still depends on social feedback in order to refine skill performance. The next phase, *self-control,* describes the time when the learner has internalized the steps necessary to perform the skill independently but still uses the information gleaned from the observational phase to judge performance. The final phase, *self-regulation*, refers to the highest level of skill development. The learner has reached this phase when she is able to adapt her performance to conditions different from the learning situation. During

this phase there is little reliance on the model because the learner has developed her own internal standards and strategies for performing the skill under various conditions.

Applying Zimmerman's (2000) theory of skill development to second language pronunciation acquisition in adult learners, it is hypothesized that learners must first *observe* a model performing the correct pronunciation to develop a framework for the correct pronunciation (i.e., other-perception). Second, the learner must *emulate* the behavior of the model in an effort to learn the pronunciation skill herself. During this phase, feedback from the model or an expert would help to guide the learner in developing correct pronunciation skill. In the course of the third phase, *self-control*, the learner would practice the speech production skill in the context it was learned. During practice, the learner would apply the internalized standards of correct pronunciation learned through observation to produce correct approximations of the target pronunciation (i.e., self-judgment). The final phase, *self-regulation*, represents the time when the learner would move beyond the context in which the pronunciation skill was learned to apply the strategies and skill to different situations. For example, a learner may have observed a model in a laboratory setting and practiced pronunciation through isolated words and other relatively staged situations. The self-regulatory phase will have been reached when the learner moves beyond the laboratory setting and produces correct pronunciations in naturalistic settings such as conversations with friends. This study focuses on the first two phases of the theory—observation and emulation.

A review of the literature examining the relationship between phonemic perception ability (self and others) and production ability in both first and second language reveals many conflicting results with no clear theoretical models. This body of

research will be discussed in the next chapter beginning with first language pronunciation acquisition. Much of the early research on the development of L2 speech stemmed from work with children and the acquisition of L1 speech. Children who were not developing correct L1 phoneme development often underwent "speech therapy" which included exercises in phoneme perception. This relates to the debate described above where it is not known whether accurate phoneme perception is necessary for accurate production or if production can occur without phoneme perception ability.

CHAPTER 2

Literature Review

This chapter reviews the pertinent research literature involving other-perception, self-judgment and production of phonemes. The review begins with first language pronunciation acquisition research and then discusses the research on second language pronunciation acquisition. The second language pronunciation review includes findings on other-perception training and research examining the relationships among other-perception and self-judgment of novel or nonnative phonemes (i.e., phonemes that do not occur in the learner's first language).

First Language Pronunciation Acquisition

Several researchers have studied the relationship between phoneme perception and production in children with articulatory defects (Aungst & Frick, 1964; Lapko & Bankson, 1975; Shelton, Johnson & Arndt, 1977; Williams & McReynolds, 1975; Woolf & Pilberg, 1971). These articulatory defects include speech errors common in children such as /w/ substitution for /r/ as in pronouncing *dream* as *dweam*. These studies arose from the hypothesis that children with articulation disorders must have trouble perceiving the correct sound in the speech of others and this perception failure was thought to explain the speech defects.

A training study by Williams and McReynolds (1975) examined the relationship between other-discrimination (same-different judgments) and production in children with misarticulations. The conditions of the study included a production training component where participants were taught to produce a nonword syllable containing the target phoneme correctly. There was also a discrimination training component where participants were taught to correctly discriminate between two nonword syllables

containing the target phoneme. Results showed that production training modified participants' production and other-discrimination abilities. Other-discrimination training alone had an effect on participants' other-discrimination abilities but not on their production skill. It is important to note from this study, in terms of the model being hypothesized, that participants were not asked to self-evaluate either their discrimination skill or their production ability. It is possible that during the production training, which involved feedback on the accuracy of participants' articulations, participants were forming a mental representation of the correct sound. They were learning to correctly perceive the phoneme (self-judgment) based on the feedback received about their attempts at production.

Participants may have then used these representations stored in long-term memory when discriminating others' speech. The students receiving the other-discrimination training were never asked to produce the sounds or given feedback on their own production attempts. The other-discrimination training improved their other-perception ability but without production practice they were unable to improve production accuracy. Viewed in terms of the model of self-regulated learning it is as if they were at the observational phase and did not receive the opportunity to venture beyond to the other phases through practice and self-correction.

A similar study by Shelton, Johnson and Arndt (1977) examined the relationship between children's misarticulations and self-evaluations (right-wrong judgments) of their own speech. The researchers measured production by tape-recording children as they named pictures that contained the target phonemes (elicited speech sample). The tape was then played back and the children were asked if they said the target phonemes correctly

or incorrectly. Next, the researchers taught the participants to produce the phonemes correctly and then played the original tape of the self-produced speech samples and asked the children to self-evaluate a second time. However, the children were not measured on other-perception ability so it is not known whether the children had a stable representation of the phoneme in long-term memory developed through observational learning. If the children did not have the correct phonemic representation stored in long-term memory then it would be difficult for the children to make judgments since there would be no internal standard against which to compare their utterances. Results showed low correlations between the children's articulation scores and self-evaluations. The researchers hypothesize that one reason a strong relationship was not found between these two measures is that the children "did not use the same criteria as the articulation judges did" (p.713). This finding relates to the theory of self-regulated learning proposed here in that if the children had not formed internal standards of the target phonemes by observing others, then the children would be unable to evaluate their own speech productions.

Aungst and Frick (1964) investigated the relationships among other-discrimination ability (same-different), self-discrimination ability (same-different), self-evaluation ability (right-wrong) and pronunciation in children who misarticulated the /r/ phoneme. Speech production was measured as the ability to correctly imitate sentences. Self-discrimination was measured as the ability to judge if a pre-recorded self-produced speech utterance was the same or different when compared to a recording of another speaker. Self-evaluation was measured as the ability to listen to recorded self-speech samples and judge whether sounds were produced correctly or not. The researchers found

no correlation between production and other-discrimination. However, they did find significant correlations between speech production and measures of self-discrimination and self-evaluation. The researchers conclude that since low correlations were found between other-discrimination ability (same-different) and speech production, as well as self-evaluations, that the measure of other-discrimination is unreliable and not an accurate way of measuring auditory judgment abilities. These findings correspond to the model of speech production described above in that participants may have been able to make reliable same-different judgments but could not make other-evaluations of right and wrong. Participants may have lacked an internal representation of the sound as is learned through the observational learning phase. If participants did not have this internal standard then they would be unable to judge sounds in the absence of an auditory comparative stimulus. Furthermore, the measures of speech production were flawed in that they asked participants to *repeat* what they heard and did not require elicited production of the target speech sounds.

Woolf and Pilberg (1971) looked at the relationship between phoneme perception and speech production. Speech production was assessed by asking children to *repeat* sentences presented to them on a tape. The children's responses were tape-recorded. Children were then given three tests of self-judgment: self-evaluation (right vs. wrong), self-discrimination (self-speech compared to speech produced by another and judged as same/different) and other-discrimination (same/different in the speech of another speaker). Results showed that children performed best on tests of other-discrimination followed by self-discrimination, and self-evaluation. These findings support the claim that other-discrimination (same-different) is not an ideal measure of phoneme perception

since it is not assessing an internal representation held by the participant but asks the listener to compare two sounds together using short term memory. The test of self-discrimination has the same drawback because it asks participants to compare two auditory stimuli to each other rather than to a mental standard. The finding that the children performed worst on the measure of self-evaluation (right vs. wrong) can be interpreted as evidence that the children did not have stable mental representations of the correct phonemes. Therefore, the children had difficulty judging whether phonemes were correct when there were no auditory stimuli available for comparison.

Lapko and Bankson (1975) performed a similar study comparing measures of other-discrimination, self-discrimination, self-evaluation, and production. Participants were children who misarticulated the /s/ phoneme. Interestingly, in this study, two measures of speech production were used: imitated (children repeated speech samples produced by others) and elicited (children named pictures). Results showed a significant correlation between self-discrimination and the imitated and elicited speech production tasks. This suggests that the ability to perceive one's own speech is an important part of production. However, no significant correlations were found between the other-discrimination task and the two production tasks. This absence of a correlation between the other-discrimination task and the production tasks conflicts with other similar studies, and it is not clear why these non-significant results were found by the researchers. What is of importance in this study, as in the study described above by Williams and McReynolds (1975), is the use of an elicited speech production task stimulated by picture-naming. It seems that this is a better measure of speech production because it

assesses the ability of the child to produce the phoneme in the absence of an auditory stimulus.

In conclusion, the results of the first-language pronunciation literature reveal varying results and many different ways of measuring the abilities of interest. In terms of the model proposed in this study, it appears that the elicited (reading words or naming pictures) production task, as opposed to the imitation task, is a more accurate way to measure phoneme production ability. The elicited task is not confounded by the auditory perception abilities of the learner. In the same vein, the identification perception task (labeling) for both other- and self-produced speech is a more accurate measure because it tests the participants' auditory judgment against an internal standard. It is the development of this internal standard in the observational phase of learning that is necessary for the later stages of learning and ultimately for independent phoneme production ability. A review of research findings in second-language pronunciation is discussed below.

Second-language Pronunciation Acquisition

Research on second-language pronunciation acquisition has closely followed the tradition of first-language acquisition research in terms of examining the relationship between phoneme perception and production. One of the main differences between first and second language pronunciation acquisition is the concept of categorical perception (Flege, 1981). Categorical perception is a theory that states that a person's perception of second language phonemes is influenced by his/her L1 phonetic categories. For example, research has shown native Japanese speakers have difficulty with the English phonemes / r / and / l /. The Japanese language has an approximate of the / l / phoneme and no / r /

phoneme. Japanese learners must learn to perceive and differentiate between English / r / and / l / when the L1 has only a single / l / categorical phoneme (Sheldon & Strange, 1982).

Flege and Wang (1989) hypothesize that L1 phonemes may not affect the identification of L2 phonemes if the phonemes are sufficiently different in terms of acoustic-articulatory features. For example, an English speaker who is learning to speak a foreign language (L2) that uses tongue clicks would not be predicted to experience L1 interference problems because clicks do not exist in the L1. However, if the phonemes in L2 are similar to those in the L1 system then difficulties in perceiving and producing these phonemes are expected. This is similar to the Japanese example stated earlier. The Japanese language does not have / r / and / l / phonemes and this presents a difficulty for a Japanese speaker when learning English. This effect was also noted by Lado (1957) who states "when a phoneme in the foreign language does not exist in the native language the student will tend to substitute the native phoneme that seems nearest within the whole structure of his native language" (p. 27).

Difficulties arising from categorical perception are more pronounced in adult learners than child learners because adults have had more time and experience with the first language. Several research studies have shown differences between adult native speakers and nonnative speakers in the *perception* of both other and self-produced speech (Goto, 1971; Flege & Eefting, 1986; Flege & Hillenbrand, Flege & Schmidt, 1995; Flege & Wang, 1989; Miyawaki, Strange, Verbrugge, Liberman, Jenkins & Fujimura, 1975; Sakow & McNutt, 1993; Williams, 1977). The concept of categorical perception has also been used to explain why nonnative speakers, especially adults who already have strong

internal phonetic categories based on first language experience, often have difficulty *producing* unfamiliar phonemes when learning a second language. The adult second language acquisition research literature on perception of unfamiliar phonemic categories and the relationship to speech production is reviewed below.

Research on Phoneme Perception Training

Phoneme perception training studies have concentrated on nonnative contrasts (i.e., those most likely to be difficult for learners because of categorical perception) and results have generally shown training to be effective in improving the phonemic perception abilities of participants (Flege, 1989; Flege, 1995; Jamieson & Morosan, 1986; Jamieson & Morosan, 1989; Lively, Pisoni, Yamada, Tokhura & Yamada, 1994; Lively, Logan & Pisoni, 1993; Logan, Lively & Pisoni, 1991; Pimsleur, 1963; Pisoni, Aslin, Perey & Hennessy, 1982; Strange & Dittman, 1984). Training methods using two different tasks have been used in phoneme perception studies: perceptual fading tasks and categorical prototype tasks. In addition, participants have been asked to respond in two different manners: same/different discrimination and forced-choice identification.

Perceptual fading tasks first require participants to discriminate (same/different) easily distinguishable stimuli, which may be exaggerated to emphasize the perceptual differences. Then participants respond to gradually more difficult stimuli as their other-perception abilities develop. Categorical prototype tasks present listeners with standard phonemes (as spoken by native speakers of a language) and teach participants to develop other-perception skill based on these examples. In some studies, this variable is further manipulated by using phonemes produced by more than one speaker. Response feedback

in the form of right/wrong is used to help participants develop phonemic perception skill in most training studies.

Same/different discrimination and forced-choice identification response types in training studies are defined in the following ways. A same/different discrimination response requires participants to listen to two phoneme stimuli and make a judgment about whether the two phonemes are the same or different. For example, a researcher interested in final position perception of / d / and / t / would present a participant with a pair of stimuli such as *bid – bit* or *bid – bid*. The correct response for the first pair is different while the correct response for the second pair is same. This response type, as mentioned earlier, may simply be assessing short-term memory as the participants are not asked to judge the phoneme against an internal standard but simply to compare two phonemes heard in close proximity to each other. In contrast to this type of response is the forced-choice identification. Forced-choice identification responses require the participant to listen to an auditory stimulus and assign a non-auditory label (e.g., orthographic representation, phonetic symbol, picture). For example, a listener would hear *bid* and be given a choice of responding with d or t. This type of task requires the participant to first listen to the given stimuli and then identify it based on information stored in long-term memory.

Pisoni, Aslin, Perey, and Hennessey (1982) studied the effects of training on novel phoneme perception in adult monolingual speakers of English. The study was conducted because at the time it was widely known that adults experienced difficulty perceiving novel phonemes (i.e., not occurring in the L1). It was also believed that it was difficult to modify "fossilized" perceptual categories, and this fossilization was thought to

account for adult learners' accent in a foreign language (i.e., if the learner could not perceive the sound then he/she would not be able to produce it). The training techniques included two and three category forced-choice identification and in some instances gave feedback during training. The results from a series of experiments showed that participants were successful in learning to accurately perceive the stimuli. The researchers concluded that it is possible to modify adults' perceptual categories with laboratory training techniques. This study led the way for additional perception training studies that grew more sophisticated and began to compare training techniques.

A study examining the effects of perceptual training techniques in native speakers of French showed that 90 minutes of instruction improved performance compared to an untrained control group (Jamieson & Morosan, 1986). This study supported the then-new claim that phonetic categories could be modified in the laboratory. In their review of previous studies, Jamieson and Morosan (1986) write that one reason prior efforts to modify perception ability failed could be the choice of techniques. They argue that the use of discrimination (same/different responses) techniques during training are not very effective in helping participants develop new perceptual categories. Learners need to develop an internal standard to evaluate auditory stimuli. Discrimination tasks do not teach the learner to develop internal standards because the stimuli are presented together and compared using short-term memory.

A second study by Jamieson and Morosan (1989) compared categorical prototype and perceptual fading techniques when training French speakers on an English phoneme contrast. Participants responded by identifying the phoneme using a two-alternative forced-choice format. Their stimuli included both natural and synthetic speech samples

and participants received immediate feedback about the accuracy of their identifications. Results showed that for the natural stimuli the categorical prototype training was as effective as the perceptual fading technique. The researchers concluded that the training shows that adults' perceptual categories are relatively malleable.

Additional research assessing the usefulness of speaker variability in training phonemic perception was undertaken in series of studies (Lively, Logan & Pisoni, 1993; Lively, Pisoni, Yamada, Tokhura, Yamada, 1994; Logan, Lively & Pisoni, 1991). Participants were trained using the categorical perception method but with an additional variable—the use of multiple speakers. This technique can be thought of as a blend between the categorical perception method and the perceptual fading technique because listeners are exposed to "prototype" examples that vary slightly depending on the speaker. Training occurred over several sessions and each session had stimuli from a single speaker. Participants received accuracy feedback during the training. Results showed that trained participants' phoneme perception ability improved from pretest to posttest as a result of the training.

A study by Flege (1995) compared two types of phonemic perception training. Participants were adult speakers of Mandarin who had learned English as adults and had lived in the United States for an average of one year. The two target phonemes were / t / and / d / in final position in English words. These target phonemes were chosen because they are often difficult for native speakers of Mandarin. The two training conditions were 1) two-alternative forced-choice and 2) same/different discrimination. Results showed that both groups improved significantly in their phoneme perception skills and the difference between groups was not significant. Flege interprets these results as a

challenge to the widely held view that identification training results in better perception skill than discrimination training. However, one drawback of this study is that the pre- and posttest assessment of perception ability used an identification task that was also one of the training modalities. The discrimination (same/different) training group could have continued the labels they learned during the pretest when making judgments during training.

Strange and Dittman (1984) conducted a study in which they examined the effects of phoneme discrimination training of the / r / and / l / phonemes in Japanese adults learning English. They used an other-discrimination (same/different) task and participants received immediate feedback. Results showed that participants learned to discriminate between the / r / and / l / phonemes in the speech of others. The researchers conclude that phoneme discrimination learning is slow and effortful but that adult learners of a second language can modify their internal phonetic categories. The learning may have been "slow and effortful" because the task required discrimination and not identification. Jamieson and Morosan (1986), among others, have noted that discrimination training may not be the best way to teach a novel phonetic contrast. If learners are simply discriminating two sounds heard in close proximity they might not form an internal standard for each of the phonemes. The current study uses an identification task during training to help learners develop a new phonetic category.

A naturalistic study by Cenoz and Lecumberri (1999) examined the effects of classroom instruction on other-discrimination and identification of English vowels by native speakers of Basque and Spanish. The classroom instruction involved practice in phoneme discrimination and identification of English vowels using commercially

produced audiotapes. The English vowel categories selected do not occur in the Basque or Spanish languages so the participants were developing new vowel categories. Results indicated that classroom instruction had a positive effect on participants' phoneme perception ability. This study is important because it measured participants' perception skills at the beginning and end of a semester, showing that perception skills can be influenced by classroom interventions, whereas the previous studies used highly controlled laboratory experiments.

The research on phoneme perception training shows that it is possible for adults to modify their perceptual categories. Flege's (1981) linguistic interference theory posits that categorical perception impedes adults learning to perceive and produce nonnative contrasts in a second language. Training studies provide evidence of methods that have been successful in modifying phoneme perception ability in controlled settings. Generally, the most successful method is identification training using a variety of speakers. Interestingly, there are no studies in the literature teaching specific strategies during training. The present study uses a phoneme-embedded sentence strategy during phoneme perception training. This method was effective during pilot testing and may be the first study to use this strategy during training. Other-perception training studies are of interest in the present study because of the relationship between other-perception and production. This research is reviewed below.

Research Involving Other-Perception and Production

There is a large body of research examining the relationship between L2 phoneme perception (spoken by others) and production in second language learners. In this research, other-perception skill is the most widely studied variable. It is commonly

thought that before a learner can produce a phoneme he/she must be able to distinguish the phoneme in the speech of others. Neufeld (1980) in a summary and re-analysis of early research concludes "there is frequent asymmetry in the adult's receptive and productive performance in L2 at the phonological level" (p. 295). He called for more controlled research to uncover the processes by which adults learn a second language and native-like pronunciation. More recently, Rochet (1995) wrote "although research in second-language (L2) speech has been very active in the past few years, the relationship between the perception of L2 speech sounds and their production by nonnative speakers is still far from understood" (p. 379). This research is reviewed below and, as will be seen, is inconclusive in terms of clearly elucidating the direction of the relationship between other-perception and production.

An early study by Pimsleur (1963) reports the results of discrimination training on the French pronunciation skill of English speaking adults. The study tested if teaching students to discriminate new phonemic contrasts before practicing pronunciation would aid acquisition. It is interesting to note, in terms of the model being proposed here, that Pimsleur believed prior discrimination training would later help students become better judges of their own pronunciation, helping students self-evaluate their own speech. However, students were not taught to monitor their own speech or evaluate the accuracy of their productions (self-judgment) of the French phonemes. The results showed that other-discrimination training helped students learn to perceive the differences between some French phonemes but not all. The study found no differences in the production of French vowels between the students in the training group and the control group. Pimsleur notes that other-discrimination skill is not enough to improve the pronunciation of L2

learners and suggests that students must be trained to become better judges of their own speech. It is noteworthy that this early empirical work on the relationship between other-perception and production noted the importance of self-judgment, a variable that still has not been adequately explored.

Goto (1971) studied Japanese and American adults listening to recordings of English words spoken by others and themselves but not identified as their own speech samples. Goto recorded the words and then randomly played all of the participants' recordings without disclosing who produced the words. The words contained either the / r / or / l / English phonemes and listeners were asked to identify the phoneme as it occurred in each word. A second measure of phoneme perception for the Japanese participants was also included that consisted of a phoneme discrimination (same/different) task based on the recordings made by the native English speakers. Results showed that Japanese speakers had great difficulty in both identifying (labeling) and discriminating (same-different) the phonemes produced by Americans as well as by themselves and other Japanese speakers. Goto concluded that these results showed the lack of an internal phonetic category for the Japanese speakers since the sounds / r / and / l / do not occur in the Japanese language.

A study by Shimamune and Smith (1995) examined the relationship between speech production and other-perception (measured using a same-different paradigm) of the / r / and / l / English phonemes in two adult Japanese students learning English. One student received pronunciation training and the effect on other-perception was assessed while the other student received other-perception training and the effect on speech production was measured. Corrective feedback was given during both training conditions.

Results show that the student who received pronunciation training improved in speech production but that these effects did not carry over to other-perception ability. On the other hand, the student who received other-perception training improved in both other-perception and speech production. These results support the self-regulatory learning model. The student who engaged in observational learning (other-perception) was able to improve speech production. The student who did not have a clear standard of the skill (pronunciation condition) did not score as highly on the other-perception task. Unfortunately, no measures of self-judgment were obtained in the study.

Current pedagogical techniques are described by Dalby and Kewley-Port (1999). They report on a computer training system designed to improve adults' pronunciation of a second language. The three-step program includes an other-perception training component (identification of an aural stimulus), a listen-and repeat practice, and an elicited pronunciation practice (reading words without hearing a model). Learners receive feedback from the computer program on the correctness of their productions. Empirical research has not yet been performed testing the effectiveness of the computer program. Although the researchers include an other-perception training section, they state that although "second language teachers often assume that students must be able to perceive an L2 contrast before they can learn to produce it, this is not necessarily always the case" (p. 431). These conflicting beliefs are common, but, only rarely have the relationships between other-perception, self-judgment and pronunciation been explored. This research is described below.

Research on Other-Perception, Self-judgment and Pronunciation in a Second Language

A few empirical studies exist that examine the relationships among other-perception, self-judgment, and pronunciation of a second language. The studies use different methods of measuring perception and pronunciation and are reviewed below.

An early experimental study by Lane and Schneider (1963) investigated the importance of self-judgment (measured as right-wrong evaluations) in adult English speakers' learning to produce an unfamiliar Thai phoneme. The study compared six methods of "self-shaping" in the pronunciation acquisition process of a novel phoneme. The conditions included: 1) listen and repeat, 2) listen and repeat followed by discrimination training, followed again by listen and repeat, 3) listen and repeat, listen and repeat with delayed auditory feedback followed by listen and repeat, 4) listen and repeat, discrimination training, listen and repeat with feedback, listen and repeat, 5) listen and repeat, listen and repeat with visual feedback, listen and repeat, free responding, 6) listen and repeat, listen and repeat with visual feedback, and free responding. Unfortunately, this study had only three subjects in each of the six experimental conditions and there were no significant differences between the methods. There were, however, some interesting results showing that a combination of other-perception training and delayed auditory feedback resulted in a small improvement in production.

Lane and Schneider write that "self-shaping requires... that the subject respond discriminatively to his own behavior; in the particular case of echoic responding he must respond discriminatively to the disparity between the model stimulus and the stimuli produced by articulation" (p.154). This directly relates to the proposed model of pronunciation acquisition that states that the learner must be able to make adjustments in

his/her productions based on self-judgment when compared to an internal standard. This suggests that participants were developing an internal standard based on the other-perception training and comparing this standard to their utterances during the delayed feedback. It appears that the participants then made adjustments in their productions because a small improvement was noted. One notable difference between this study and the proposed study is the method of measuring production skill. The researchers used a mimicking task while the proposed study will use an eliciting task by having the participants read a list of words.

Another early study on the effects of other-perception training (using a same-different discrimination task) included a component for participants to self-evaluate their productions (Henning, 1966). English-speaking adults with no French language experience were randomly assigned to three treatment groups: 1) other-perception training (same-different response) only, 2) pronunciation practice and 3) a combination of the other-perception training and pronunciation practice. The target French phonemes were selected because they do not occur in the English language and so are often difficult for English speakers to perceive and produce. The other-perception group listened to tapes of French phonemes and circled answers indicating same or different. Participants were given immediate feedback about the accuracy of their discriminations. The pronunciation group practiced the target phonemes in a listen and repeat format. The combination group received other-perception training and pronunciation practice. Posttests showed that the other-perception and combination groups outperformed the pronunciation-only group on measures of perception and production. Results of the

participants' self-evaluations (measured as right-wrong judgments) of their own pronunciation showed no overall difference between the three groups.

However, it was found that the groups receiving other-perception (using a same-different paradigm) training were more likely to rate their correct productions as incorrect, indicating they had developed a stricter criterion than the pronunciation-only group. This is interesting in terms of the development of an internal standard. It seems that the students in the discrimination group had formed a representation of the phonemes in long-term memory. Those students then used this internal representation to evaluate their own attempts at pronunciation. One drawback of the study is the use of a mimicking procedure to gather data on production ability. This technique may inflate the production capabilities of participants since they are asked to repeat an utterance, confounding production ability with other-perception skill. The author concludes that helping students become more critical of their own attempts to pronounce a language may help them work on their own pronunciation during language laboratory practice sessions. This relates directly to the proposed model where students must first observe and develop other-perception skill. Students then need to practice pronouncing while self-evaluating and making adjustments based on the comparisons of the self-judgments and an internal standard.

Sheldon and Strange (1982) looked at the relationship between speech production, self-judgment (measured by a labeling identification paradigm) and other-perception (also measured by a labeling identification paradigm) of / r / and / l / English phonemes in Japanese speakers who were learning English. Speech production samples were obtained by having participants read words and sentences from cards into a tape-

recorder. These samples were then randomly re-recorded onto another tape. Participants were given a list of the words and listened to the tape. As participants listened to the tape they wrote the word they heard and identified each word as containing either the / r / or / l / phoneme.

Results indicate that the participants had higher speech production scores than both self- and other-perception scores. However, self-judgment scores were higher than the other-perception scores. The researchers argue that speech production shapes perception ability. That position contradicts the theory proposed in this study. One explanation for their finding that production was higher than perception could be due to the subjects having learned English using a variety of methods. Some reported being taught to pronounce based on mouth-feel rather than phoneme perception. Therefore, the results could be confounded by the previous learning experiences of the participants.

A similar study by Sakow and McNutt (1993) examined other-perception (produced by native English speakers) and self-judgment ability for the English / r / phoneme in native Korean and Japanese speakers compared to native English speakers. The / r / phoneme was used because it is not present in the Korean or Japanese languages. Results showed that the nonnative speakers of English made significantly more errors when judging their own speech (self-judgment) compared to the judgments of the native English speakers' speech productions (other-perception). Judgments were based on a continuum where participants indicated if the sound was / r /-like or / l /-like. These results can be interpreted as evidence that a learner must first develop an internal standard of correct phonemes through aural training (observational learning) before he/she can

make judgments about self-produced phonemes. The finding that the participants did better on other-perception than self-judgment suggests that participants were developing an internal standard of other's speech production and were not yet able to apply this standard to their own phoneme productions.

Borden, Gerber, and Milsark (1983) conducted a training study to examine the relationships among production, self-judgment and other-perception of the / r /-/ l / contrast. Participants were Korean speakers who were learning English. Phoneme production was measured through an imitation task. An interesting aspect of this study was the use of multiple self-judgment judgments—live and tape-recorded. There were also two types of self and other-perception measures—identification (labeling) and discrimination (same-different).

Results show a stronger relationship between pronunciation and the self-identification task than pronunciation and the other-discrimination task. Participants were better at judging their own pronunciations than judging native speakers' productions. Participants were more accurate at judging their own speech production in the live condition than when recorded on tape. This is likely due to the proprioceptive feedback available when making a live judgment versus a taped judgment. Participants' speech production scores were highly correlated with self-judgment scores. The authors looked at this relationship over time and found that self-judgment improved at a faster rate than production and concluded "self-judgment may be a prerequisite to improvement in production" (p.516). However, these results must be interpreted cautiously because the production task asked participants to imitate an auditory stimulus (i.e., mimicking

paradigm). Therefore, phoneme production ability is confounded by the perceptual demands of the task.

A training study by Ellis (1994) compared self-monitoring training and other-perception training on the speech production of nonstandard speakers of English. Participants in this study were both native and nonnative speakers of English who mispronounced the *-ask* cluster in English words. For example, a common mispronunciation of the word *ask* involves the reversal of *ask* to *aks* resulting in the pronunciation *axe*. Participants in the other-perception condition were taught to accurately evaluate the correct and incorrect instances of the pronunciation of *ask* in the speech of others. Participants were taught to self-monitor their own speech productions and were given feedback regarding the accuracy of their self-monitoring efforts. For example, if a student pronounced the word correctly and self-monitored that the word was pronounced correctly, he/she was told the self-monitoring was accurate. If a student pronounced the word incorrectly and self-monitored that the word was pronounced correctly he/she was told that the self-monitoring was inaccurate.

Results showed that students who were taught to accurately evaluate the speech of others and then evaluated their own speech improved pronunciation more than students in the other-evaluation only and self-monitoring only conditions. The results support the proposed model of speech production learning because the students who were taught to evaluate other-productions and taught to self-evaluate their own speech productions improved more than students who did not receive the other-evaluation training and/or taught to self-evaluate their speech productions. However, the main focus of the Ellis study was on the effect of self-monitoring on pronunciation. The relationships among

self-judgment, other-perception, and speech production were not examined as a causal model.

The research on the relationships among other-perception, self-judgment and production, is not extensive and has shown inconclusive results. One of the problems with the research is the use of many different ways of measuring perception and production. However, studies have shown that self-judgment plays an important part in the development of accurate second-language phoneme production.

Research on Self-judgment and Pronunciation

A case study by Lindholm (1989) describes a self-monitoring technique called an "ear mirror". The hypothesis is that one of the deterrents to native-like pronunciation of a second language is a problem with self-judgment due to bone-conducted feedback interference. This bone-conducted feedback prevents the speaker from hearing him/herself as others do. This same effect occurs when a person hears him/herself on a tape recording and doesn't think it sounds like him/her. The author designed an amplification system with a slight delay so that the speaker can hear him/herself as others do. It was thought that if a learner could hear him/herself slightly after uttering a foreign word, the learner could make corrective adjustments to pronunciation. The author used this system during listen-and-repeat practice sessions and listened to his utterances using the delay feature. He found that he improved his production of L2 pronunciation after three months practice. The idea of delayed feedback improving pronunciation is interesting in terms of the model proposed here because it appears that the efforts at self-judgment improved the pronunciation of the learner. However, it is not clear how the

learner made judgments about the accuracy of his utterances because there were no measures of other-perception.

Research on Self-efficacy and Pronunciation

Self-efficacy is defined as the level of confidence one has in his/her ability to complete a *specific* task (Bandura, 1977). It is important to note that self-efficacy is measured *before* a person engages in the task. Research has shown that higher levels of self-efficacy are related to higher levels of competency on many academic and motoric tasks (Bandura, 1977; Zimmerman & Bandura, 1994). In the only known study assessing self-efficacy beliefs and second language pronunciation ability, Ellis (1994) found that higher levels of self-efficacy were associated with pronunciation ability. Ellis compared the self-efficacy ratings of college students who were learning to correctly pronounce the *-ask* cluster as in the word **task**. It is difficult to interpret precisely how self-efficacy ratings affected the pronunciation because the training study conditions influenced both the self-efficacy ratings and the pronunciation (see earlier review). Regardless, the study is important because of the students' self-efficacy and pronunciation level increased as a result of learning a specific strategy (in this case, self-monitoring). Although self-efficacy focuses on students' level of confidence before performing a task, it is also interesting to assess how sure students are *after* completing a particular task. Are students merely "guessing" in an attempt to answer a question correctly or are they confidently choosing a response based on knowledge? This has been termed confidence in second language learning research but self-evaluation in the self-regulation literature (Schunk, 1996).

A series of studies examined the role of confidence in other-perception tasks (Yule, Damico, Hoffman, 1987; Yule, Hoffman, Damico, 1987; Yule, Yanz, Tsuda,

1985). In the first study, participants were adult Japanese speakers who were learning English in the United States (Yule, Yanz & Tsuda, 1985). They listened to 25 recorded English sentences and identified target words when given a choice of two alternatives. For example, students heard the sentence "It was a nice _____" and had an answer sheet with the sentence and *rock / lock* printed on it. Students circled the word they thought they heard and then indicated on a five-point scale (5 = completely sure, 1= not at all sure) how sure they were of the correctness of their answer. All the target words were minimal pairs that ranged from easy to difficult in terms of their similarity. Overall results indicate that students were more confident of their correct answers (mean rating = 3.85) than their incorrect ones (mean rating = 3.32). However, the researchers note that cases of "nonconfident correct answering" and "very confident wrong answering" occurred. They suggest adding confidence ratings to classroom tests to provide a way for teachers to assess the interaction of knowledge and confidence. If students are choosing right answers but are "not at all confident" this may be an area the teacher wants to review in detail along with incorrect answers.

This section reviewed the thoughts and actions of language learners that affect the acquisition process. Strength of concern, self-efficacy, and confidence are all beliefs that affect the learner's choice of behavior. For example, a learner with very little concern about pronouncing the language correctly will probably not attend to phonemic differences between his/her first and second language and will not seek help in learning to produce novel phonemes. Additionally, a learner with low self-efficacy about pronouncing unfamiliar phonemes will likely avoid producing the sounds and may limit his/her vocabulary in an effort to avoid speaking errors. Similarly, a learner with

inaccurate self-evaluation skill will not be aware of when he/she is producing phonemes correctly. However, in previous research, these areas have been studied separately and often treated as unchanging beliefs of the learner. The learner's beliefs are central to the development of self-regulatory learning and are expected to change as the learner engages in activities that increase skill in a particular area. In this study, self-efficacy will be measured during pre- and posttests.

Summary

In summary, the research literature on phoneme production in a second language by adult learners has not yet led to the development of a comprehensive model of the acquisition process. Several training studies (Borden, Gerber, & Milsark, 1983; Cenoz & Lecumberri, 1999; Ellis, 1994; Schneiderman, Bourdages, & Champagne, 1988; Shimamune & Smith, 1995; Strange & Dittman, 1984) have shown that it is possible for adult learners of a second language to learn to make accurate other-perceptions. However, the relationship between other-perception, self-judgment and speech production is still not clear from the research literature. Part of this lack of a clear relationship is due to the measures employed in the different studies. Vastly different measures of phoneme perception ability have been used which makes it difficult to compare studies. The same is true of measures of speech production. Some studies use imitation as an indication of speech production ability while others use elicited speech as a measure of speech production ability. Furthermore, until this point there has been no clear model of the relationship between phoneme perception abilities and speech production.

The learner's self-efficacy for pronunciation is also an area that has not received much attention. Ellis (1994) showed that high levels of self-efficacy towards pronunciation were associated with higher levels of pronunciation accuracy. It was also shown that self-efficacy was malleable and increased as a result of learning a specific language learning strategy. The affective factors relating to L2 pronunciation have not been studied in a systematic way as they relate to other-perception, self-judgment, and production skills.

The current study uses measures of phoneme perception and speech production that were carefully chosen as the most accurate indicators of ability for the conditions of the study. The measure of other-perception employs a two alternative forced-choice identification task. Participants will be asked if the other-produced nonword syllables contain either the / ʃ / as in ship or the / tʃ / as in chip phoneme. This measure will be used instead of a discrimination task to test whether the participants are using an internal standard when judging the speech of others. The same procedure will be used when participants are judging self-produced speech. The self-produced speech will be obtained through an *elicitation* task that asks students to read a list of nonword syllables. This measure will be used instead of an *imitation* task to gather an accurate measure of what the participants are able to produce in the absence of an aural stimulus.

Self-efficacy towards pronunciation will also be measured before and after the intervention. This construct is conceptualized as a variable that changes according to the learner's level of accuracy in assessing pronunciation skill. That is, a learner is expected to have higher levels of self-efficacy as he/she masters the skills of other-perception and self-judgment, which are expected to lead to an improvement in pronunciation accuracy.

Purpose

The purpose of this study is to examine the causal model of second-language speech production depicted in Figure 1. This model shows the independent and joint effects of perception (other and self) on production. The study will also investigate the effects of self-efficacy for second language pronunciation.

Research questions:

1) Is other-perception skill necessary for accurate pronunciation?
2) Is other-perception skill necessary for accurate self-judgment?
3) Does self-judgment affect pronunciation?
4) Does listen-and-repeat practice affect other- and self-judgment?
5) Is self-efficacy for pronunciation related to pronunciation ability?
6) Does self-efficacy change from pre-test to posttest?

Hypotheses

Participants in the study will be assigned to one of five groups (four treatment groups and a no- treatment control group). The groups are listed below.

Group 1	Perception of other-speech instruction/self-judgment judgments during pronunciation practice
Group 2	Perception of other-speech instruction/ **no** self-judgment judgments during pronunciation practice
Group 3	**No** perception of other-speech instruction/self-judgment judgments during pronunciation practice
Group 4	**No** perception of other-speech instruction/ **no** self-judgment judgments during pronunciation practice

Group 5 **No** perception of other-speech instruction/ **no** pronunciation practice

1) Group 1 (perception of other-speech perception instruction/self-judgments during pronunciation practice) will outperform all students on posttest measures of other-perception, self-judgment, pronunciation, and self-efficacy and on speaking practice measures of production and will outperform Group 3 on measures of self-judgment.
2) Group 2 (perception of other-speech perception instruction/no self-judgments during pronunciation practice) will outperform Group 3 (no perception of other-speech instruction/self-judgments during pronunciation practice) and Group 4 (no perception of other-speech instruction/no self-judgments during pronunciation practice) who do not receive other perception training.
3) Students in Group 3 will outperform students in Group 4.
4) Students in Group 4 will outperform Group 5 (no treatment control group).
5) Self-judgment will mediate the causal effect of other-perception on pronunciation.
6) Self-efficacy will be causally linked to pronunciation.

CHAPTER 3

Methods

Participants

One hundred and five adults whose first language was Spanish who were enrolled in English classes participated in Phase I (pretest) of the study. Participants were recruited from non-credit bearing language classes offered by the Hillsborough County School Board in Tampa, Florida and the New York City Department of Education. All testing was done individually. From the pool of 105 participants tested in Phase I, 40 met the criteria for Phases II through IV. Of the 40 who met the criteria for additional phases, 26 were from Florida and 14 were from New York. The results reported below are based on the 40 participants who were included in all phases of the study.

Participants ranged in age from 18 to 64 years (mean = 36.99 years) and were born in twelve different Spanish-speaking countries. There were 33 females and seven males. Twenty-five percent of the participants were born in Colombia, twenty percent were from Cuba, eighteen percent were from Mexico, twelve percent were from Venezuela and seven percent were from Ecuador. One participant was in the sample from each of the following countries: Peru, Panama, Bolivia, Guatemala, Puerto Rico, Nicaragua and Dominican Republic. The length of time the participants had been living in the United States ranged from one month to 42 years (Mean = 6.3 years). However, the amount of time the participants had been studying English was significantly less, with a range of 1 week to 10 years (11.85 months). Additionally, the majority of the participants reported speaking primarily Spanish in most areas of their lives. Fifty-five percent reported speaking Spanish at work, seventy-three percent reported speaking Spanish with friends and eighty-three percent reported speaking Spanish with their family. A series of

one-way ANOVAS showed there were no significant differences among the groups on the demographic variables.

Tasks

Production

Production was measured by an oral reading task. Each participant read a list of 64 nonwords out loud and was recorded by a Sony minidisk player/recorder with an external microphone. There were thirty-two nonwords for each of the phonemes, with half containing the target phonemes in the initial position and half containing the target phoneme in the final position. Examples of the nonword syllables are ish, shi, chi, ich. A complete list of the stimuli can be found in Appendix 4. A native English speaker listened to each participant's recording and scored the utterances as correct or incorrect. A sample of the recordings was listened to by a second native English speaker and the Pearson correlation for the pretest recordings was .95 ($p < .01$) and for the posttest recording the correlation was .92 ($p < .01$) indicating a high level of agreement between the raters.

Self-judgments

Each participant listened to his/her recording of the nonword syllables from the production task and identified the phoneme he/she produced by circling either CH or SH on a scoring sheet. The self-judgments were then compared to the native English speaker's judgment of the production and scored as correct if they were in agreement and incorrect if they were not.

Other-perception

Each participant listened to a recording of a native English speaker reading a list of nonwords containing the sounds SH and CH and identified the phoneme by circling

either CH or SH on a piece of paper. This was similar to the self-judgment task except that students heard a native English speaker's productions rather than their own.

Self-efficacy

Self-efficacy for production was measured for each of the target phonemes in initial and final position. Each participant was asked to rate on a ten-point scale how confident he/she was about correctly pronouncing each target phoneme when it appeared in both initial and final position in the nonword.

Design

The design of the study is a pretest-posttest control-group design with a 2 (presence or absence of other-speech perception training) X 2 (presence or absence of self-judgment) factorial design. The dependent measures to be compared are (1) production, (2) self-judgment (3) other-perceptions and (4) self-efficacy judgments. The four study groups are 1) Perception of other-speech instruction and self-judgment during practice, 2) Perception of other-speech instruction/no self-judgment during practice 3) No perception of other-speech instruction /self-judgment during practice, 4) No perception of other-speech instruction/no self-judgment during practice. Additionally, there was a no-practice control group.

The study was conducted in four phases. Phase I was pretesting, selection, and random assignment of the participants to the treatment groups. During Phase II, students in the perception of other-speech groups received instruction in identifying the target English phonemes spoken by a native English speaker. All groups, except the control group, practiced saying the target English phonemes in Phase III. All participants were post-tested in Phase IV. The four phases are described in more detail below.

Procedures

Phase I

The pretest measures of production, self-judgment, other-perception, and self-efficacy were collected individually. First, students were shown two cards with the letters SH on one and CH on the other. The student was asked if he/she knew the sounds associated with the two pairs of letters and was asked to say the sounds out loud. If the student hesitated he or she was prompted to think of a word that started with the letters and say the word out loud. This was done to ensure that the students are aware that the letters have different sounds. It was important that students had this knowledge because the task required them to identify the sounds associated with the pairs of letters. It was not expected that students would be able to produce or accurately identify the phonemes. But it is important that they know the letters represent two specific and distinct sounds in order for the task to accurately measure production and perception skills.

A familiarization task preceded the real task. During the familiarization task students were shown a list of 12 nonword syllables that did not contain the target phonemes (see Appendix 4) and were asked to read the list out loud and were recorded on a minidisk. Students were told to say the number first and to speak loudly and clearly. The tape was played back for the students and each circled on a scoring sheet the sound he or she heard. The purpose of this task was to have the students practice speaking so that they are recorded properly. They also practiced listening to themselves and became familiar with the circling exercise.

First, students were given the target list to look over and then asked to make self-efficacy ratings for both the SH and CH nonwords. Then, production of target phonemes

was measured by having students read the target list of 64 nonword syllables (see Appendix 4) aloud and was recorded onto a minidisk.

The self-judgment skill of students was measured in the following way. After recording the list of words, each student was asked to listen to the recording and identify through listening whether he/she said the target phoneme / ʃ / or / tʃ / and to circle the corresponding letters SH or CH on a scoring sheet.

Perception of other speech was measured in a similar way. Students listened to a recording of a native English speaker reading the same list of 64 nonwords in a different order and identified the phoneme they heard by circling either SH or CH on a scoring sheet. Students were asked to complete an attitude towards pronunciation and language learning beliefs questionnaire (see Appendix 3) during the pretest session. Finally, students were asked if they would be willing to participate in other sessions of the study. The pretest session lasted, on average, for 25 minutes.

The purpose of these pretests was to identify students who could not produce the target phonemes nor accurately identify the phonemes when spoken by himself or herself or a native English speaker. Because this was a learning study it was important that none of the participants had the target skills at the outset of the study.

Phase II

Phase II was the other-perception instruction phase and included only students in the other-perception instruction conditions (Groups 1 & 2). During this phase these students were taught strategies for identifying the two target phonemes. The strategies were designed to give these students a cognitive method for discriminating between the two phonemes. To the best of my knowledge, this type of instruction has not been used in previous other-perception instruction studies. The strategies consist of labeling the

phonemes and providing key words that contain the target phonemes. For example, students were shown two cards printed with the following phrases: "Scratchy sound like in ITCH" and "Hushing sound like in SHHH". The representative letters for the target phonemes were printed in red ink to draw the students' attention to the target sounds. The instruction in identifying the two phonemes occurred over several trials. A computer was used to present the aural stimuli to the student and each session consisted of 160 nonword syllables. The student heard a recording of a nonword syllable spoken by a native English speaker (containing either / ʃ / and / tʃ /, see Appendix 4) twice, and then the student circled on a scoring sheet the letters representing the phoneme he/she heard. The experimenter recorded each student's response on the computer and provided immediate feedback to the student by saying "Good" when the student was correct and by saying "No, listen again" when the student was incorrect. This instruction lasted for up to eight sessions of 25 minutes each. A posttest without feedback was given to each student at the end of the perception training phase. The posttest contained 32 nonword syllables. A posttest score of less than 10 errors was set as the criterion for the student to be deemed capable of distinguishing between the target phonemes. The scores ranged from 0 to 8 with an average score of 4.2 errors.

Phase III

Phase III, the listen-and-repeat production practice session involved 3 trials of 32 nonword syllables. Students heard a native English speaker saying the syllable and then repeated it and were recorded on a minidisk. Students in the self-judgment groups (1 & 3) made immediate and delayed judgments. The immediate judgments were made after each utterance and the delayed judgments were made after each trial as the participant listened to his or her recording. Groups 2 & 4 listened to their productions after each trial without

being asked to identify the sound they produced by circling. Feedback was not given to any of the groups. This session lasted approximately 30 minutes.

Phase IV

Phase IV of the study was the posttest phase and followed the same procedure described in the Phase I (pretest). The posttest lasted approximately 25 minutes. Students were asked to make self-efficacy judgments about their ability to correctly pronounce each of the phonemes when in initial and final position. Then students read the cards containing the nonwords and recorded themselves. Students then made self-judgment judgments and other-perception judgments.

Measures

The experiment contained the following dependent variables:

1) Number of target phonemes accurately produced (pretest, posttest, and practice phase)
2) Number of accurate self-judgments for target phonemes (pretest, posttest, practice trials—immediate and delayed from practice trials)
3) Number of accurate other-perceptions for target phonemes (pretest, posttest, practice trials)
4) Self-efficacy for producing the target phonemes (pretest and posttest)

CHAPTER 4

Results

An analysis of variance (ANOVA) was conducted on the dependent variables (production, other-perception, self-judgment and self-efficacy for production) collected during the pretest (Phase I). The data for each posttest dependent measure (production, self-judgment, other-perception, and self-efficacy) were also analyzed using an ANOVA to test for differences among the four treatment groups and the control group. Post hoc analyses were also performed to examine the differences between the treatment groups for the significant measures. Additionally, the data from Phase III (speaking practice) for the four treatment groups were analyzed using ANOVA techniques and post-hoc tests were conducted to examine the differences among the groups. Regression and path analysis techniques were employed to test the hypothesized model.

Pretest Measures

The means and standard deviations on pretest measures for the five groups: (1) perception training/self-judgment during speaking practice, (2) perception training/no self-judgment during speaking practice, (3) no perception training/self-judgment during speaking practice, (4) no perception training/no self-judgment during speaking practice, (5) no treatment control group are presented in Table 1. One-way ANOVAS were conducted on the pretest measures of production, self-judgment, other-perception, and self-efficacy for production. No significant differences were found among the groups.

Table 1

Mean Errors on Pre-test Measures of Production, Self-judgment and Other-perception

Group	Production	Self-Judgment	Other-Perception	Self-efficacy for Production*
Group 1 (Perception training/ self-judgment)				
M	27.00	27.11	23.78	5.92
SD	4.53	8.04	4.82	1.49
n	9	9	9	9
Group 2 (Perception training/no self-judgment)				
M	29.13	28.00	31.63	4.59
SD	5.00	5.61	8.57	1.69
n	8	8	8	8
Group 3 (No perception training/self-judgment)				
M	29.89	31.78	24.44	4.83
SD	5.58	10.69	6.42	0.87
n	9	9	9	9
Group 4 (No perception training/no self/perception)				
M	32.43	35.29	29.57	4.25
SD	6.08	11.30	12.31	2.01
n	7	7	7	7
Group 5 (Control group)				
M	33.86	38.00	29.14	5.14
SD	7.69	8.35	4.14	2.14
n	7	7	7	7

* Mean self-efficacy rating over four categories: SH initial, SH final, CH initial, CH final

Posttest Measures

The means and standard deviations for each of the five groups on the posttest measures of production, self-judgment, other-perception, and self-efficacy for production are presented in Table 2. One-way ANOVAS were conducted on each dependent variable to examine the differences among the five groups (four treatment groups and one control group). Results of the ANOVAs are shown in Table 3. A significant difference was found on the measure of other-perception, $F(4,35) = 6.36$, $p < .01$. Post-hoc analyses revealed significant differences among the four treatment groups and the control group. Groups 1 and 2 (perception training groups) were not significantly different from each other. Group 1 outperformed Groups 3, 4, and 5. Group 2 outperformed Groups 3 and 5. The results from the ANOVAS for the posttest measures of production, $F(4,35) = .80$, self-judgment, $F(4,35) = 1.21$ and self-efficacy for production, $F(4, 34) = 2.44$ did not show significant differences among the groups.

A chi-square test showed the attrition rates of students who received perception training and those who did not were not significantly different from each other, $X^2(1) = .79$, ns. Thus, any differences in results between these two training groups cannot be attributed to differential attrition.

Speaking Practice

The errors on each of the three listen-and-repeat speaking practice trials were combined to create a total speaking practice score for each participant (N= 33, no-treatment control group did not participate in speaking practice). The errors on the listen-and-repeat self-judgment task (immediate and delayed) were totaled to create an immediate and delayed self-judgment score for each of the participants in the self-

judgment groups (Groups 1 and 3). The means and standard deviations for the four groups are shown in Table 4.

Table 2

Mean Errors on Post-test Measures of Production, Self-judgment and Other-perception

Group	Production	Self-judgment	Other-Perception	Self-efficacy for Production*
Group 1 (Perception training/ self-judgment)				
M	21.11	21.55	8.11	7.00
SD	8.16	8.19	4.14	1.69
n	9	9	9	9
Group 2 (Perception training/no self-judgment)				
M	19.00	19.50	13.13	5.64
SD	8.72	7.56	5.28	1.61
n	8	8	8	8
Group 3 (No perception training/self-judgment)				
M	24.44	26.44	22.44	5.31
SD	10.89	12.08	9.79	1.12
n	9	9	9	9
Group 4 (No perception training/no self/perception)				
M	25.00	27.29	20.71	5.00
SD	12.74	12.61	9.05	2.94
n	7	7	7	7
Group 5 (Control condition)				
M	26.71	28.57	23.86	4.36
SD	7.25	8.50	9.15	1.29
n	7	7	7	7

* Mean self-efficacy rating over four categories: SH initial, SH final, CH initial, CH final

Table 3

Effects of Perception Training and Self-judgments on Posttest Production, Self-judgment, Other-perception and Self-efficacy

Variable and Source	SS	MS	*F*	*df*
Production				
Between groups	303.06	75.77	0.80	4, 35
Within groups	3302.54	94.36		
Self-judgment				
Between groups	482.39	120.60	1.21	4, 35
Within groups	3491.59	99.76		
Other-perception				
Between groups	1520.13	380.03	6.36***	4, 35
Within groups	2092.27	59.78		
Self-efficacy				
Between groups	31.59	7.90	2.44	4, 35
Within groups	110.19	3.24		

***$p < .001$

Speaking practice production. A one-way ANOVA conducted on the speaking practice production measure for the four treatment groups was significant, F (3,29) = 6.63, $p < .01$. Post-hoc analyses showed the following significant differences among the groups: Group 1 (perception training and self-judgment) had the fewest errors and was significantly different from Group 2 (perception training/self-judgment), Group 3 (no perception training/self-judgment) and Group 4 (no perception training/no self-judgments). Significant differences were not found among the remaining groups (see Table 4).

Speaking practice self-judgment. The means and standard deviations for the self-judgments made during speaking practice are also presented in Table 4. Self-judgments, both immediate and delayed, were collected during speaking practice for participants in the self-judgment condition (Groups 1 and 3). Group 1 was composed of participants who had received perception training and Group 3 included participants who did not receive perception training. Groups 2 and 4 did not make self-judgments during the speaking practice phase. The self-judgment errors for participants in Groups 1 and 3 were totaled for each self-judgment condition, immediate and delayed, across the three trials. The total score was used because the trials were short and it was not expected that there would be significant differences across the trials. A t-test examining the difference between the two groups on the immediate self-judgments (Group 1, M = 13.89; Group 3, M = 38.67), t (16) = -4.48, $p < .01$ was significant with Group 1 (perception training/self-judgment) outperforming Group 3 (no perception training/self-judgment). The same effect was evident for the delayed self-judgments (Group 1, M = 20.22; Group 3, M = 43.13), t (15) = -3.49, $p < .01$.

Table 4

Mean Errors on Productions and Self-judgments During Speaking Practice (Phase III)

Group	Speaking Practice Production*	Immediate Self-judgment*	Delayed Self-judgment*
Group 1 (Perception training/ self-judgment)			
M	15.55	13.89	20.22
SD	7.86	7.75	11.33
n	9	9	9
Group 2 (Perception training/no self-judgment)			
M	27.63		
SD	10.07		
n	8		
Group 3 (No perception training/self-judgment)			
M	36.56	38.67	43.13
SD	11.65	17.57	15.66
n	9	9	9
Group 4 (No perception training/no self-judgment)			
M	35.00		
SD	14.14		
n	7		

* Totaled over three trials

Correlations and Regression

The Pearson correlations among posttest measures of other-perception, self-judgment and production for the 40 participants appear in Table 5. The correlation between production and other-perception is 0.45 ($p < .01$), the correlation between other-perception and self-judgment is 0.40 ($p < .05$), and the correlation between self-judgment and production is 0.79 ($p < .01$).

The posttest measures of other-perception, self-judgment and production were also found to be correlated with the productions obtained during speaking practice and the Pearson coefficients appear in Table 6 ($N = 33$, not all groups participated in speaking practice). The correlation between speaking practice production and posttest production is .67 ($p < .01$), the correlation between speaking practice production and self-judgment is .61 ($p < .01$) and the correlation between the speaking practice production and other-perception is .75 ($p < .01$).

A regression analysis examining the effects of self-judgment and other-perception on posttest production was performed and the results are presented in Table 6. The regression equation with self-judgment and other-perception used as predictors explains 65% of the variance in posttest production scores. Self-judgment is a significant predictor ($\beta = .73$, $p < .01$) and other-perception is not a significant predictor ($\beta = .16$) of posttest production.

Path analysis

A path model examining the effects of the perception training (Groups 1 and 2) and self-judgment (Groups 2 and 4) conditions on speaking practice production shows the effects on posttest production skill as mediated by posttest other-perception and posttest

self-judgment (Figure 2). The path coefficients represent the standardized regression weights and the Pearson correlations appear in parentheses. The squared multiple correlation coefficients appear to the right of the variables. The significant paths are indicated in bold. Perception training and self-judgment are coded as (0, 1) with a 0 indicating the presence of the condition.

The squared multiple correlation coefficient for production is 0.63. In this model, other-perception and self-judgment account for 63% of the variance in posttest production scores. The contribution for posttest self-judgment skill is $\beta = .73$, $p < .05$. The contribution of other-perception was not significant ($\beta = 0.17$). The effects of the other-perception training and self-judgment conditions on speaking practice production appear at the left side of the model. The perception training treatment ($\beta = 0.55$) had a significant effect on speaking practice production while the self-judgment treatment did not. Speaking practice, in turn, affected both self-judgment ($\beta = 0.87$) and other-perception ($\beta = 0.75$). The effect of other-perception on self-judgment was nonsignificant however it the p-value was close to significant at 0.09.

Table 5

Pearson correlations for Posttest Measures of Production, Self-Perception, and Other-Perception

	Post Production	Post Self-Perception	Post Other-Perception
Post Production			
Post Self-Perception	.79**		
Post Other-Perception	.45**	.40*	
Speaking Practice Production (N = 33)	.67**	.61**	.75**

** Correlation is significant at the .01 level.
* Correlation is significant at the .05 level.
N= 40

Table 6

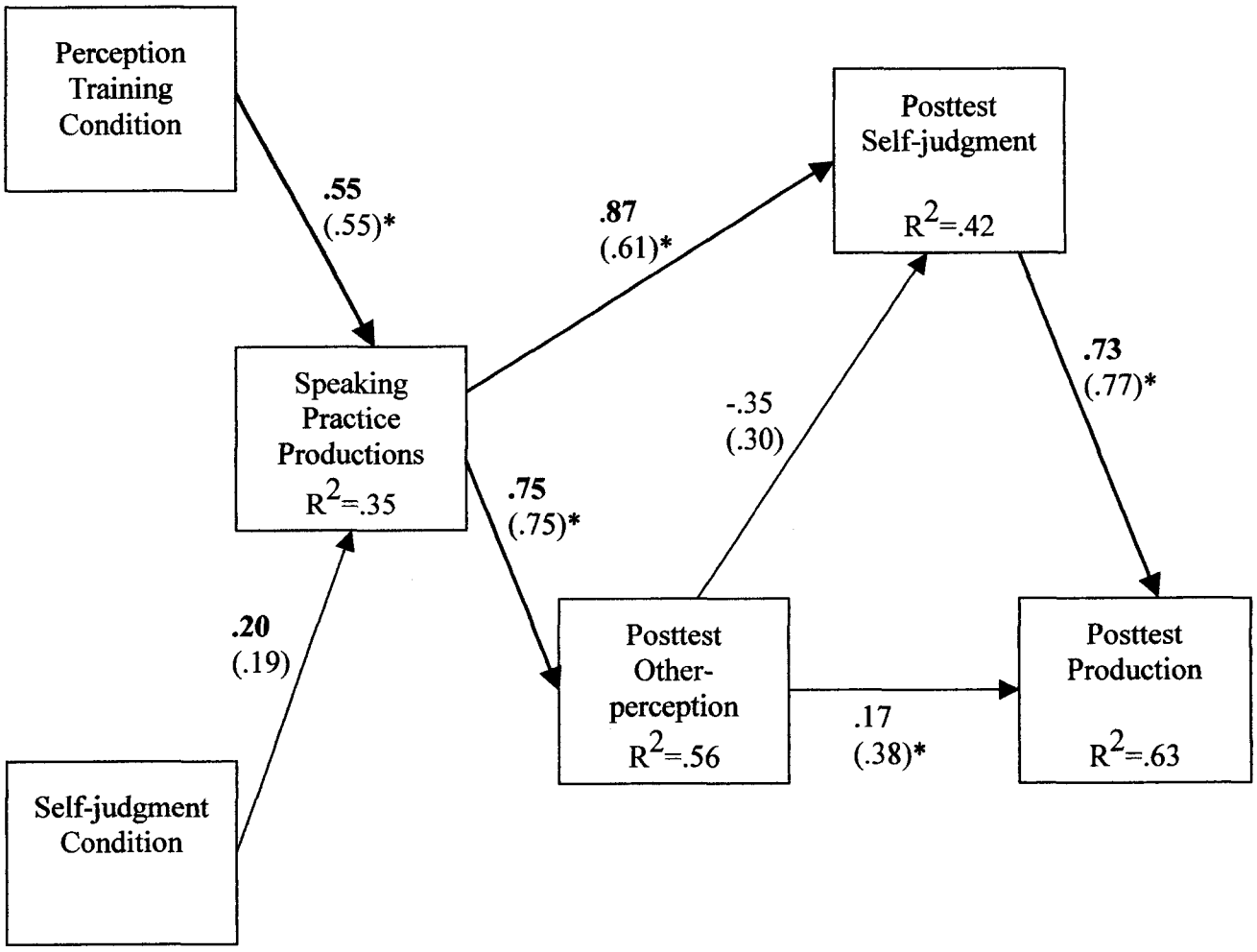
Regression Analysis Summary for Other-perception and Self-judgment Variables Predicting Phoneme Production

Variable	B	SEB	β
Self-judgment	0.69	0.10	0.73*
Other-perception	0.16	0.11	0.16

Note. $R^2 = 0.65$ ($N=40$, $p < .01$).
*$p < .01$.

Figure 2.

Path Analysis Showing Effects of Perception Training and Self-Judgment Conditions and Speaking Practice on Posttest Measures.



Significant paths are indicated in bold.
Pearson correlations appear in parentheses.
* p< .05

CHAPTER 5

Discussion

Learning Theory Implications

This study examined a causal model of second language pronunciation acquisition based on Zimmerman's (2000) model of the development of self-regulated learning. The roles of other-perception and self-judgment in learning to produce a nonnative phoneme contrast were experimentally manipulated and the effect on production was measured. Participants' production results on an elicited task (posttest production) and an imitative task (speaking practice) were compared across the four treatment groups (Group1—Perception of other-speech instruction/self-judgments during pronunciation practice; Group 2—Perception of other-speech instruction/ **no** self-judgments during pronunciation practice; Group 3—**No** perception of other-speech instruction/self-judgments during pronunciation practice; Group 4—**No** perception of other-speech instruction/ **no** self-judgments during pronunciation practice) and the no-treatment control group (Group 5). Participants' self-efficacy for production was also measured and is discussed below.

The main hypotheses of the study were based on the necessity of an internal standard to use as a comparison to one's own pronunciations and the use of this standard to allow learners to make accurate self-judgments and improve their pronunciation. It was predicted that the participants who received perception training (Groups 1 & 2) would outperform the groups who did not. Additionally, it was hypothesized that the students who engaged in self-judgments during speaking practice (Groups 1 & 3) would outperform those students who did not. The groups were predicted to perform in a stair step pattern on all posttest measures with Group 1 having the highest performance

followed by the other groups in turn. The results of the study and how they relate to the hypotheses are discussed below.

Groups 1& 2 (the groups receiving the perception training) significantly outperformed Groups 3, 4, & 5 (the groups that did not receive perception training) on the measure of posttest other-perception as hypothesized. However, in contrast to other stated hypotheses, significant differences among the groups on the measures of posttest production, posttest self-judgments, and posttest self-efficacy for production were not found. Although the differences are not statistically significant, an examination of the mean posttest scores for production, self-judgment, and self-efficacy show higher scores for Groups 1 & 2 as compared to Groups 3, 4 and 5 (see Table 2). The lack of statistically significant differences could be due to the relatively small numbers of participants in each group or could be an artifact of the task and difficulty level.

The significant difference on the posttest measure of other-perception provides evidence that adult learners of a second language can learn to perceive nonnative phonemes. Earlier studies have shown that with much practice and feedback it is possible to influence the perceptual categories of adults and the present study provides further evidence (Lively, Logan & Pisoni, 1993; Strange & Dittman, 1984). It should be noted that similar to previous studies of perception training, the learning process was long and arduous. For the majority of participants, the individual perception training took place over four sessions, each lasting approximately thirty minutes. Informal feedback from participants during the perception training revealed participants found the task to be difficult, yet they appreciated the feedback and felt they were learning a valuable skill.

In support of the hypotheses, it was found that participants who received other-perception training *and* made self-judgments (Group 1) during speaking practice made significantly fewer speaking practice production errors than participants in Groups 2, 3, 4 and 5. The participants in Group 1 also made significantly fewer self-judgment errors than the participants who did not receive other-perception training (Group 3). In terms of Zimmerman's (2000) model of the development of self-regulated learning, it can be said that the participants who received other-perception training developed an internal standard and then used this standard as a comparison during the speaking practice phase. The speaking practice production scores of participants in Groups 1 through 4 as well as the speaking practice self-judgment scores of participants in Groups 1 and 3 support this theory.

The differences in outcomes between the posttest data and the speaking practice data are likely due to the task demands. Recall the discussion in Chapter 2 about the differences between elicited and imitative tasks. The elicited task requires the learner to produce the correct sound in absence of a model while the imitative task presents an aural stimulus and asks the learner to essentially listen-and-repeat. The posttest measure of production was an elicited task where the participant was given a list of nonwords containing the target phonemes and asked to read it aloud. The posttest task tapped learners' ability to correctly produce the phonemes *independently* in absence of a model, similar to Zimmerman's (2000) self-control phase where the learner has begun to internalize the skill.

In contrast, the speaking practice phase of the study used an imitative task where the participants heard a recording of a native speaker and were asked to repeat the

nonword they heard and their utterances were recorded. This difference in task could explain why differences among the groups in production ability were found during speaking practice yet were not evident on the posttest. These results are also similar to the findings of previous researchers (Borden, Gerber & Milsark,1983; Lane & Schneider, 1963) who used a mimicking task for production data.

The imitative task is akin to Zimmerman's (2000) notion of emulation where learners are developing their own skill as learned through observation of a model. In this case, the participants in the perception training groups had developed an internal standard of the correct phonemes from a native speaker and used this information to assist in their productions and self-judgments. The students who had developed this perception skill and engaged in judgments about their own productions significantly outperformed the other groups, emphasizing the importance of both an internal standard and active monitoring of one's own progress.

The path analysis shows a significant effect of speaking practice production on posttest self-judgment while posttest other-perception does not. This lends further evidence of the importance of the role of the learner in developing accurate pronunciation in a second language. In both the regression analysis and the path model, self-judgment skill is a significant predictor of posttest production and other-perception skill is not. While other-perception is an important skill for learners to have and the other-perception training groups outperformed the groups without training, it appears that the speaking practice mediates the effect on production. In other words, the learner needs to have the internal standard developed through other-perception training available during practice and use this to make judgments about his/her own productions. This focused type of

listen-repeat-make judgment practice available during the speaking practice phase hones the other-perception and self-judgment skills that lead to improved production performance for participants in groups receiving the training.

Surprisingly, the posttest measure of self-efficacy for production failed to show significant differences among the groups, but there is a stair-like pattern in the posttest self-efficacy group means as hypothesized. The measure of self-efficacy was specific and asked participants directly about the posttest production task which also did not show significant differences among the groups. It could be that participants realized their limited improvement in their ability for production, and their self-efficacy beliefs reflected an accurate personal assessment.

This study provides limited evidence for a model of the development of second language pronunciation that includes both the external perception of unfamiliar phonemes and the role of the learner in making self-judgments in order to learn the sounds. As discussed in Chapter 2, many researchers have studied the relationship between other-perception, self-judgment and production (Borden, Gerber & Milsark, 1983; Sakow & McNutt, 1993; Sheldon & Strange, 1982). However, because of the varied ways of measuring the perception and production abilities of the participants, results from previous research are difficult to interpret, and there is no clear model of the development of pronunciation skill. In the current study, the measurement of the perception and production abilities was more controlled than in previous studies.

Overall, the results show that other-perception skill is a necessary component of learning to pronounce novel phonemes. It is through developing other-perception skill that learners form a basis of the correct pronunciation and use this as a comparison for

their own attempts. Additionally, the role of self-judgment in the production of novel phonemes also plays an important part in a learner's development of production skill. Through making judgments about their own pronunciations learners are able to make adjustments and become more accurate producers of novel phonemes.

Limitations of the Study

The limitations of the present study include the use of a single phoneme contrast, a relatively small sample size and a difficult posttest task. The use of only two phonemes limits the extent to which the findings can be generalized, but these were particularly problematic phonemes for Spanish speakers. Furthermore, the phonemes were embedded in an artificial nonword citation task context that was unfamiliar to the participants. While this nonword context minimizes external validity it enhances internal validity because prior word learning is controlled experimentally. The choice of nonwords instead of real words was made based on the results of pilot work and decreases the effects of memory for known words.

The small sample size also limits the conclusions that can be drawn and may account for many of the nonsignificant hypothesized findings. The small sample size is due to the difficulty of testing and recruiting students for the study. Over one hundred participants were pretested and less than half went on to participate in the study. Additionally, the training component took longer than expected and which also reduced the numbers of participants in the study. Many of the between-group differences approached significance, yet with the small sample size and large within-group variability these differences were not statistically significant. This was especially true in the path analysis for the effect shown by other-perception on self-judgment. This relationship was

significant in a pilot study and would most likely be significant in the present study with a larger sample size.

The posttest task, which required participants to produce the sample nonwords without an aural model was akin to a transfer task in Zimmerman's (2000) model of self-regulatory development and required students to have mastered the skills and perform them in a different context than the practice phase. An elicited task that required participants to produce the sounds in the absence of a model was used as a posttest task in order to measure the production ability without the confounding effect of perception that is present in the imitative listen-and-repeat type of task. However, the posttest production task proved to be more difficult than expected and required students to perform at a level beyond their reach. More research is needed in the ways in which students learn to produce a nonnative phoneme contrast through manipulating the listen-and-repeat speaking practice phase and providing some limited feedback to learners.

Educational Implications

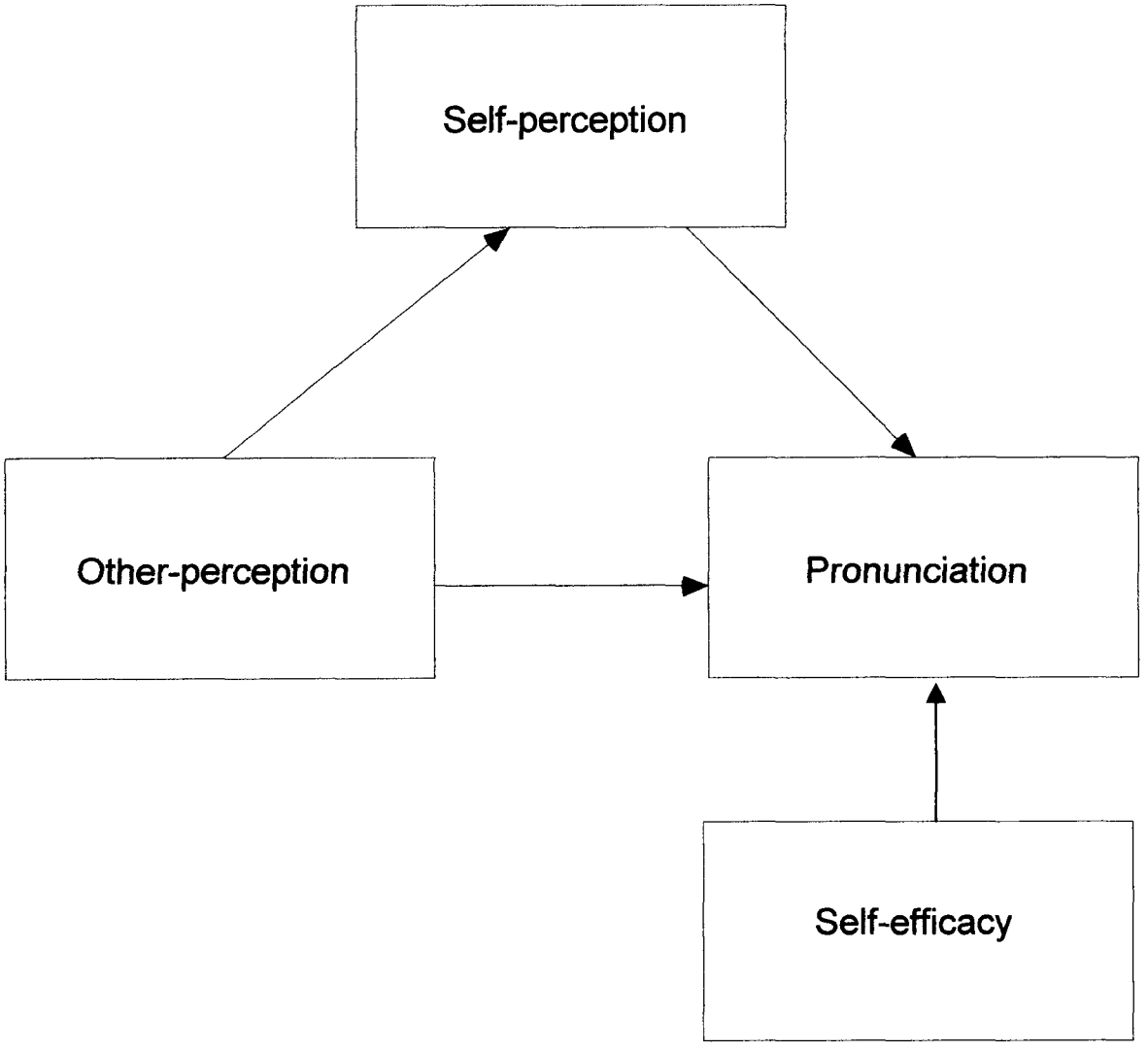
The results of this study can be applied directly to classrooms to assist learners in the correct pronunciation of novel L2 phonemes. The perception training results add further support to the literature and show that adult learners can establish L2 phonetic categories through practice and feedback. Although the process was difficult and sometimes tedious for the learner, the students did find the experience to be useful. Many students spontaneously reported they were able to hear differences in the speech of their teacher and other native speakers they encountered in their daily lives and attributed this skill to the training and the strategy taught during the training.

In addition to teaching students to hear the difference between unfamiliar phonemes, the findings also suggest it would be useful to provide opportunities for students to make judgments about their own productions. Based on the speaking practice data it might be more productive for students to engage in listen-and-repeat types of production exercise and to make self-judgments about their productions both immediately after speaking and after a delay (from a recording). Students in the study enjoyed the opportunity to listen to their own recordings and make judgments about their accuracy. Most reported this was not something they had ever done in the classroom and felt it was very beneficial to their production skill. Of course, as shown in the present study, self-judgments are only helpful if the student has developed an internal standard through other-perception training and can use this to compare against their own utterances.

Students in the present study were not provided with self-judgment feedback because the purpose of the study was to examine how other-perception and self-judgment skill affected the learner's self-directed learning of a novel phoneme. However, an interesting follow-up study or even a classroom activity would be to provide feedback to each learner about the accuracy of his/her productions and measure the differential effects on students as a factor of their other-perception skill.

Appendix 1

Figure 1. Model of second language pronunciation development.



Model depicting the effect of perception, beliefs and self-efficacy on second language pronunciation. The effect of other-perception is mediated by self-perception.

Appendix 2

Phase 1- Pre-testing

One session- 25 minutes

Students will record speech samples, make self-judgment and other-perception judgments and complete the participant survey. *Eligible students will be randomly placed in one of the five experimental groups.* (See below for a description of the groups.)

Phase 2- Perception of other-speech Instruction

Groups 1, 2, 3, 4

2-7 sessions- 25 minutes each

Groups 1 and 2 will receive instruction in the discrimination of target phonemes spoken by a native English speaker during the course of four to seven sessions of 160 non word syllables each. There will be a posttest after the final session to ensure that the training groups learned the phonemes accurately.

Phase 3- Pronunciation Practice

Groups 1, 2, 3, 4

1 session- 25 minutes

Students will practice pronouncing the target phonemes by listening to a recording of a native speaker saying nonword syllables and will repeat the nonwords and be recorded. Students in the self-judgment condition will listen to their productions and mark the phonemes they hear themselves producing.

Phase 4- Post-testing

One session- 25 minutes

Groups 1, 2, 3, 4, 5

Students will record speech samples, make self-judgments, and other-perception judgments as in the pre-test session.

Group 1	Perception of other-speech instruction/self-judgment judgments during pronunciation practice
Group 2	Perception of other-speech instruction/ **no** self-judgment judgments during pronunciation practice
Group 3	**No** perception of other-speech instruction/self-judgment judgments during pronunciation practice
Group 4	**No** perception of other-speech instruction/ **no** self-judgment judgments during pronunciation practice
Group 5	**No** perception of other-speech instruction/ **no** pronunciation practice

		Other – perception condition	
		YES	NO
Self-judgment judgment condition	YES	Group 1	Group 3
	NO	Group 2	Group 4

Appendix 3

Participant Survey

Please answer the following questions as accurately as possible.

1. Date of birth: _____

2. Gender: (circle one) Male Female

3. Native language:_____

4. Country of birth: _____

5. Can you read and write in Spanish? YES NO

6. How long have you been living in the United States?

_____

7. How many years have you been speaking English?

_____

8. What language do you speak the most in each of the following areas? (circle **one**)

A) **Work**: ENGLISH SPANISH BOTH

B) **Family**: ENGLISH SPANISH BOTH

C) **Friends**: ENGLISH SPANISH BOTH

9. How would you define good English pronunciation? (circle **one**)

Sounding like a native speaker of English

Being easily understood by native English speakers

Being easily understood by native Spanish speakers

Cuestionario para Participante

Por favor responda las siguientes preguntas de la manera más exacta posible.

5. Fecha de nacimiento: _____

6. Sexo: (circule **uno**) Masculino Femenino

7. Idioma materno:_____

8. País de nacimiento: _____

5. ¿Puede leer y escribir en español? SI NO

6. ¿Por cuánto tiempo ha vivido en los Estados Unidos?

_____

7. ¿Por cuánto tiempo ha estado aprendiendo inglés?

_____

8. En las siguientes áreas, circule el idioma que Ud. habla más, en cada caso:

D) **Trabajo**: INGLES ESPAÑOL AMBOS

E) **Familia**: INGLES ESPAÑOL AMBOS

F) **Amistades**: INGLES ESPAÑOL AMBOS

9. ¿Cómo definiría Ud. buena pronunciación del inglés? (circule **uno**)

Oírse como una persona que habla inglés de nacimiento

El ser fácilmente comprendido por personas que hablan inglés de nacimiento

El ser fácilmente comprendido por personas que hablan español de nacimiento

Appendix 4

Phase 1 - Familiarization (production, self-judgment, and other-perception) List

Ti
Tu
Ib
Ub
Bi
Bu
Id
Ud
Du
Di

Phases 1 & 4 - Pre-Posttest Other-, Self-judgment and Production List

SH initial position
Shi
Shu
SH final position
Ish
Ush
CH initial position
Chi
Chu
CH final position
Ich
Uch

Phases 2 & 3 Perception Training/Production Practice List

SH initial position
Sha
Shai
She
Sho
SH final position
Ash
Aish
Esh
Osh
CH initial position
Cha
Chai
Che
Cho
CH final position
Ach
Aich
Ech
Och

Appendix 5

Pre-test procedure

NOTE DATE AND START TIME ON LOG
Hi. My name is Ellie Hanlon and I am doing a project on how Spanish speakers learn to pronounce English sounds. I would like to show you a consent form and explain a little more about my project.

GIVE CONSENT FORM and read it to the participant
Ask if he/she has any questions
Ask if he/she would like to participate and sign the form
PRODUCTION PRETEST (get scoring sheet ready)

Hand the student the practice cards and *explain that you would like him/her to read these words onto a tape. After he/she records the words you are going to ask him/her to listen to the tape and mark on a piece of paper the sounds he/she hears so it is very important that he/she speaks loudly and clearly onto the tape. It is also important to leave a few seconds in between each word. He/she should also say the number out loud before reading each nonword. Ask if there are any questions about the words.*

GET TAPE RECORDER READY
Explain again that he/she is going to listen to the words so it is important to speak loudly and clearly
Ask if the student is ready

START TAPE
Motion to the student to start reading the list
After the student is finished rewind the tape and play it back to check for quality. If the student forgot to say the numbers or the recording is not clear due to the voice volume have the student practice recording again.

TELL THE STUDENT *GOOD JOB*

BRING OUT THE SH CH cards and *ask the student if he/she knows the sounds the two pairs of letters make. Ask them to say each one for you. SAY "GOOD" at any attempt to say the sounds correct or not*

GET THE REAL LIST READY and TURN TO THE SCORING SHEET
and give the student the SH CH nonword syllable list and say "*Now I want you to make a recording of yourself reading this list of words into the tape recorder. Remember, you are going to listen to the recording so be sure to say the number and speak loudly and clearly*"

Give the student a minute or so to look over the list. Ask the student to complete the self-efficacy form.

Ask if he/she is ready and get the tape ready.

START THE TAPE and motion to the student to start reading

Mark on the scoring sheet the pronunciation you hear the student say

AFTER the student finishes take the list of words away and say, *"Good job. Here is a marking sheet for when you listen to the recording.* GIVE SELF-SCORING SHEET. *Now I want you to listen to the recording and circle either SH or CH on this piece of paper next to each number depending on what you hear. DO you have any questions? OK. Let's get started."*

Play the tape for the student and have them mark on the piece of paper he/she hears.

After he/she finishes say, "Good, now I want you to do the same thing for a recording made by someone else."

HAND THE STUDENT THE OTHER-SCORING SHEET and get the tape ready

Ask if he/she has any questions. **Start the tape.**

When the student finishes turn to the survey in the packet and *ask the student to complete the survey. Tell the student to feel free to ask any question he/she may have about the survey.*

When the student finishes *ask the student if he/she would be willing to participate in other sessions of the study.* If the student agrees write his/her name on the activity log and obtain phone number (if necessary). Note location of student.

Thank the student and **NOTE END TIME.**

Perception training procedure (sessions 2-7)

NOTE DATE AND START TIME ON LOG- START TAPE RECORDER
Hi. Thank you for agreeing to participate in other sessions of my project. Today I am going to teach you to hear the difference between two tricky sounds in English.

SHOW SH AND CH CARDS
Do you know the sounds these two pairs of letters make?
[student will probably say no or get them wrong since they have already been screened for this]
Yes, they are tricky sounds. It is really easy to get them confused. I like to think of them like this- *TURN CARDS OVER*- See, the CH is a scratchy sound like in ITCH and the SH is a hushing sound like in SHHH.

Perception training

Now we are going to practice listening to the difference between these two sounds. You will hear some nonword syllables and I want you to circle on this piece of paper either the CH or the SH. You will hear each nonword twice and then you circle your answer. I will tell you if you are right. If you are wrong, I will play the sound for you again. Do you have any questions?

OK. Let's get started. Now, you are going to hear a nonword twice and then I want you to circle the sound you heard.

PROCEED THROUGH TRAINING AND MARK ON THE COMPUTER THE STUDENT RESPONSE.

When the student makes a correct response say GOOD. *When the student is incorrect say* NO, LISTEN AGAIN *and* play the nonword again.

Continue through the set of 160 nonwords.

AFTER the student finishes take the response sheet away and say, *"Good job"*

Thank the student and **NOTE END TIME.**

Pronunciation Practice Procedure (phase 3)

NOTE DATE AND START TIME ON LOG- START TAPE RECORDER
Hi. Thank you for agreeing to participate in other sessions of my project. Today you are going to practice pronouncing some sounds in English.

SHOW SH AND CH CARDS
Do you know the sounds these two pairs of letters make?

Now say, "OK, now I want you to listen to the word and then repeat it You will hear each word once then repeat it. *[for self-judgment groups see below]*

SELF-JUDGMENT GROUPS
After the student repeats each word have them circle on the paper what he/she said. After each trial, have the student listen to the recording and circle what he/she said.

OTHER GROUPS
Let students practice the list two more times. After each trial the student should listen to the recording without making judgments.
The practice session is over after each student has practiced the list ***three*** *times.*

AFTER the student finishes take the response sheet away (from self-judgment groups) and say, *"Good job"*

Thank the student and **NOTE END TIME and STOP TAPE.**

Post-test Procedure (Phase 4)

NOTE DATE AND START TIME ON LOG
Hi. Thank you for agreeing to participate in other sessions of my project.

PRODUCTION POST-TEST (get scoring sheet ready)

Hand the student the practice list and *explain that you would like him/her to read this list of words onto a tape. After he/she records the words you are going to ask him/her to listen to the tape and mark on a piece of paper the sounds he/she hears so it is very important that he/she speaks loudly and clearly onto the tape. It is also important to leave a few seconds in between each word. He/she should also say the number out loud before reading each nonword. Ask if there are any questions about the words.*

GET TAPE RECORDER READY
Explain again that he/she is going to listen to the words so it is important to speak loudly and clearly
Ask if the student is ready

START TAPE
Motion to the student to start reading the list
After the student is finished rewind the tape and play it back to check for quality. If the student forgot to say the numbers or the recording is not clear due to the voice volume have the student practice recording again.

TELL THE STUDENT *GOOD JOB*

BRING OUT THE SH CH cards and *ask the student if he/she knows the sounds the two pairs of letters make. Ask them to say each one for you. SAY "GOOD" at any attempt to say the sounds correct or not*

GET THE REAL LIST READY and TURN TO THE SCORING SHEET

and give the student the SH CH nonword syllable list and say "*Now I want you to make a recording of yourself reading this list of words into the tape recorder. Remember, you are going to listen to the recording so be sure to say the number and speak loudly and clearly"*

Give the student a minute or so to look over the list.

Ask if he/she is ready and get the tape ready.

START THE TAPE and motion to the student to start reading

Mark on the scoring sheet the pronunciation as you hear the student read

AFTER the student finishes take the list of words away and say, *"Good job. Here is a marking sheet for when you listen to the recording.* GIVE SELF-SCORING SHEET. *Now I want you to listen to the recording and circle either SH or CH on this piece of paper next to each number depending on what you hear. DO you have any questions? OK. Let's get started."*

Play the tape for the student and have them mark on the piece of paper he/she hears.

After he/she finishes say, "Good, now I want you to do the same thing for a recording made by someone else."

HAND THE STUDENT THE OTHER-SCORING SHEET and get the tape ready

Ask if he/she has any questions. **Start the tape.**

Ask the student to complete the questionnaire again.

Collect the post-test packet from the student.

Thank the student profusely because this is the last time you will see them as a participant in the project and **NOTE END TIME.**

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