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CONTENTS

A CRITIQUE OF MINIMAL PAIR MATERIALS: A GUIDE FOR SPEECH-LANGUAGE PATHOLOGISTS

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ABSTRACT

Minimal pair contrast therapy is a linguistically-based approach that is frequently used by clinicians in treatment of children with phonological delays and disorders. This approach has been supported by various researchers since the 1980s (Barlow & Gierut, 2002; Saben & Ingham, 1991; Elbert, Powell, & Swartzlander, 1991; Tyler, Edwards, & Saxman, 1987; Monahan, 1986; Weiner, 1981). Prior to the current study, minimal pair materials had not been examined and critiqued individually to determine their effectiveness, strengths and weaknesses, and adherence to minimal pair theory. To address this void, several minimal pair materials were critiqued and their contributions to specific elements of phonological treatment were discussed within the present article. Suggestions were also made for further research and development of additional minimal pair, maximal opposition, and multiple opposition materials to be used in treatment of children with phonological delays and disorders.

KEY WORDS

Phonological Therapy, Minimal Pairs, Critique

INTRODUCTION

Minimal pairs are a common treatment approach or material often used with young children who present with phonological delays or disorders, whose rationale as well as efficacy are well-documented in the literature (Barlow & Gierut, 2002; Saben & Ingham, 1991; Elbert, Powell, & Swartzlander, 1991; Tyler, Edwards, & Saxman, 1987; Monahan, 1986; Weiner, 1981). Although most of the literature discusses use of minimal pairs with young children who exhibit phonological processes, some of these materials may also be used with adolescents or adults seeking accent reduction services or with those who present with sound errors that persist into adolescence or adulthood (Elbert, Rockman, & Saltzman, 1980). However, the present article limits use of minimal pair materials primarily to children who present with phonological delays and disorders.

"Minimal pair" materials exist in various forms: picture cards, line drawings, photo cards, workbooks, reading books with activities, cd-roms, and computer software programs. Most of these materials claim to be minimal pairs that can be contrasted in therapy to reduce a child's use of phonological processes. Some claim to be "articulation" materials, but are actually used with children who present with phonological processes. Some "minimal pair" materials include activities that do correspond to the tenets of minimal pairs; however, others claim to be solely "minimal pairs" yet borrow from other schools of thought as well, such as from Hodson and Paden's cycles approach (1983, 1991). Some resources provide sample goals or objectives as well as data collection sheets that can easily be modified by practicing speech-language pathologists. Few appear to provide detailed instructions for use with caregivers. Though some sources appear very comprehensive, they do not provide everything clinicians need throughout the therapeutic process: data collection sheets, goals, generalization probes, sample therapy plans, minimal pair cards, information as to how many pairs to use as well as when to fade these in therapy, homework, and home program instructions for caregivers. In order for speech-language pathologists to use minimal pairs effectively, they need to take existing materials and modify them for specific purposes. Therefore, it is important for practicing clinicians to be critical of the materials they plan to use before implementing them in therapy to ensure that these materials are in fact suitable. For these reasons, the purposes of the present article include: (a) to provide a summary of several minimal pair materials, (b) to summarize their rationale and efficacy, and (c) to provide a critique to aid clinicians in making prudent decisions to support evidence-based practice (American Speech-Language-Hearing Association, 2004).

REVIEW OF MINIMAL PAIR CONTRAST THERAPY EFFICACY STUDIES

Minimal pair therapy, also known as minimal pair contrast therapy, is a linguistically-based therapy approach that is frequently used in helping children to suppress phonological processes with which they present. According to Saben and Ingham (1991), "Currently, the form of linguistic treatment most often recommended [for suppressing phonological processes] is minimal pairs treatment" (p. 1024). Barlow and Gierut (2002) discuss use of traditional minimal pairs as one approach to treatment of children with phonological delays and disorders (as opposed to multiple oppositions and maximal oppositions). As Tyler, Edwards, and Saxman (1987) describe, the minimal pair "technique involves contrasting a pair of words in which one word contains the child's error production and the other contains the target production [with the phonemes differing in only one aspect (e.g., *see-tea; can-tan*)]" (p. 394). Saben and Ingham (1991) continue: "a minimal pair consists of two words that become homophones when a child's typical speech-sound error is produced. . . minimal pairs demonstrate to children that they need to make *phonemic* contrasts in their speech in order to differentiate meanings" (p. 1024).

IMPORTANCE OF REVIEWING LITERATURE PRIOR TO CRITIQUING MINIMAL PAIR MATERIALS

Using evidence from literature is one of the American Speech-Language-Hearing Association's (ASHA's) three criteria to consider when applying evidence-based practice to treatment decisions (ASHA, 2004). As such, the present researcher found it necessary to review relevant minimal pair literature that discusses use of traditional minimal pair contrast therapy for children with phonological delays and disorders prior to reviewing several minimal pair therapy materials. It is important to note that more recent research, including Barlow and Gierut's (2002) article, attempts to compare the efficacy of using minimal pairs, multiple oppositions, and/or maximal oppositions as potential therapeutic programs when treating children with phonological delays and disorders. Articles that discuss the traditional minimal pair contrast therapy, however, will be considered in greater depth, as the materials critiqued correspond to the traditional minimal pair approach, not to that of multiple oppositions or maximal oppositions. The articles summarized were obtained via a thorough search of scholarly peer-reviewed journal articles (using databases such as EBSCO Host—Academic Search Complete and Education Research Complete, ComDisDome, PsycInfo, Medline, PubMed, and ASHA's website). Special attention was paid to usage, rationale, and treatment efficacy for each article discussed.

Minimal Pair Treatment Utilizing Five Levels of Training

Tyler, Edwards, and Saxman (1987) studied the effects of using minimal pair contrasts in treating two children aged 3:8 and 5:1, who presented with "moderate to severe phonological disorders" (p. 395). Treatment involved five levels of training, discussed in sections below.

Subject pool and choice of phonological processes to target.

The children discussed in the study were referred to a university clinic for phonologically-based treatment after

receiving an evaluation diagnosing them with "moderate to severe phonological disorder[s]" (p. 395). The most prominent phonological processes of the children's speech were selected for treatment. Subject A (5:1) exhibited gliding of fricatives as well as depalatization, while Subject B (3:8) exhibited stopping of fricatives as well as fronting of velars. One process for each child was immediately targeted in therapy (e.g. gliding for Participant A, stopping for Participant B), while some processes (e.g. depalatization for Participant A, velar fronting for Participant B) were treated after the first process chosen for each child had been suppressed.

Study design and minimal pair treatment approach.

Tyler, Edwards, and Saxman (1987) first assessed these two participants' phonological processes during the pretreatment phase by using a generalization probe. Next, they provided the minimal pair contrast treatment, which involved five levels of training, including perception, word imitation, independent naming, production of the minimal pairs, and production of sentences. The researchers defined specific criteria that permitted these two children to begin minimal pair contrast treatment initially as well as to move through the five levels hierarchically. After a few treatment sessions had taken place, a probe was administered to the children to determine progress. Finally, the researchers followed-up after withdrawing treatment for the semester break, gathering probe data again, so as to compare any changes noted in the phonology of the children pre and post treatment.

Results and conclusions.

Tyler, Edwards, and Saxman (1987) discovered the following: "Training on the target sounds /f, s/ for both subjects resulted in generalization of the pattern of frication with greater than 70% accuracy in fewer than 12 training sessions. Although not all fricatives were produced correctly in this time, all were replaced by more typical substitutes that represented improvement in the subjects' phonological systems. Treatment on the sounds /f, s/ led to improvement in untrained sounds . . . for Subject A and untrained sounds . . . for Subject B. The untreated processes for Subjects A and B showed little or no positive change during treatment of the target processes. However, the untreated processes changed dramatically when they became the focus of treatment for both of these subjects" (p. 400). The researchers concluded that the minimal pair contrast therapy approach was "effective and efficient in eliminating the processes targeted for remediation for each subject" (p. 400).

Minimal Pairs: Effective in Suppression of Phonological Processes

Weiner (1981) studied the use of minimal pair contrast therapy in suppressing the final consonant deletion, stopping, and fronting processes of two male children (4:10 and 4:4) with previously unintelligible speech. Weiner's game based activity is different from those discussed in other articles that were included in the critique, though it did include the element of teaching the importance of phonemic contrasts in distinguishing meanings.

Subject pool and choice of phonological processes to target.

The two participants of the study were referred to Pennsylvania State University's Clinic as they exhibited "unintelligible speech" (p. 98). Both children exhibited at least six phonological processes before treatment. However, final consonant deletion, stopping, and fronting were targeted as these should have been suppressed prior, based on the children's ages.

Study design and minimal pair treatment approach.

Weiner's (1981) study used a variation of a game-based minimal pairs contrast procedure originally used by Cooper (1968 as referenced in Weiner, 1981), giving the children opportunities to learn that when phonological processes are used, words and meanings are confused for the communication partner. According to Weiner (1981), elements of one sample game included the following: when targeting final consonant deletion, the child was provided with 5 pictures of a boat and 4 pictures of a bow. The client was to produce the desired word so that the clinician could pick up the corresponding picture, until the clinician had all 5 of the same picture. The clinician picked up the picture that corresponded to the word the child said. After two consecutive errors, the clinician offered verbal instructions in the form of an explicit reminder for the child to use different final sounds to convey a different word or meaning. Any production that showed that the child was no longer using the phonological process was considered correct at early stages, even if the child did not correctly produce the target word. Two baselines were obtained by "eliciting delayed imitation responses to the 20 target words for each of the treatment processes" to determine frequency of phonological process production prior to treatment (p. 99). A generalization probe for non-treatment words was also given post treatment to determine whether the children were able to suppress phonological processes on words not directly targeted; responses were elicited in the same fashion as during baseline data collection.

Results and conclusions.

Weiner (1981) summarized the results of his study: "For Subject A the minimal-pairs treatment procedure was effective in reducing the frequency of the phonological processes and in deletion of final consonants, stopping, and fronting. There was no reduction in the frequency of any of the processes except stopping until the treatment procedure was applied" (p. 100). He continued, "In addition to decreases in process use, there was a concomitant improvement in sound production for sounds related to the three treatment processes (p. 100). The second subject also made gains once treatment began. According to Weiner (1981), "The minimal-pairs treatment procedure was effective in reducing the frequency of phonological processes for Subject B since in no case was there a drop in the frequency of occurrence of deletion of final consonants, stopping, or fronting until treatment began" (p. 102). Subject B also became able to correctly produce some sounds related to the phonological processes targeted with treatment. This researcher also stated: "although performance

improved for the probe words, performance for target words was never equaled. This result was difficult to interpret but probably suggests that even when phonological oppositions are established in therapy, they do not immediately spread throughout a child's speech. Rather, generalization in the use of phonological opposition may be a gradual process" (p. 100). Taking this data into consideration, it appears that using minimal pairs, at least at the word level, can be an efficient and motivating way to treat the speech of children with phonologic delays or disorders (e.g. in comparison to articulation training). However, further steps need to be taken to ensure generalization of phonologic skills to the level of conversational speech.

Using Minimal Pairs at the Word and Sentence Level

Monahan's (1986) approach to treating phonological processes "uses minimal-word-pair contrasts to aid in the identification and elimination of common phonological processes and involves production practice at the word and sentence level" (p. 199). This study is also distinct, as it includes the concept of "auditory bombardment" (Hodson & Paden, 1983, 1991), which is not associated with traditional minimal pair contrast therapy as previously described.

Subject pool and choice of phonological processes to target.

Monahan (1986) treated four kindergarteners between the ages of 5:5 and 5:8 who had been diagnosed with moderate to severe phonological disorders thru use of the *Assessment of Phonological Processes* (Hodson, 1980 as cited in Monahan, 1986). Each child used at least five phonological processes prior to treatment, some of which included: prevocalic voicing, postvocalic voicing, backing, stopping, affrication, deaffrication, patalization, depatalization, epenthesis, and assimilation.

Study design and minimal pair treatment approach.

The approach that Monahan (1986) used to treat phonological processes incorporated three elements: "conceptualization training using a perceptual sorting task and a lexical production procedure," "short sessions of auditory bombardment," and "a phonemic contrast approach that enables the child to perceive semantic differences in minimal-word-contrast pairs illustrating the error production and target response" (p. 200). Minimal-word-contrast pairs were used to illustrate that different speech sounds can change meaning. In the first stage of therapy, the clinician described the error pattern and the target productions in terms that children could understand. The sound contrasts were then illustrated by using several individual phonemes (such as /t/ and /k/); "the child was asked to identify the clinician's productions as 'front' or 'back.' A criterion of 90% accuracy on 20 attempts was required before moving to Step 2" (p. 201). At the second step of the process, the clinician picked five minimal-word-contrast pairs to constitute the training set and introduced these to the child. According to Monahan (1986), "to ensure correct picture identification, the child was asked to point to the appropriate picture in a word pair when asked 'Show me ____' "; the child needed to correctly identify all words presented on 3 consecutive trials (p. 201). At the third step, "the clinician said a training-pair and commented on the production of each word" to highlight specifically contrasted phonemes using exaggerated productions of those sounds in the target word pairs (p. 201). The author continued, "After a few such examples, the child was asked to listen to the clinician's production of each training word and sort the cards into two stacks, words containing 'front' sounds and words containing 'back' sounds" with 90% accuracy across 3 consecutive trials (p. 202). At the fourth step, the child and clinician engaged in a variety of drill-play activities to facilitate practice of productions using the minimal-word-contrast pairs as stimuli. Some sample games included "find a card," "playing teacher," and "silly sentences" (p. 202). In these types of games, the child was to use the minimal-word-contrast pairs in sentences. At the start and end of each therapy session, Monahan (1986) read a list of minimal pairs demonstrating the processes being targeted and provided the child's caregivers with lists to be read aloud to the child on a daily basis. Pre and post treatment data were collected and compared, consistent with an ABA single subject design (Hegde, 2003).

Results and conclusions.

According to Monahan (1986), "using a minimum number of training stimuli, the frequency of occurrence of targeted phonological processes in all four subjects decreased to 34% or less with generalization of target patterns (e.g. stridency, final consonant inclusion, production of velars). In addition, there was an increase in the percentage-of-correct sound productions for all of the subjects involved, resulting in an improvement in overall intelligibility" (p. 204-205). She concluded "generalization of target patterns had indeed occurred, not only on untrained words, but in conversational speech as well," (p. 205) though she could not discount the potential role of maturation as well as use of minimal pair contrast therapy on the children's improved speech.

While elements of "auditory bombardment" as referenced by Monahan (1986) are not originally linked to minimal pair theory (Barlow & Gierut, 2002; Saben & Ingham, 1991; Elbert, Powell, & Swartzlander, 1991; Tyler, Edwards, & Saxman, 1987; Weiner, 1981), recent researchers have also discussed use of "auditory bombardment" with use of minimal pairs in a therapeutic approach known as *PACT: Caregivers and Children Together* in phonology therapy (Bowen & Cupples, 2006). "Auditory bombardment," first referenced by Hodson and Paden (1983) as part of the cycles approach, is also now referred to as "focused auditory stimulation" (Hodson, 2006) and may be useful in improving phonologic skills of children.

Number of Minimal Pairs Needed for Generalization

Complementing Monahan's (1986) study, Elbert, Powell, and Swartzlander (1991) conducted a study to determine the number of minimal pair exemplars needed for sufficient generalization of phonological process suppression at the level of conversational speech. Various numbers of minimal pair exemplars were presented to children with phonological delays or disorders during treatment. This study is unique, as it included the largest sample size of the ones critiqued.

Subject pool.

Nineteen monolingual participants, ranging from 3:6 to 6:8, were selected for Elbert, Powell, and Swartzlander's (1991) study from a larger group of forty children, who had participated in an earlier research project. The sample was composed of 6 females and 13 males.

Study design.

To determine the sounds and processes that were treated, the participants' speech and language were assessed using the *Goldman-Fristoe Test of Articulation* (Goldman & Fristoe, 1986 as cited in Elbert, Powell, & Swartzlander, 1991), *Phonetic Inventory Level* (Dinnsen, et. al, 1990 as cited in Elbert, Powell, & Swartzlander, 1991), *Peabody Picture Vocabulary Test-Revised* (Dunn & Dunn, 1981 as cited in Elbert, Powell, & Swartzlander, 1991), and "an extensive 306-item single-word speech sample" (Elbert, Powell, & Swartzlander, 1991, p. 83). Once targets had been chosen, generalization probes in the form of delayed-imitation responses were administered three times prior to treatment in order to establish baseline data. After collection of baseline data, minimal-pair contrast therapy was initiated using only three sets of contrasts that were presented randomly by the clinician and produced correctly by the children (all six words needed to be correctly produced). If the child met the 90% accuracy generalization criterion, treatment ceased. However, two contrast pairs were added if the child did not meet the 90% accuracy generalization criterion with the original three pairs. An additional five contrast pairs were added if the child did not meet generalization criterion for dismissal at five contrast pairs.

Results and conclusions.

According to Elbert, Powell, and Swartzlander (1991), three minimal pair exemplars were sufficient for generalization in 59% of cases, "five exemplars were sufficient in 21% of the test cases," and ten exemplars were necessary in 14% of cases (p. 81). However, "in 7% of the test cases, generalization did not occur despite treatment on 10 exemplars" (p. 81). These authors additionally reported, "Although generalization usually occurred following treatment using a small number of exemplars, there was substantial variability across individual subjects" (p. 81). Elbert, Powell, and Swartzlander (1991) summarized: "most subjects generalized to untrained words in the same position after receiving treatment on a relatively small number of exemplars," concluding that "the use of minimal pairs provided salient examples of the contrastive elements of sounds in signaling meaning differences" (p. 86).

Other Linguistically-Based Phonological Approaches

Another approach used to reduce phonological processes is known as maximal oppositions. This approach consists of contrasting word pairs that differ by several phonetic features, such as place, manner, and/or voicing. This type of contrast is distinct from minimal pair contrast since the target words chosen differ by more than one feature at a time (Gierut, 1989). Gierut (1992) concluded that "specifically, minimal pairs comparing two phonemes previously unknown to a child that also differed by maximal and major class features were found to be the preferred context motivating change" in her study (p. 1049). However, since few maximal opposition resources are widely available, these materials cannot be critiqued by this article.

Additionally, a third linguistically-based approach, known as multiple oppositions, involves selection of sound pairs that are "based on every one of a child's substitutes for a target sound" (Barlow & Gierut, 2002). For example, when a child produces the /s/ sound as [t d, and l], three sets of minimal pairs would be used in therapy, including/s/-/t/, /s/-/d/, and /s/-/l/ (Barlow & Gierut, 2002). Williams (2000a, 2000b) suggests that multiple oppositions, which "directly addresses the multiple absence of adult sounds that results from extensive phoneme collapses" as "the child is confronted with several sounds simultaneously within a phoneme collapse" (Williams, 2000a, p. 282) may result in faster gains and increased intelligibility of the child's speech. However, multiple opposition materials do not appear to be widely published and thus cannot be encompassed by this critique. For this reason, only minimal pair resources were critiqued at the present time.

SELECTION OF MINIMAL PAIR MATERIALS FOR REVIEW

For the second portion of this study, minimal pair therapy tools were collected to analyze and critique. All materials that have been critiqued (Daly, 1999; Drennan, 2005; Elbert, Rockman, & Saltzman, 1980; Krupa, 1999; Lechler & Mitchell, 2003; Webber, 1997) were viewed by the author of this article before inclusion. These materials included workbooks, a storybook, photo cards, line drawings, and picture cards. A few exemplars were chosen, which include: *Contrasts: The Use of Minimal Pairs in Articulation Training Clinician Manual* (Elbert, Rockman, & Saltzman, 1980), *Webber Photo Phonology Minimal Pair Cards* (Lechler & Mitchell, 2003), *Webber Photo Phonology Minimal Pair Cards Fun Sheets: A Companion Book to the Webber Photo Phonology Minimal Pair Card Set* (Drennan, 2005), *Read Aloud Minimal Pair Contrast Stories with Activities* (Krupa,1999), the *Webber Phonology Card Set* (Webber, 1997), and *Scissors, Glue, and Phonological Processes, Too!* (Daly, 1999). *Contrasts: The Use of Minimal Pairs in Articulation Training Clinician Manual*(Elbert, Rockman, & Saltzman, 1980) was chosen because it provides extensive rationale and many lists of minimal pair words that could be used in therapy. Though some of its terminology is dated (e.g. frequent references to articulation when a child who presents with phonological processes has a phonological delay or disorder instead), it is a valuable clinical tool. The *Webber Photo Phonology Minimal Pair Cards* (Lechler & Mitchell, 2003), *Webber Photo Phonology Minimal Pair Cards Fun Sheets: A Companion Book to the Webber Photo Phonology Minimal Pair Card Set* (Drennan, 2005), *Webber Phonology Card Set* (Webber, 1997), and Krupa's *Read Aloud Minimal Pair Contrast Stories with Activities* (1999) were chosen, as they are easily available and representative of Super Duper's line of minimal pair products. Linguisystems' *Scissors, Glue, and Phonological Processes, Too!* workbook (Daly, 1999)

was also selected for inclusion in this critique, as it is reported to be used by speech-language pathologists who were consulted (anonymous, personal communication, June 2, 2011). Additionally, a resource by Nelson (1988) entitled, *Planning Individualized Speech and Language Intervention Programs: Objectives for Infants, Children, and Adolescents,* was studied for its goals and objectives that appear to be relevant to the minimal pair contrast therapy approach.

CRITIQUE

Speech-language pathologists will need to collect and modify several minimal pair resources in order to deliver minimal pair contrast therapy as discussed in the literature. For a 5:0 client who presents with the phonological process of initial consonant deletion, the clinician might use certain minimal pairs from the *Webber Photo Phonology Minimal Pair Card Set* (Lechler & Mitchell, 2003), certain activities of the accompanying workbook (Drennan, 2005), and specific activities from Krupa's (1999) *Read Aloud Minimal Pair Contrast Stories with Activities,* depending upon the level and type of activities required to best address his or her needs. However, clinicians may need to create their own goals specific for the child and use existing data sheets or modify them as appropriate [see *Webber Photo Phonology Minimal Pair Cards Fun Sheets: A Companion Book to the Webber Photo Phonology Minimal Pair Card Set* (Drennan, 2005) and *Contrasts: The Use of Minimal Pairs in Articulation Training Clinician Manual* (Elbert, Rockman, & Saltzman, 1980) for examples]. Clinicians may also want to modify sample information about phonological processes and minimal pair treatment that is included with *Webber Photo Phonology Minimal Pair Cards* (Lechler & Mitchell, 2003) when providing background information and treatment demonstrations to caregivers.

In reviewing specific minimal pair resources, several themes were noted. These will be discussed respectively: sources that reference theory beyond minimal pair theory, sources that address academic, language, and motoric skills, rather than purely phonologic skills, sources with extensive rationale provided, sources with minimal rationale provided, sources that contain inappropriate minimal pairs, sources that contain appropriate and/or inappropriate picture card design, sources that aid in goal/objective writing, sources that aid in data collection, discussion of phonological processes addressed by critiqued materials, discussion of phonological processes not addressed by critiqued materials, and the difficulty in generalization of skills.

SOURCES THAT REFERENCE THEORY BEYOND MINIMAL PAIR THEORY AND/OR ADDRESS OTHER SPEECH AND LANGUAGE SKILLS

Some sources claim to be based solely upon the rationale of minimal pair contrast therapy, but incorporate concepts of other theories as well. For example, the *Webber Photo Phonology Minimal Pair Cards* (Lechler & Mitchell, 2003), *Webber Phonology Cards* (Webber, 1997), and accompanying workbook (Drennan, 2005) advocate beginning a therapeutic session by reading lists of words with the aim of improving sound awareness skills. "Auditory bombardment" (Hodson & Paden, 1983, 1991) or "focused auditory stimulation" (Hodson, 2006), however, is not part of the theory behind minimal pairs as it has been described in the literature (Saben & Ingham, 1991; Tyler, Edwards, & Saxman, 1987; Weiner, 1981). Rather "auditory bombardment" has been associated with Hodson and Paden's (1983, 1991) cycles approach useful for apraxia. A new therapeutic approach known as *Caregivers and Children Together in Phonological Therapy* (Bowen & Cupples, 2006) advocates use of "auditory bombardment" (p. 282). Regardless of name, the concept of "auditory bombardment/focused auditory stimulation" (Hodson, 2006) is traditionally associated with treatment of apraxia, rather than phonological disorders, and was not originally associated with traditional minimal pair theory.

Some activities in particular that are identified as minimal pairs address other speech and/or language skills than sole reduction of phonological processes. Multiple activities of the workbook accompanying the *Webber Photo Phonology Minimal Pair Card Set* (Drennan, 2005), of Krupa's (1999) *Read Aloud Minimal Pair Contrast Stories with Activities,* and of Daly's (1999) *Scissors, Glue, and Phonological Processes, Too!,* ask the child to cut, paste, play a game of tic-tac-toe, describe a pictured item, or read when producing a word or two from a set of minimal pairs which have been previously taught [e.g. Drennan's (2005) "Hide 'n' Seek" and "Fishy Business;" Krupa's (1999) syllable reduction "activity 3, 7, and 8;" and Daly's (1999) "Crazy Animals," and "Crazy Animal Pictures" for final consonant deletion]. These cutting, pasting, game-playing, and reading activities may provide opportunities for children to practice skills that will prepare them for school success (following directions, turn-taking, fine motor skills) or might be reinforcing for some children, but are not likely to provide enough opportunities for children to show reduction of phonological processes in their speech during a thirty minute therapy session, as phonological processes are not the sole target of these activities. Additionally, activities such as these should not be considered minimal pair activities unless the two semantically distinct words which differ only by one characteristic of a phoneme are actively contrasted. For example, one of Daly's (1999) activities asks the child to cut and paste pictures depicting articles of clothing (robe, hat, boot, coat, sock, etc.) to dress an animal appropriately while saying the target words. This activity was designed to reduce final consonant deletion; however, all words pictured contain different final consonants and none are minimal pairs for each other. This activity then actually supports other academic, language, and motoric skills, such as following directions and fine motor skills. It is important to ensure that a child will have many opportunities to practice a target skill during each therapeutic session. If reduction of phonological processes is the sole goal for a child, then perhaps the activities

described in this paragraph may not be the most efficient and effective way to reduce the child's phonological processes. This conclusion may be especially relevant if children present with multiple phonological processes which render their speech difficult to understand. It is necessary to tease out skills that are being targeted by activities before using them in therapy to ensure the child's goals and objectives will truly be met. Please see Appendix A for a summary of this information.

SOURCES WITH EXTENSIVE RATIONALE PROVIDED

At the start of the *Contrasts: The Use of Minimal Pairs in Articulation Training Clinician Manual,* Elbert, Rockman, and Saltzman (1980) describe the purpose of using minimal pairs in speech and language therapy for children who exhibit errors of speech sound production. These authors state that minimal pairs are currently and commonly used contrastively to show children who exhibit phonological processes that sounds convey different meanings and should be used appropriately. The manual suggests that minimal pairs can be used for multiple purposes, such as in treatment of children who exhibit phonological processes or for those who are learning English as a second language. This manual also provides a criterion that can guide clinicians in understanding when it is appropriate to expect the child to produce minimal pairs aloud (after training children to ensure they understand the procedure and after providing discrimination tasks to ensure the children know the difference between the words chosen). Additionally, the clinician's manual provides 122 distinct lists of monosyllabic, minimal pair words, "providing word pairs for a variety of contrasts from which vocabulary-appropriate pairs may be selected for any age group" (p. 2). The manual indicates that a "wide range of vocabulary" has been included, "allowing a clinician to select pairs appropriate for either children or adults" (preface p. 1). The manual also provides lists for each consonant in both the initial and final position next to various vowels as well as a list of consonant clusters in the initial position. Additionally, separate lists address phonological processes of final consonant deletion, cluster reduction, fronting, stopping, and gliding. While these authors claim that " 'unreasonable' or unacceptable pairs" were excluded "on the basis of obscurity or obscenity," (preface, pg. 1), several word or word pairs that have been included in the resource may or may not be considered acceptable by all clinicians. Therefore, these potentially offensive pairs will be discussed at length in a later section of this critique.

SOURCES WITH MINIMAL RATIONALE PROVIDED

Drennan's (2005) workbook provides very limited rationale as to the theory behind minimal pairs as well as the creation of its activities. One or two pages at the front of the workbook are devoted to discussion of rationale behind "auditory bombardment" (Drennan, 2005) as well as of the contrasting procedure that occurs when the minimal pair cards and some activity sheets are used in treatment for reduction of phonological processes. It is important to note here that "auditory bombardment" (Drennan, 2005) now referred to as "focused auditory stimulation" (Hodson, 2006) is not part of the original minimal pair theory (Saben & Ingham, 1991; Tyler, Edwards, & Saxman, 1987; Weiner, 1981). The workbook does reveal that ten phonological processes are targeted and that "each section of the book reviews a phonological process and teaches all 28 pairs of photo cards found in each deck" (Drennan, 2005, p. iii). However, the workbook (Drennan, 2005) does not discuss how the cards are to be contrasted, as this explanation is only briefly covered by an insert of the *Webber Photo Phonology Minimal Pair Cards Set* (Lechler & Mitchell, 2003). For further understanding of the contrasting procedure, a clinician should reference the literature (Barlow & Gierut, 2002; Saben & Ingham, 1991; Tyler, Edwards, & Saxman, 1987; Monahan, 1986; Weiner, 1981).

SOURCES THAT CONTAIN INAPPROPRIATE MINIMAL PAIRS

Some words of minimal pair sets from the *Contrasts* (Elbert, Rockman, & Saltzman, 1980) source may be inappropriate (e.g. "slave," "lynch," "booze"). Others may not be salient or well-known to children (e.g. "thy," "thou"). Because minimal pair contrast therapy is a linguistically-based approach, the client must not only learn to produce the words on the cards but learn their definitions or semantic differences as well. Minimal pair theory suggests that children learn that sounds convey meaning (Saben & Ingham, 1991; Tyler, Edwards, & Saxman, 1987; Monahan, 1986; Weiner, 1981). Therefore, these potentially offensive, controversial words may not be the best ones to teach young children. When evaluating word pairs to use, a major question must be asked: 'will these words be useful for the children served?' It is necessary for these words to contribute to overall communication, which is the overarching goal of all speech and language intervention. Therefore, it is best to analyze the lists of word pairs as well as their pictures to choose not only salient pairs, but also those that will help to facilitate effective communication overall. This consideration is especially important when treating children who present with multiple phonological processes that severely compromise speech intelligibility. As it takes time to introduce children to new words, these new words should then have a positive effect on the children's vocabulary and expressive communication. For example, the minimal pair of "bear/wear" is both salient and useful for young children, whereas the word "wend" from the pair "bend/wend" might need to be taught and is not likely to be as useful for everyday communication. For young children, pairs that can be pictured are especially helpful, as they provide visual stimuli that show children the physical and semantic differences between two minimal pairs. It is important to keep in mind the client's age and experiences when choosing or avoiding certain minimal pairs for therapy. Some pairs included in the *Contrasts* (Elbert, Rockman, & Saltzman, 1980) source could be appropriate for older children or adults, but not for young children. For example, an older child or adult may be more likely to use the pairs "pent/tent," "sire/shire," "psych/hike,"

"threat/thresh," "verge/merge", "cap/chap" or "hoax/coax" in conversation or in academic settings. Therefore, these clients with more advanced vocabularies and presumably fewer phonological processes might benefit from more advanced contrasts.

SOURCES THAT CONTAIN APPROPRIATE AND/OR INAPPROPRIATE PICTURE CARD DESIGNS

Elbert, Rockman, and Saltzman's (1980) picture cards appear to be well-designed. Though the line drawings may appear outdated, these cards may be useful in therapy with older children who are able to read. Unlike the *Webber Phonology Cards* (Webber, 1997) and *Webber Photo Phonology Minimal Pair Cards* (Lechler & Mitchell, 2003) that use color drawings or pictures and have written words on the same side as the pictures or photos, the Elbert, Rockman, and Saltzman (1980) picture cards have an elaborate line drawing on one side with a boldface word describing the picture on the other. For example, the concept "pain" is indicated by a woman holding an ice pack to the side of her face and the word "page" is indicated by a thick black arrow pointing to a page of a book (Elbert, Rockman, & Saltzman, 1980); however, the words describing these phenomena are found on the opposite side of the card. In this way, the clinician may be able to ask the child to produce the word pictured without the child being influenced by the orthographic cue that could stimulate a correct production of the word (depending upon the age and skills of the child being treated).

While most of the line drawings are not ambiguous, some may initially be confusing for young children, as "breeze" is pictured by air blowing out of an open window, which could elicit the word "window," without training (Elbert, Rockman, & Saltzman, 1980). The *picture file* set does not have line drawing representations of every contrast mentioned in the *clinician manual*, as some of these pairs are not easily depicted visually. However, ten nonsense drawings are included and may be used when one word of the minimal pair is picturable and the other is not, to provide another visual cue to show children that their erroneous productions do not correspond to real words. Additionally, the first ten numerals and the twenty-six letters of the alphabet are included as part of the contrast cards. Line drawings are arranged by initial and final phoneme rather than by phonological process. Nonetheless, some of the lists highlight common phonological processes, including cluster reduction, final consonant deletion, fronting, and gliding, which were considered in creation of the minimal pair contrast materials for this guide. Theoretically, it would be possible to teach multiple minimal pairs to the child for each of the four phonological processes addressed (depending on the child's needs). It is expected that these pairs would become salient and increase the child's intelligibility as well as correct use of phonology, at least at the word level. Though these cards may no longer be easily available, if a clinical setting has this *clinician manual* and *picture file*, it may be beneficial for a clinician to determine whether any of these pairs can also be used in treatment of clients with phonological delays and disorders.

Word pairs of the *Webber Phonology Cards* (Webber, 1997) and *Webber Photo Phonology Minimal Pair Cards* (Lechler & Mitchell, 2003) are clearly pictured and appear to be clinically useful, at least at the word level, for reduction of ten commonly occurring phonological processes (fronting, stopping, cluster reduction, stridency deletion, gliding, prevocalic voicing, postvocalic devoicing, initial consonant deletion, final consonant deletion, and nasalization). These cards are considered appropriate for use with preschool and early school-age clients.

SOURCES THAT AID IN GOAL/OBJECTIVE WRITING

One of the resources critiqued, Nelson's (1988) *Planning Individualized Speech and Language Intervention Programs: Objectives for Infants, Children, and Adolescents,* may aid in goal and objective writing for students who need to suppress use of phonological processes. While the terminology "Articulation: Phonological Process Approach" (p. 123) is used and objectives are placed into cycles (not akin with minimal pair theory), a number of the goals can be modified to fully coincide with tenets of traditional minimal pair theory. For example, one goal reads, the child will "produce the target pattern … correctly in minimal word pairs that are chosen to illustrate the contrast in meaning based on the use or replacement of the target phonological process (for example, *bow/boat* illustrates the final consonant deletion/inclusion contrast, and *toe/saw* illustrates the stop/continuant contrast" (p. 123); this goal simply needs a criterion for success in order to be used clinically. Another goal, such as "the child will demonstrate knowledge of meanings represented by each member of the contrasting word pair by responding appropriately to questions about it (2 to 3 questions answered correctly about each word concept)" (p. 124), will need to be modified to accommodate a greater number of trials/opportunities to demonstrate the skill in a measurable way in response to a particular type of question (e.g. verbally answering 9 out of 10 function questions). The goal "the child will produce previously targeted …patterns correctly in review words from previous sessions (80% correct)" (p. 124) might be modified slightly to provide a few examples of the type and number of review words chosen in parentheses; the criterion might be increased to 90% correct. Two final objectives: "the child will produce novel words that include target … patterns that have been previously practiced, with phonological simplification processes observed on less than 10% of possible occasions" and "the child will produce spontaneous speech that is intelligible to adults other than the speech-language pathologist or caregivers with previously targeted phonological processes observed on less than 10% of possible occasions" (p. 126) need only to be modified slightly to include which processes (specific to the child) have been practiced. Additionally, these last two goals can be modified to include the number of words that need to be produced or the type of

utterances that need to be produced to show mastery. These final objectives, especially the most recently mentioned, express the ultimate long term goal (for the child to fade use of phonological processes to elimination so that untrained listeners will understand the child's spontaneous conversational speech). Speech-language pathologists must keep in mind that success at the word level is not enough to prove that a child no longer uses a phonological process at the level of conversational speech.

SOURCES THAT AID IN COLLECTING DATA

Two sources critiqued (Elbert, Rockman, & Saltzman, 1980; Drennan, 2005) aid the clinician in collection of data relevant to the reduction of phonological processes. Elbert, Rockman, and Saltzman's (1980) *Contrasts: The Use of Minimal Pairs in Articulation Training Clinician Manual* provides a data sheet that allows the clinician space to record success in the form of + or - and even to record the child's production of the target word, for up to 200 trials. At the top of the form, the clinician can also record the specific type of contrast used, the stimuli used, and the response type (discrimination or production) (Elbert, Rockman, & Saltzman, 1980). The clinician can additionally indicate the phonological process(es) that are being targeted (Elbert, Rockman, & Saltzman, 1980). This form can be used clinically, as it is easy to use and allows space to record success from a large number of trials, obtained during individualized therapy sessions.

For use with group therapy, two tracking sheets from Drennan's (2005) *Webber Photo Phonology Minimal Pair Cards Fun Sheets* appear useful. The first tracking sheet allows the clinician to record the overall results of minimal pair contrast therapy at different levels of the speech hierarchy. The clinician is to record the date, phonological process targeted, the level of the speech hierarchy at which the process is targeted, how success is indicated (checkmark or -), the overall percentage of success, and additional comments. The blocks are small; however, multiple checkmarks, – signs, or tally marks to indicate success could be recorded in this space. The second tracking sheet allows the clinician to collect data for up to four children at a time, ten trials for each child. The clinician records the phonological process targeted for each child as well as whether the phonological process was reduced at the word, phrase, or sentence level, and calculates the percentage from the number of checks or minuses marked in the boxes provided. While the second form does not allow for many opportunities for the child to show reduction of phonological processes within one session, it may be most useful for a school-based speech-language pathologist who must simultaneously record data for multiple students served in group therapy sessions.

PHONOLOGICAL PROCESSES ADDRESSED BY CRITIQUED MATERIALS

The following phonological processes are addressed by one or more products critiqued: syllable reduction (Krupa, 1999), final consonant deletion (Daly, 1999; Drennan, 2005; Elbert, Rockman, & Saltzman, 1980; Krupa, 1999; Lechler & Mitchell, 2003; Webber, 1997), fronting (Daly, 1999; Drennan, 2005; Elbert, Rockman, & Saltzman, 1980; Krupa, 1999; Lechler & Mitchell, 2003), stopping (Daly, 1999; Drennan, 2005; Elbert, Rockman, & Saltzman, 1980; Krupa, 1999; Lechler & Mitchell, 2003; Webber, 1997), marked and unmarked cluster reduction (Daly, 1999; Drennan, 2005; Elbert, Rockman, & Saltzman, 1980; Krupa, 1999; Lechler & Mitchell, 2003; Webber, 1997), stridency deletion (Daly, 1999; Drennan, 2005; Lechler & Mitchell, 2003; Webber, 1997), gliding (Daly, 1999; Drennan, 2005; Elbert, Rockman, & Saltzman, 1980; Krupa, 1999; Lechler & Mitchell, 2003; Webber, 1997), pre-vocalic voicing (Daly, 1999; Drennan, 2005; Lechler & Mitchell, 2003), post-vocalic devoicing (Drennan, 2005; Lechler & Mitchell, 2003; Webber, 1997), initial consonant deletion (Drennan, 2005; Krupa, 1999; Lechler & Mitchell, 2003; Webber, 1997), and nasalization (Drennan, 2005; Lechler & Mitchell, 2003; Webber, 1997). Please see Appendix A for another representation of the above information.

PHONOLOGICAL PROCESSES NOT ADDRESSED BY CRITIQUED MATERIALS

The following phonological processes are not addressed by any of the products studied: alveolarization, assimilation (changing a consonant so that it becomes more similar to surrounding phonemes), backing, coalescence ("substitution of a single phoneme that is different from two adjacent target phonemes yet takes on features of the target"), deaffrication, denasalization, depatalization, diminutization ("addition of /i/ or consonant + /i/"), doubling ("repetition of a word"), epenthesis ("insertion of a new phoneme"), labialization, metathesis ("transposition of two phonemes"), pre-vocalic devoicing, reduplication ("repetition of a complete or incomplete syllable"), and vowelization (Shipley & McAfee, 2009, p. 228-230). These processes may not be addressed for several reasons: these types of phonological errors may be less common than the phonological errors addressed by current minimal pair materials, some of these phonological processes may naturally be suppressed prior to age three in the typically developing child (e.g. assimilation, diminutization, doubling, reduplication), or some types of phonological errors may not lend themselves to being contrasted (e.g. efficacy of contrasting /mimi/ with /mi/ to address doubling).

THE DIFFICULTY IN GENERALIZATION OF SKILLS

In using resources such as minimal pair cards or worksheets published in minimal pair resources (Lechler and Mitchell, 2003; Webber, 1997; Elbert, Rockman, & Saltzman, 1980; Daly, 1999; Drennan, 2005, Krupa, 1999), it is also important to realize that children may struggle with generalization of phonological skills.

Children may have learned to include final consonants on target words, but they may not be able to immediately include final consonants at the sentence level or during spontaneous conversational speech. Therefore, it is essential that treatment begins at the word level and follows through to levels of increased linguistic complexity (phrase, sentence, through to spontaneous conversational speech).

All minimal pair materials critiqued (Lechler and Mitchell, 2003; Webber, 1997; Elbert, Rockman, & Saltzman, 1980; Daly, 1999; Drennan, 2005; Krupa, 1999) allow the clinician and child to contrast and produce appropriate productions at least at the word level, in some if not all activities. Some worksheet pages and activities discussed above appear to have diverged from use of contrastive word pairs to convey different meanings and rather employ target words or address other language and motor skills. These types of activities can take away from the contrastive nature of minimal pairs, which demonstrate that phoneme changes alter meanings. Some activities suggested by worksheets and cards in which children are to correctly produce minimal pairs in a phrase or a sentence may be a next step [Drennan's (2005) "Heads or Tails" and "Story Loop"]. It is also important to consider that activities of Krupa's (1999) *Read Aloud Minimal Pair Contrast Stories* often ask children to repeatedly produce one or two target words correctly multiple times, which will not constitute generalization of phonological skills. Children may be producing the minimal pairs correctly as target words; however, they may still experience difficulty generalizing correct productions to non-targeted words or to lengthier utterances. Since most minimal pair materials only focus on reduction of phonological processes at the word level, clinicians might decide to employ different methods and/or materials to encourage children to use correct patterns of production in everyday speech, which can be a challenging endeavor.

SOURCES THAT CAN AID SPEECH-LANGUAGE PATHOLOGISTS WHEN SPEAKING WITH CAREGIVERS

Skilled clinicians know from experience that caregiver education is crucial to a child's success in therapy. Therefore, it is helpful to note whether existing minimal pair materials support the clinician in explaining the concepts of phonology, phonological processes, and the minimal pair approach to caregivers.

In terms of resources that can be provided to caregivers, Drennan (2005)'s *Webber Photo Phonology Minimal Pair Cards Fun Sheets: A Companion Book to the Webber Photo Phonology Minimal Pair Card Set* provides a "Parent/Helper Letter" that can be given to caregivers of the child. This form allows the clinician to indicate "Your child is currently working on _____ in Speech and Language Class" and asks the caregiver to complete attached worksheets with the child and to sign to indicate completion. Alternately, the worksheet contains an option to complete attached activities without returning them to the clinician. Additionally, blank space provided allows the clinician to add extra information or additional requests to aid the caregivers. Because it is critical to know whether carryover of phonological skills is occurring in other settings, it should not be an option for the caregivers to complete the activities without returning them to the speech-language pathologist for review. While this letter may be helpful, it does not explain why these activities are being used and, furthermore, how the caregivers can support and continue minimal pair contrast training at home in a natural way. Lechler & Mitchell (2003) provide a brief explanation of phonological processes and minimal pair treatment that can be summarized to caregivers. However, speech-language pathologists may need to create a more complete protocol, possibly in the form of handouts, brochures, or even video demonstrations, to better explain how the minimal pair contrast therapeutic approach can be continued and supported at home.

Please see Appendix A, which shows the sources that can provide guidance to a clinician during each step or aspect of minimal pair contrast therapy.

DISCUSSION AND CONCLUSION

This critique was written to help practicing speech-language pathologists to critically evaluate minimal pair materials used primarily in treatment of children with phonological delays and disorders. Additionally, this critique provides a summary of some resources which existed at the time this article was written. It is important for practicing speech-language pathologists to be critical of minimal pair materials used to ensure that phonological processes are being reduced quickly and efficiently. It is also imperative for practicing speech-language pathologists to systematically test how a child responds to new methods of treatment or to clinician-designed minimal pair materials or activities which address reduction of phonological processes beyond the word level. Speech-language pathologists should compare children's baseline data to data taken after treatment has occurred and then consider publishing the results of intervention. This type of information is necessary to determine continued efficacy and efficiency of minimal pair contrast therapy for reduction of phonological processes, as well as whether any modifications made to existing materials or to newly created materials will be clinically useful in treatment of children with phonological delay or phonological disorders.

Several directions for further research are suggested. Some phonological processes (alveolarization, assimilation, backing, coalescence, deaffrication, denasalization, depatalization, diminutization, doubling, epenthesis, labialization, metathesis, pre-vocalic devoicing, reduplication, and vowelization) are not addressed by minimal pair resources critiqued; perhaps a few of these processes could be addressed by minimal pair materials yet to be developed. Further research is needed to determine how to promote carryover of speech sound production from the word

level to the sentence level through to the level of spontaneous conversational speech. Additionally, only a few sources (Drennan, 2005; Lechler & Mitchell, 2003) address how minimal pair contrast therapy can be clearly explained and taught to caregivers and teachers, so that it can be effectively implemented by caregivers and teachers outside of the therapy room. Further resources could be created to provide a more detailed description of the minimal pair contrast procedure to caregivers as well as to classroom teachers to aid in service delivery outside the speech room. Also, recent research (Williams, 2000a, 2000b; Gierut, 1989) suggests that multiple opposition and maximal opposition contrast therapy is effective in treatment of children with frequent phonological breakdowns, yet no published materials of these types are widely available to be used by speech-language pathologists. To address recent research findings, multiple opposition and maximal opposition pairs could be created. Clearly, many avenues for improvement and/or additions to existing materials and treatment protocols do exist and these avenues warrant further research and development.

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REFERENCES

American Speech-Language-Hearing Association [ASHA]. (2004). *Evidence-based practice in communication disorders: An introduction.* [Technical Report]. Available from www.asha.org/policy.

Barlow, J.A., & Gierut, J.A. (2002). Minimal pair approaches to phonological remediation. *Seminars in Speech and Language, 23*(1), 57-67.

Bowen, C. & Cupples, L. (2006). PACT: Caregivers and children together in phonological therapy. *Advances in Speech-Language Pathology, 8*(3), 282-292.

Daly, G. H. (1999). *Scissors, glue, and phonological processes, too!: Interactive activities for remediating phonological processing.* East Moline, IL: Linguisystems.

Drennan, A. (2005). *Webber photo phonology minimal pair cards fun sheets: A companion book to the Webber photo phonology minimal pair card set.* Ed. Lisa Priddy. Greenville, SC: Super Duper Publications.

Elbert, M., Powell, T.W., & Swartzlander, P. (1991). Toward a technology of generalization: How many exemplars are sufficient? *Journal of Speech and Hearing Research, 34*, 81-87.

Elbert, M., Rockman, B., Saltzman, D. (1980). *Contrasts: The use of minimal pairs in articulation training clinician manual and picture file.* Austin, TX: Exceptional Resources, Inc.

Gierut, J.A. (1992). The conditions and course of clinically induced phonological change. *Journal of Speech and Hearing Research, 35*, 1049-1063.

Gierut, J.A. (1989). Maximal opposition approach to phonological treatment. *Journal of Speech and Hearing Disorders, 54*, 9-19.

Hegde, M. N. (2003). *Clinical research in communicative disorders: Principles and strategies.* (3rd ed.). Austin, TX: Pro-Ed.

Hodson, B., & Paden, E. (1983). Targeting intelligible speech: A phonological approach to remediation. Austin, TX: Pro-Ed.

Hodson, B., & Paden, E. (1991). Targeting intelligible speech: A phonological approach to remediation. (2nd ed.). Austin, TX: Pro-Ed.

Hodson, B. W. (2006). Identifying phonological patterns and projecting remediation cycles: Expediting intelligibility gains of a 7 year old Australian child. *Advances in Speech-Language Pathology, 8*(3), 257-264.

Krupa, L. (1999). *Read aloud minimal contrast stories with activities.* Ed. Sharon G. Webber. Greenville, SC: Super Duper Publications.

Lechler, T. & Mitchell, T. (2003). *Webber photo phonology minimal pair cards.* Ed. Sharon G. Webber. Greenville, SC: Super Duper Publications.

Monahan, D. (1986). Remediation of common phonological processes: Four case studies. *Language, Speech, and Hearing Services in Schools, 17*, 199-206.

Nelson, N. W. (1988). *Planning individualized speech and language intervention programs: Objectives for infants, children, and adolescents.* Tucson, AZ: Communication Skill Builders, Inc.

Saben, C.B., & Ingham, J.C. (1991). The effects of minimal pairs treatment on the speech-sound production of two children with phonologic disorders. *Journal of Speech and Hearing Research, 34*, 1023-1040.

Shipley, K.G. & McAfee, J.G. (2009). *Assessment in speech-language pathology: A resource manual.* (4th ed.). [pgs. 228-231]. Clifton Park, NY: Delmar Cengage Learning.

Tyler, A.A., Edwards, M.L., & Saxman, J.H. (1987). Clinical application of two phonologically based treatment procedures. *Journal of Speech and Hearing Disorders, 52,* 393-409.

Webber, S. (1997). *Webber phonology cards.* Greenville, SC: Super Duper Publications.

Williams, A.L. (2000a). Multiple oppositions: Theoretical foundations for an alternative contrastive intervention approach. *American Journal of Speech-Language Pathology, 9*, 282-288.

Williams, A.L. (2000b). Multiple oppositions: Case studies of variables in phonological intervention. *American Journal of Speech-Language Pathology, 9*, 289-299.

Weiner, F. (1981). Treatment of phonological disability using the method of meaningful minimal contrast: Two case studies. *Journal of Speech and Hearing Disorders, 46,* 97-103.

APPENDIX A

Critiqued Materials Most Appropriate for Use with Various Ages and Needs

Preschool	Early School-Age	Adults/Accent Modification	Children with Additional Concerns
Daly, 1999	Daly, 1999	X	Daly, 1999
Drennan, 2005	Drennan, 2005	X	Drennan, 2005
X	X	Elbert, Rockman, & Saltzman, 1980	X
Krupa, 1999	X	X	X
Lechler & Mitchell, 2003	Lechler & Mitchell, 2003	X	X
Webber, 1997	Webber, 1997	X	X

Phonological Processes Addressed by Six Minimal Pair Materials Critiqued

Daly, 1999	Drennan, 2005	Elbert, Rockman, & Saltzman, 1980	Krupa, 1999	Lechler & Mitchell, 2003	Webber, 1997
Final consonant deletion	Final consonant deletion	Final consonant deletion	Final consonant deletion	Final consonant deletion	Final consonant deletion
Fronting	Fronting	Fronting	Fronting	Fronting	X
Stopping	Stopping	Stopping	Stopping	Stopping	Stopping
X	X	X	Syllable reduction	X	X
Cluster reduction	Cluster reduction	Cluster reduction	Cluster reduction	Cluster reduction	Cluster reduction
Stridency deletion	Stridency deletion	X	X	Stridency deletion	Stridency deletion
Gliding	Gliding	Gliding	Gliding	Gliding	Gliding
Pre-vocalic voicing	Pre-vocalic voicing	X	X	Pre-vocalic voicing	X
X	Post-vocalic devoicing	X	X	Post-vocalic devoicing	Post-vocalic devoicing
X	Initial consonant deletion	X	Initial consonant deletion	Initial consonant deletion	Initial consonant deletion
X	Nasalization	X	X	Nasalization	Nasalization

Minimal Pair Materials Which Aid in Various Steps or Aspects of the Therapeutic Process

Discuss theory beyond minimal pair theory/address other speech/language skills	Drennan, 2005	Lechler & Mitchell, 2003	Webber, 1997
Sources with extensive rationale	Elbert, Rockman, & Saltzman, 1980	X	X
Sources with minimal rationale provided	Drennan, 2005	X	X
Sources that contain inappropriate minimal pairs	Elbert, Rockman, & Saltzman, 1980	X	X
Sources that contain appropriate picture design	Elbert, Rockman, & Saltzman, 1980	Lechler & Mitchell, 2003	Webber, 1997
Sources that contain ambiguous pictures	Elbert, Rockman, & Saltzman, 1980	X	X
Sources that aid in goal/objective writing	Nelson, 1988	X	X
Sources that aid in data collection	Drennan, 2005	Elbert, Rockman, & Saltzman, 1980	X
Sources with some tasks beyond word level	Daly, 1999	Drennan, 2005	Lechler & Mitchell, 2003
Sources that support parent education	Drennan, 2005	Lechler & Mitchell, 2003	X

ENGLISH PHONOLOGY DEVELOPMENT AFTER INTERNATIONAL ADOPTION: A CASE STUDY

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ABSTRACT

Research on the characteristics of second language (L2) phonology acquisition is limited. This case study was designed to determine changes and developmental patterns of English phonology and phonological patterns used by a young native Tagalog speaker. Four language samples and the Goldman-Fristoe Test of Articulation-Second Edition (GFTA-2) were transcribed over 5 months. The participant produced nasals, stops, and glides with 76% accuracy, fricatives with 38% accuracy, and affricates and liquids with 0% accuracy, consistent with general patterns of L2 phonology development. Several English age appropriate phonemes had not yet developed. Age inappropriate phonological patterns were noted including reduction, place and manner, and voicing patterns. Results suggest that normal versus disordered patterns of L2 phonology acquisition can be used to guide speech-language pathologists (SLP) in diagnosing phonology disorders L2 children.

KEY WORDS

International Adoption, Phonological Development, Language Development

INTRODUCTION

The growing number of internationally adopted (IA) children to the United States, 12,782 in 2007 alone, (U.S. Department of Health and Human Services, 2010) represents a population with unique language development issues. The majority of these children were four years of age or younger (U.S. Department of Health and Human Services, 2010), and in the language development phase. These IA children often arrive in the USA with a birth language other than English. Unlike more typical forms of bilingualism, neither simultaneous nor successive acquisition characterizes language learning of most internationally adopted children. Upon arrival in the United States, adoptees undergo rapid attrition of the first-language as a second first language (SFL) is acquired (Gindis, 2005; Glennen & Masters, 2002). IA children learn their adoptive language in an environment void of their first-language (L1), unlike typical bilingual children (Roberts, Pollock, Krakow, Price, Fulmer & Wang, 2005; Glennen, 2002). Because most children are adopted by monolingual English speaking parents, this period is a time of language arrest, where development in the L1 ceases while a new language is learned (Roberts, et al., 2005; Glennen & Masters, 2002).

Research in SFL development in IA children suggests that most young children's language development follows a normal pattern (Snedeker, Geren, & Shafto, 2007; Glennen & Masters, 2002; Roberts et. al. 2005). Furthermore, losing the birth language and learning a SFL after infancy does not appear to result in a language disorder. Most young IA children rapidly develop their SFL (Roberts, et al., 2005). However, a subgroup of IA children exhibit significant language delays or disorders (Roberts, et al., 2005; Glennen, 2007). It is important that these children are identified early and efficiently to initiate speech-language services. Risk factors may facilitate the identification of this subgroup of IA children who do not develop language skills as expected.

One of the risk factors for SFL delays/disorders is age of adoption. Age at the time of adoption has repeatedly been linked to the language outcomes of IA children (Glennen & Masters, 2002; Roberts et al., 2005; Krakow, Toa, & Roberts, 2005). Supporting these findings, the rates for referral for speech and language assessments and treatment of IA children also increased with age at adoption (Glennen & Masters, 2002).

Older IA children may live longer in institutions and/or poverty conditions with developmental risk factors such as nutritional and environmental deprivation. Information about the pre-adoption environment as well as the age at adoption provides red flags of risk factors for speech and language delay/disorders. Recently, guidelines were made available for assessment of newly arrived infants and toddlers (Glennen, 2007; Glennen & Masters, 2002; Roberts et al., 2005; Scott et al. 2010), but information on older IA children is still lacking. Children adopted at older ages may not be diagnosed with a language learning disorder until much later in their development when valuable intervention time is lost. Indeed, unless children are evaluated in their birth language before or immediately after adoption, there are no guidelines for assessing speech or language in this older population (Glennen, 2007; Scott, Roberts, Glennen, & Raade, 2011).

Guidelines for assessing the expressive and receptive language skills of young IA children are helpful (Glennen & Masters, 2002; Roberts et al., 2005; Scott et al. 2010), but there is limited information available about phonological development (Polack & Price, 2005). The only studies on the phonological development of IA children were done on infants and toddlers adopted from China (Pollock & Price, 2005; Roberts et al., 2005). The initial phonological output showed wide individual variation. However, nearly all children performed age appropriately compared to non-adopted peers by three years of age (Pollock & Price, 2005). These findings were supported by a larger group study of 3-6 year olds who were adopted from China as infants or toddlers where only 7% scored below the mean on a standardized articulation test (Roberts et al., 2005). These studies indicated that IA infants' and toddlers' phonological development was as robust as their language development and that they rapidly caught up with their non-adopted peers. Most IA children followed the same patterns as typically developing non-adopted children and conventional articulation evaluation tools can be used two years post adoption.

In contrast with the guidelines for children adopted as infants and toddlers, there is no information on the phonological development of older IA children. It is not clear if these older IA children follow the same patterns as bilingual children or if they transition differently to the SFL. Data from phonological acquisition in preschoolers learning a second language (L2) via immersion showed that development proceeded with relative ease (Anderson, 2004). These children used their knowledge of their first language phonology to acquire the phonological system of their second language. The influence of the first language, or transfer, occurred mainly at the articulatory level and only in the earlier stages of immersion. Nevertheless, the characteristics of the first language impacted production of similar sounds in the second language (Anderson, 2004). Similarities between L1 and L2, developmental errors in L1 structure similar to L2, and transfer of unmarked features for marked features are all reasons transfer may occur (Ellis, 1994). Phonemes in L1 that are similar to phonemes in L2 will be substituted. Dissimilar phonemes will follow normal acquisition patterns of L2 development (Ellis, 1994; O'Grady et al., 1993; James, 1988). L1 interference in surface productions is stronger in phonology than all other areas of language. This is due, in part, to the responsibility to acquire new sound patterns and sound perceptions, or physiologic components. The cognitive components of language (e.g., morphology, syntax) are thought to be more easily altered in SFL than the physiological component (e.g., phonology) (James, 1988).

Due to the interference and transfer from L1 phonology to L2 phonology, use of phonological patterns and errors are an unavoidable and not necessarily negative aspect of SFL. Furthermore, L2 learners across many languages show similar phonological acquisition patterns regardless of L1 (Anderson & Graham, 1994). For example, L1 learners are more likely to employ cluster reduction and L2 learners are more likely to employ patterns such as epenthesis, cluster reduction, deletion of final consonants, and final devoicing (Pena-Brooks & Hedge, 2000; James, 1988). Also, marked phonemes, or those phonemes used less frequently, are more difficult to acquire in L2 (Pena-Brooks & Hedge, 2000).

Phoneme acquisition across various first languages is also similar in terms of sound class development. L1 Spanish speaking children produced stops, nasals, and glides with high accuracy, but fricatives, affricates, and laterals with moderate accuracy. The children also produced two times as many initial consonants as final consonants. Liquids and clusters were most often deleted and substitutions occurred most often for liquids and affricates. A similar trend was noted for L1 children speaking American, Russian, Cantonese, and Igbo. Similarities in phonological acquisition and patterns used across languages suggest universal tendencies (Goldstein & Cintron, 2001). Consonants that cause the most difficulty for L2 learners include sibilants, affricates, clusters, /p/, /r/, and /w/ (Major, 1995). Vowels and diphthongs may be difficult to learn and produce because of the complexity and number compared to other languages. Because of the distribution of vowels within the vowel space, L2 learners of English have an increased chance of producing errors (Goldstein & Cintron, 2001). General characteristics of L2 phonology development, such as those just described, provide a necessary starting point when investigating the L1 of a child. Still, general characteristics should be supplemental to more specific research regarding the language in question, in this case, Tagalog.

Tagalog vs. English There are inherent differences between Tagalog and English. For example, four Tagalog verb inflections are cited and include basic, future, perfect and imperfect (Tagalog, 1998; French,1988; Cheng, 1987). English recognizes six verb forms including base, present, past, infinitive, present participle, and past participle (Lester, 2001). Tagalog also uses a focus system (e.g., actor, object, benefactive, locative, instrumental, and causative) (Tagalog, 1998; French, 1988; Cheng, 1987). There is not a comparable system of focus in English. The majority of Tagalog words contain a root and affix, together determining the meaning of the word (Cheng, 1987). English also uses a root and affix organization that is more commonly referred to as free and bound morphemes, respectively (Crystal, 1991). In Tagalog, reduplication is commonly used to demonstrate plurality, intensity, and uncompleted action (e.g., dalawa means 'two' and dadalawadalawa means 'five') (Cheng, 1987). Reduplication is not used in English. The most common sentence word order in Tagalog is Predicate + Subject. This is the opposite of common sentences in English (Rubino, 1988; Cheng, 1987). Tagalog syllable types generally include two to three phonemes. The most common Tagalog syllable patterns are CV and CVC (Schachter & Otanes, 1972), but V and VC also exist (French, 1988). CV and CVC syllable patterns are also most common in English (Crystal, 1991).

Indeed, there is much discrepancy between the respective sound systems. Native speakers of Tagalog must learn new sounds to speak and understand English. Tagalog phonology includes 26 phonemes: 15 consonants, 5 vowels, and 6 diphthongs (Cheng, 1987). Tagalog phonology is comprised of the following consonants: /b/, /d/, /g/, /l/, /m/, /n/, /ŋ/, /r/, /w/, /v/, /p/, /t/, /s/, /h/, and /f/. The fricative /f/ is a 'new' Tagalog phoneme and not used by all native speakers as the phoneme only occurs in words borrowed from other languages (Schachter & Otanes, 1972). The glottal stop does not have an orthographic character in Tagalog. However, the glottal stop can alter word meaning when used in the final position (French, 1988).

There are nine English consonants that do not occur in the Tagalog language including /v/, /ʃ/, /ð/, /z/, /ʃ/, /tʃ /, /dʒ/, and /j/ (Cheng, 1987). This difference causes variations in articulation of English consonants. For example, English /tʃ/ is realized as /ts/ in Tagalog (Tagalog, 1998; Schachter & Otanes, 1972), while /dʒ/ is realized as /dj/ (Tagalog, 1998). Articulation differences can also be noted in consonants that are similar between the two languages. In Tagalog, voiceless stops are unaspirated in all word positions. The three nasal sounds, /m/, /n/, and /ŋ/ occur in all three word positions in Tagalog phonology (Schachter & Otanes, 1972). Another example of a difference in articulation is that /t/ is produced as a dental phoneme in Tagalog and an alveolar phoneme in English. In addition, English phonology includes several more vowels and diphthongs than Tagalog phonology (Cheng, 1987). Because of the inconsistency, several English vowels will fit into the description of Tagalog vowels (e.g., English /e/ and /ɛ/ will be combined into Tagalog /e/) (French, 1988).

Influence from other languages caused an increase in the phonology system of Tagalog. The current vowel system is expanded from only three vowels (/i/, /u/, /ɑ/) due to Spanish influence, and English influence has resulted in a broader system of diphthongs (/aI/, /ɔI/, /eI/, /au/, /iw/, and /uw/) (French, 1988). Tagalog vowels are produced as follows: "a" as in "bat", "e" as in "bet", "i" as in "beet", "o" as in "long", and "u" as in "loo" (Tagalog, 1998). There is no counterpart for the English vowel /æ/. It should also be noted that in the word final or phrase final position, Tagalog /i/ is often replaced by /e/ (Schachter & Otanes, 1972). Given the differences between the two languages, it is expected that phonetic interferences exist. Native speakers of Tagalog often substitute the following phonemes when speaking English: b/v, p/f, t/tʃ, d/q, ts/tʃ, s/ʃ, s/z, d/ dʒ, and d/z. Many sounds may be distorted in addition to these substitutions. Vowel substitutions are also likely, specifically the substitution

of long vowels for short vowels (e.g., eat/it, feet/fit, fool/full, coat/caught, seat/sit, pool/pull, and odor/order). Confusion is common with the vowels /ɛ/, /æ/, /ɑ/, /ɔ/, and /e/ (Cheng, 1987).

The purpose of this study is to follow the development of English phonology in a young speaker of Tagalog to (1) determine changes and developmental patterns of English phonetic inventory, and (2) describe phonological patterns employed by the subject compared to normal English development. It was hypothesized that sounds similar in both Tagalog and English will be developed first and sound acquisition will follow normal English patterns for dissimilar phonemes. It also was hypothesized that the phonological patterns used will be more severe and more numerous than English speaking peers.

METHOD

Participant

The participant was born in the Philippines. He was adopted and brought to the United States at 3 years, 10 months of age. The participant's native language was Tagalog and he had little exposure to English prior to his arrival in the United States. No birth, prenatal, or family history was known. Information regarding the participant's development of early speech and language was unknown. A native Tagalog speaker listened to the participant's speech and language soon after his arrival to the United States and estimated that she could understand approximately 50% of what he said. When the participant was 4;7, the participant's adoptive mother reported that she could understand 90% of what the participant said in English given contextual cues and 60% without contextual cues.

Materials

The *Goldman Fristoe Test of Articulation* – 2 (GFTA-2, Goldman & Fristoe, 2000), *Khan Lewis Phonological Analysis* – 2 (KLPA-2, Khan & Lewis, 2002), and a kitchen set with plastic fruits, vegetables, and dishes were included as materials in each of four testing sessions. A full review of reliability and validity may be found in the examiner's manual of each test. A Spiderman figure that the participant brought with him was included in the fourth session only.

Each session was audio-recorded using a Radio Shack Optimus tape recorder using Sony HF audiotapes. A videotape of each session was also made using a Panasonic Quad System WJ MS 424 moveable camera, a Panasonic AG 1330 video recorder, and RCA Standard Grade Videotapes.

Procedures

The participant's phonology was assessed four times over a period of five months. The first testing session was conducted when the participant was 4;0 and the final testing session was conducted when the participant was 4;7. The participant did not receive speech and/or language therapy at any point during the duration of the study. However, he did attend preschool two days per week for two months during the period of data collection. The preschool curriculum was conducted in English.

The first three data collection sessions were conducted in a similar format. The GFTA-2 was administered in a non-standardized, research-oriented data collection fashion as the examiner simultaneously collected a language sample. The examiner (a second-year graduate student in speech-language pathology), participant, participant's adoptive mother, and a speech-language pathologist (SLP) were present in the therapy room for the first and second testing sessions; the examiner and participant were alone in the therapy room during the third testing session. A certified, licensed speech-language pathologist observed all sessions.

The same room was used for all sessions and was arranged so that the participant could sit at a small table or position himself on the floor. The participant was initially encouraged to sit at the table for the administration of the GFTA-2. However, when his attention waned, the participant was allowed to move freely. During this time, the examiner administered the remainder of the GFTA-2 as the participant's attention allowed. For example, the participant was allowed to play freely for several minutes, prompted to name a picture, then allowed to play freely for several more minutes. Formal instructions were not required because the GFTA-2 was not to be scored following the session. Rather, the test was used to elicit a similar language sample across sessions to allow for an accurate description of changes in phonology. Prompting of "What's this?" was used to elicit a response.

When the GFTA-2 was not being administered, the examiner collected a language sample in a play-based format. Materials used to collect the language sample included the play kitchen set, plastic fruit and vegetables, and assorted dishes.

During the fourth testing session, the examiner and another graduate student were in the room. Rather than a play based session such as the first three sessions, the GFTA-2 was administered in a standardized fashion at the start of the session the language sample was collected at the completion of testing. This change in procedure was necessary to comply with the standardized administration procedures of the GFTA-2. Also, an increase in the participant's attention enabled him to attend to task for longer periods of time than for the first three sessions. The same materials were used to collect the language sample with the addition of a Spiderman figure that the participant brought to the session. It should be noted that fourth language sample was conducted over a period of two days (one week apart) due to time limitations, with one half of the language sample collected on each day.

Following each session, the KLPA-2 was completed to provide an analysis of the participant's overall usage of phonological processes. Again, for session one through three, the KLPA-2 was used as a non-standardized measure for descriptive purposes

only. The test was scored according to standardized procedures for session four.

The four testing sessions were between 45 minutes and one hour 15 minutes in duration, with an average duration of 60 minutes. Each language sample was transcribed orthographically and phonetically according to the International Phonetic Alphabet (IPA). Correct versus incorrect judgments regarding the participant's phoneme production were made based on the following criteria: If the participant's phoneme production was judged to be a correct production of the English phoneme, it was marked as correct. On the other hand, any phoneme production that was deleted (i.e., -/s), substituted (i.e., t/s), added to (i.e., ts/s) or distorted (i.e., ~/s) was considered to be incorrect.

Fifty percent of the language samples (1220 words) were re-transcribed by the certified speech-language pathologist who had observed each session. Using the formula: agreements/total words X 100 = % agreement, Inter-judge reliability was determined to be 96%. This indicates strong precision, accuracy, and reliability of measurements.

Internal validity of the study was strong, affected only minimally by the practice effect, which was noted in the area of semantics. For example, specific stimulus items from the GFTA-2 and food names that were imitated in the first testing session were produced spontaneously by the fourth testing session. This increased knowledge may have been the result of maturation, exposure to English, and repeated presentation of the stimulus items. As this study was designed to investigate changes in phonology over time, which may be influenced by an increased knowledge of semantics, the practice effect should not interfere with the overall results of the study.

RESULTS

Orthographic and phonetic transcriptions were completed using the videotape. Stimulus words from the GFTA-2 and words produced in each language sample (n=31) were used to determine the participant's phonetic inventory. The percent accuracy of each phoneme in the initial and final position of words was determined and analyzed according to sound class development (for SLA and English) and normal age of acquisition (English only). Phonological processes employed by the participant were described and compared to normally developing English-speaking children in terms of age appropriate or inappropriate.

Results are presented first for overall phonology acquisition in terms of high, moderate, and low accuracy sound class production groups. Each sound class is then presented separately, describing changes that occurred for each phoneme within the sound class. The participant's production of phonemes in relation to English age of acquisition norms is included next. Finally, the participant's use of phonological processes is presented.

Figure 1 displays the sound classes arranged into three accuracy production groups, high, medium, and low. Nasals, stops, and glides were produced with the highest accuracy of 76.5%, fricatives were produced with the moderate accuracy of 38%, and affricates were produced with the lowest accuracy of 0%.

The participant's production of nasal phonemes /m/, /n/, and /ŋ/, all of which are voiced, is shown in Figure 2. The phonemes /m/ and /n/ in the initial position remained at 100% across the four testing sessions; be reminded that /ŋ/ does not occur in the initial position in the English language. In the final position, /m/ and /n/ fluctuated across sessions with only /n/ reaching mastery at 100% by session 4. The velar /ŋ/ remained constant at 83% throughout the study.

Production of voiceless stop phonemes (the next sound class to develop) in the initial and final positions is shown in Figure 3a. Voiceless stops /p/ and /k/ in the initial position declined from session 1 to session 4 from 50% to 0% and 50% to 17%, respectively. Initial /t/ was produced with 100% only in session 2; performance in all other sessions was 0%. Voiceless stops /p/, /t/, and /k/ in the final position were met with increased success over voiceless stops in the initial position. Final /p/ and /k/ remained within mastery at 100% accuracy across sessions and final /t/ reached 100% accuracy by session 4.

The participant's production of the voiced stop phonemes /b/, /d/, and /g/ is shown in Figure 3b. While voiceless stop phonemes were produced more accurately in the final position, the opposite was true for the voiced stop phonemes, which were produced with increased accuracy in the initial position. The participant demonstrated mastery of /b/, /d/, and /g/ in the initial position of words with 85%, 100% and 100%, respectively. Interestingly, production of both /b/ and /g/ in the initial position decreased to 50% at session 3 then rebounded back to 100%. In the final position of words, the voiced stop phonemes /b/ and /d/ remained at 0% accuracy, with the exception of /d/ in session 1 which was produced with 100%. The phoneme /g/ increased from 65% to 100% between sessions 2 and 3 and remained at this level through session 4.

Glide phonemes are the next sound class to develop and are shown in Figure 4. Consider that both /w/ and /j/ are voiced phonemes and that neither occurs in the final position of the English language when interpreting Figure 4. The participant's production of /w/ increased to 100% from session 1 to 2 and remained at mastery for the duration of the study. Production of /j/ was emerging at 50% consistently accuracy across the four testing sessions.

Figure 5a shows the participant's production of the voiceless fricatives /h/, /f/, /s/, /ʃ/, and /θ/. The participant demonstrated consistent mastery of 100% for /h/, /s/, and /R/. The phoneme /f/ was produced with 66% in session 4 but remained at 0% for all other sessions. In the final position, the participant produced /f/ with 100% for session 1 only, /s/ with 100% for three of four

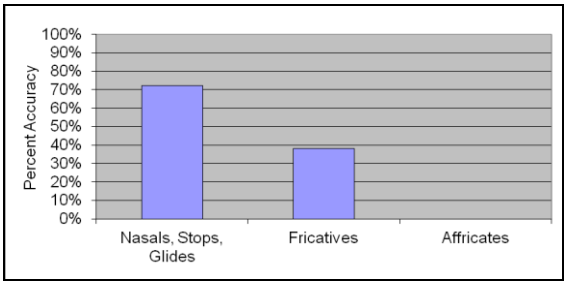

Figure 1.
Average percent accuracy of all phonemes across all positions
according to High (nasals, stops and glides), Medium (fricatives), and Low (affricates) accuracy groups.

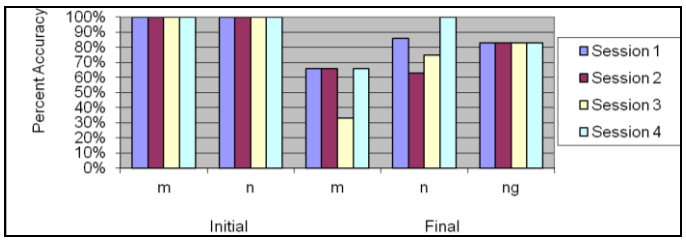

Figure 2.
Percent accuracy of nasal phonemes in initial and final word positions across four testing sessions.

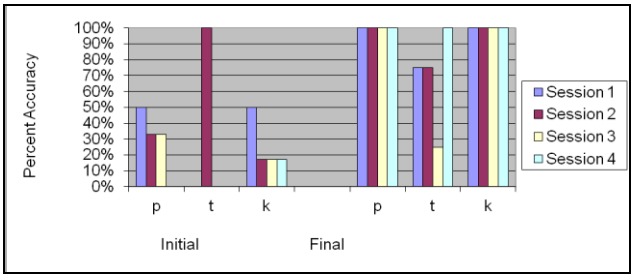

Figure 3a.
Percent accuracy of voiceless stop phonemes in initial and final word positions across four testing sessions.

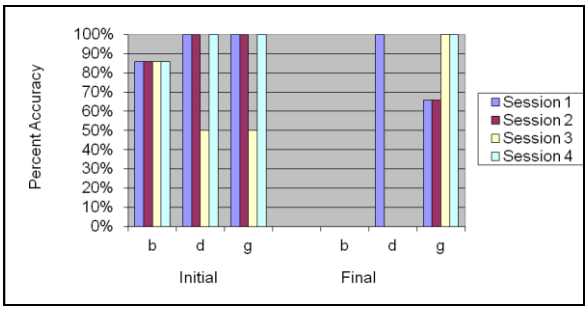

Figure 3b.
Percent accuracy of voiced stop phonemes in initial and final word positions across four testing sessions.

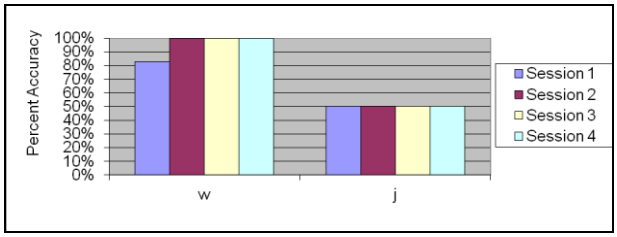

Figure 4.
Percent accuracy of glide phonemes across four sessions.

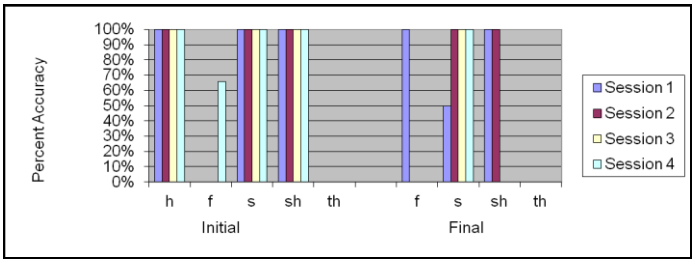

Figure 5a.
Percent accuracy of voiceless fricative phonemes in initial and final word positions across four sessions.

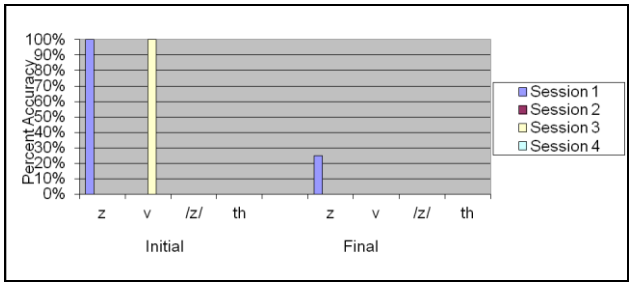

Figure 5b.
Percent accuracy of voiced fricative phonemes in initial and final word positions across four sessions.

testing sessions, and /ʃ/ with 100% only for sessions 1 and 2. Voiced fricative phonemes, shown in Figure 5b, presented differently from voiceless fricative phonemes. In the initial position, the participant produced /z/ and /v/ with 100% in session 1 and session 3, respectively. The phoneme /z/ was also produced in the final position during session 1, with 25%. All other voiced fricative phonemes remained at 0% throughout the study.

The last sound class to develop is the affricate phonemes. No figure is presented for these voiceless and voiced phonemes due to the participant's lack of production in any testing session.

In addition to sound class analysis, the participant's phonological inventory was analyzed according to English age of acquisition norms. It should be noted that the age of acquisition analysis was conducted for session 4 only. Figure 6a represents the participant's percent accuracy of phonemes and age appropriate phonemes in the initial position during session 4. For the participant's age of 4;6 he should have mastered the following phonemes in the initial position: /b/, /d/, /m/, /n/, /h/, /g/, /k/, /w/, /p/, /t/, /f/, /j/, /l/, /r/, /ʃ/, / tʃ/, and /dʒ/ (White, 2001). The participant demonstrated mastery of /b/, /d/, /m/, /n/, /h/, /g/, /w/, /R/ and /s/, of which /R/ and /s/ were above age expectations. The participant had not yet developed the age appropriate phonemes in the initial position of /k/, /p/, /t/, /f/, /j/, /l/, /r/, /tʃ /, and /dʒ/.

Production of phonemes and age appropriate phonemes in the final position are shown in Figure 6b. In the final position, the following phonemes should have been mastered: /b/, /d/, /m/, /n/, /g/, /k/, /w/, /t/, /f/, and /j/ (White,

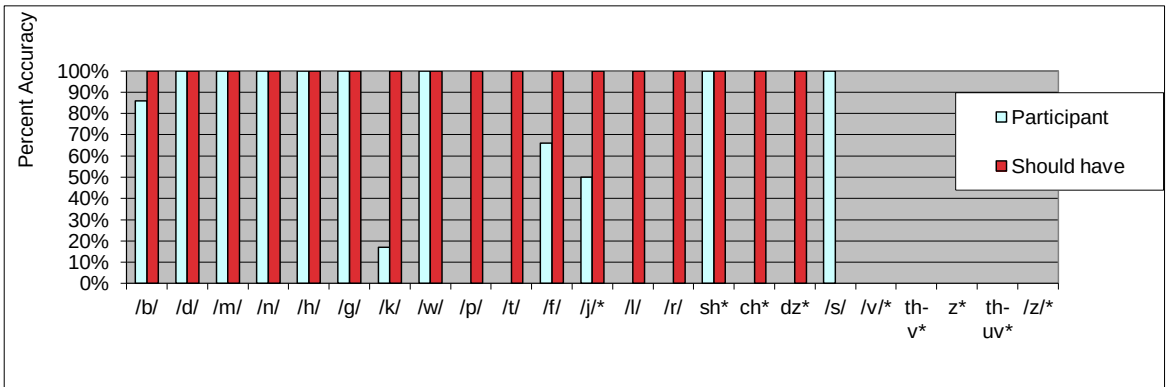

Figure 6a.
Percent accuracy of each phoneme produced in the initial word position during session four only.
Asterisk indicates phonemes that occur in English only.

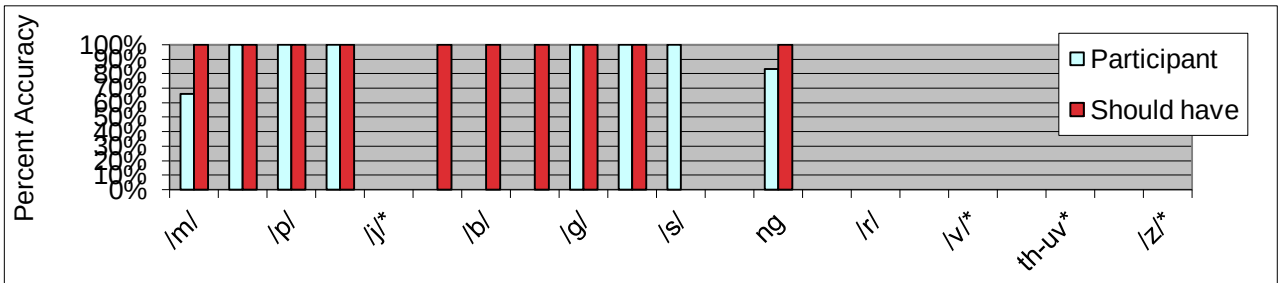

Figure 6b.
Percent accuracy of each phoneme produced in the final word position during session four only.
Asterisk indicates phonemes that occur in English only.

2001). The participant demonstrated mastery of /n/, /p/, /t/, /g/, /k/, and /s/, of which /s/ was above age expected norms. Like the initial position, the participant had not yet developed several age appropriate phonemes including /b/, /d/, /m/, /ŋ/, and /f/.

A summary of the participant's change in production of all phonemes across all testing sessions for the initial position is presented in Figures 7a and 7b. Of the 24 possible phonemes in the initial position, the participant's production of two phonemes increased, three phonemes decreased, fifteen phonemes remained constant, two phonemes underwent a dip at session 2 or 3, one phoneme had no data, and one phoneme was not possible in English. The final position included a total of 24 phonemes and is presented in Figure 7a. The participant's production of two phonemes increased, four phonemes decreased, ten phonemes remained constant, three phonemes underwent at dip at session 2 or 3, two phonemes had no data, and three are not possible in English.

The participant's use of phonological patterns was also monitored across the four testing sessions. Only words from the GFTA-2 produced in each testing session were included in this analysis. For example, the words "clown", "balloons", "glasses", "slide", "stars", and "five" were not produced in the first session due to the participant's depleted attention; therefore, these words were excluded from the phonological patterns analysis in later sessions. Scores from the KLPA-2 were adjusted to reflect the omission of these words. The criteria that a phonological process is only valid when there is opportunity to use the process on four different occasions and it is used in 20% of those occasions is used (McReynolds & Elbert as cited in Pena-Brooks & Hedge, 2000). Phonological patterns are described according to the four categories outlined by the KLPA-2: Reduction Patterns, Place and Manner Patterns, Voicing Patterns, and Other. Reduction Patterns including deletion of final consonants, syllable reduction, stopping of fricatives and affricates, cluster simplification, and liquid simplification are shown in Figure 8a.

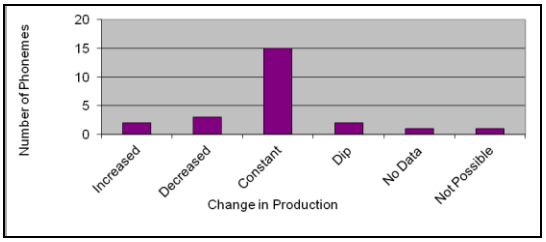

Figure 7a.
Change in production of all tested phonemes in initial word position across four sessions.

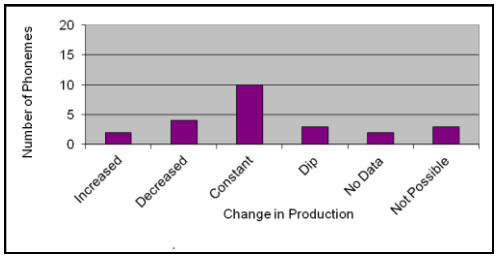

Figure 7b.
Change in production of all tested phonemes in final word position across four sessions.

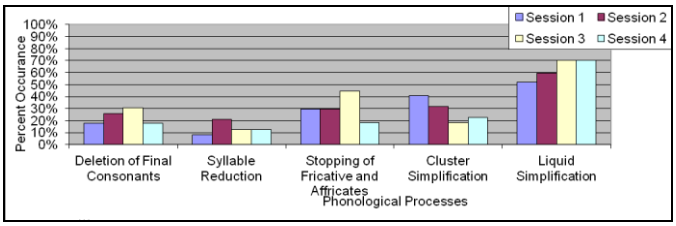

Figure 8a.
Percent occurrence of reduction in phonological patterns across four sessions.

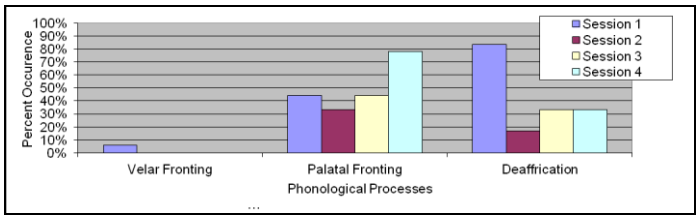

Figure 8b.
Summary of percent of occurrence of place and manner patterns across four sessions.

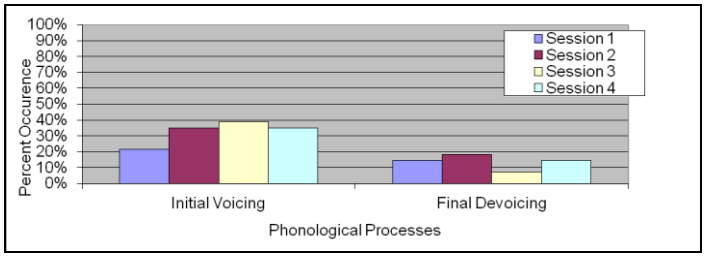

Figure 8c.
Percent occurrence of voicing patterns across four sessions.

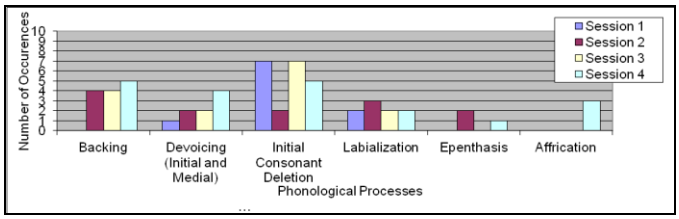

Figure 8d.
Number of occurrences of other phonological patterns across four sessions.

The participant demonstrated use of all reduction patterns. A general decrease across the four sessions was noted for stopping of fricatives and affricates and cluster simplification. Deletion of final consonants and syllable reduction remained fairly consistent at 18% from session 1 to 4. The participant's use of liquid simplification increased to 70% over time.

In Figure 8b, the participant's use of velar fronting, palatal fronting, and deaffrication is shown. The percent of occurrence of the participant's use of velar fronting is not noteworthy; therefore it can be stated that he had appropriately extinguished this process. His use of palatal fronting increased significantly from session 1 to 4. Deaffrication was noted to decrease significantly from session 1 to 2, but held at 33% occurrence for the remainder of the study.

Initial voicing and final devoicing are Voicing Patterns and represented in Figure 8c. The participant generally increased his use of initial voicing to 34% and remained consistent in his use of final devoicing at 14%.

In addition to these more common phonological patterns, the participant also used several more uncommon patterns. Of significant occurrence were backing, initial and medial devoicing, and initial consonant deletion. The participant used labialization, epenthasis, and affrication in less than three occurrences each. These other patterns are shown in Figure 8d.

DISCUSSION

The purpose of this study was to examine the change in phonology and use of phonological patterns in English of a young speaker of Tagalog over time. Results clearly confirm that the participant followed general patterns of phonology acquisition in terms of sound classes, but decreased development compared to English age of acquisition norms and phonological patterns.

A developmental pattern of sound class acquisition extends across languages, including Spanish, Russian, English, Igbo, and others (Goldstein & Cintron, 2001). A high accuracy production for nasals, stops, and glides, a moderate accuracy production for fricatives, and a low accuracy production for affricates and liquids define this pattern. The participant's production of phonemes, when averaged across four sessions clearly adheres to this pattern. However, the participant can still be classified as somewhat deviant in his sound class acquisition. Nasals, stops, and glides are early developing phonemes and should have been produced at the upper limits of mastery, whereas the participant's production indicates continued emergence of these phonemes. This same trend is noted across the remaining two accuracy groups; production of these phonemes indicates parallel development but at a decreased accuracy rate.

Accuracy groups for sound classes were divided into separate sound classes to allow for a more complete analysis of phonology development. At first glance, one can see from Figure 2 that the participant is well on his way to mastering the nasal phonemes and from Figure 4 that glides are emerging. The participant's development in other sound classes is not so definite.

Development of the stop sound class in Figures 3a and 3b shows inconsistent and almost contradictory performance. The participant achieved mastery of the voiceless stop phonemes in

the final word position, with significantly decreased production in the initial word position. Conversely, the voiced stop phonemes were produced within mastery in the initial word position, with significantly decreased production in the final word position. This idiosyncratic development does not support the expected assumptions that the participant would more accurately develop generally accepted phonological patterns, such as 1) the voiceless phonemes in the initial and final word positions; 2) the voiced phonemes in the initial and final word positions; 3) only initial word position regardless of voicing; or 4) only final word position regardless of voicing.

More clearly represented than the stop phonemes are the fricative phonemes. It is evident from Figure 5a and 5b that the participant enjoyed more success with the voiceless phonemes over the voiced phonemes. This pattern is more natural than the participant's production of stop phonemes.

In combination, the participant's development across all sound classes shows inconsistencies. A "rule" followed for one sound class, such as the voiceless/voiced distinction of fricatives, is not seen in other sound classes, such as stops. In sum, although the participant follows general patterns of sound class acquisition (e.g., high, moderate, and low accuracy groups), patterns do not transfer within individual sound classes.

To specify acquisition within the sound classes, the participant's development of individual phonemes was compared to English age of acquisition norms. It was hypothesized that the participant would develop sounds similar in Tagalog and English with relative ease and that dissimilar sounds would follow normal English development patterns. This did not prove to be true. The participant had not developed the following phonemes by session four: /k/, /p/, /t/, /f/, /j/, /l/, /r/, /tʃ/, and /dʒ/ in the initial position and /b/, /d/, /m/, /ŋ/, and /f/ in the final position. Of these phonemes, only /tʃ/ and /dʒ/ are English specific, with the remaining phonemes occurring in both languages. Therefore, it was expected that the participant would demonstrate increased performance, if not mastery of the above-indicated phonemes (except tʃ/ and /dʒ/). It is not known if the participant developed dissimilar sound according to English developmental norms. Many dissimilar phonemes (e.g., /ð/, /θ/, /v/) develop at a later age than the participant was at the end of the study and could not be observed. The participant's production of individual phonemes concurs with his unpatterned production of the larger sound classes.

Due to the inconsistencies present in the participant's phonology, a more in depth analysis was completed in an attempt to explain some of the inconsistencies noted. Native speakers of Tagalog often substitute several phonemes when speaking English (b/v, p/f, t/θ, d/ð, ts/tʃ, s/ʃ , s/z, d/dʒ, and d/z) (Cheng, 1987). The 31 words produced in each session were reexamined according to these common substitutions to determine if the participant's errors followed acceptable (e.g., common) versus unacceptable (e.g., idiosyncratic) substitutions. Of significance was the participant's appropriate substitution of s/R (2/3 opportunities), ts/˜ (4/8 opportunities), b/v (3/3 opportunities), d/ð (9/12 opportunities), and s/z (9/14 opportunities). Perhaps of greater significance is the participant's lack of use of several substitutions. For example, he did not use the accepted p/f substitution. Rather, he substituted /b/ (6 instances), /s/ (2 instances), /j/ (1 instance), /w/ (1 instance), and /ts/ (1 instance) for /f/; /f/ was also omitted in 2 instances. Inconsistent substitutions were noted for /dʒ/ also. The participant used the expected d/dʒ in three instances, but also substituted /r/ (2 instances), /s/ (2 instances), and /ts/ (1 instance). Additionally, inconsistent substitutions were noted for /θ/. The participant did not use the expected /t/ in any instance, but did use /f/ (5 instances), /d/ (2 instances), and /sj/ (1 instance). Use of idiosyncratic substitutions further supports the possible diagnosis of a phonological disorder.

Over the course of the study, the participant made little progress in his acquisition of phonology, with only four phonemes increasing from session 1 to session 4. The majority of his sound productions remained at a constant accuracy level across the four testing sessions, indicating minimal development. Interestingly, regression was noted for five phonemes in either session 2 or 3. Although this number does not total a significant portion of phonemes, it is a noteworthy phenomenon and can be explained with a theoretical pattern.

It has been suggested that phonological acquisition occurs in a nonlinear "U Shaped" pattern in all L2 learners. This pattern occurs because of a natural regression in phonology acquisition leading the SFL child to increase proficiency in L2 phonology, decrease proficiency, and later increase again (Anderson & Graham, 1994). Initial proficiency is observed when the child produces a correct target due to similarities between L1 and L2. Regression occurs when the child replaces the L1 target with the L2 target. It is assumed that the more different the sounds are, the more regression will occur. Proficiency increases again when the child produces the target correctly in and with L2 phonology (Ellis, 1994).

A more common description of patterns in speech is phonological patterns, or sound error patterns. The participant demonstrated use of Reduction, Place and Manner, Voicing, and other phonological patterns. According to Grunwell (1982) (as cited in Pena-Brooks & Hedge, 2000), the participant should have extinguished his use of all patterns except for liquid simplification, which is still age appropriate at 5 years of age. The participant displayed age inappropriate use of cluster simplification, palatal fronting, deaffrication, initial voicing, backing, devoicing (initial and medial), and initial consonant deletion. He decreased his use of deletion of final consonants, syllable reduction, stopping of fricatives and affricates, velar fronting, and final devoicing to below the criteria level (20% use of at least four occasions) suggesting appropriate use of the process. Although below the criteria, minimal (if any) use of the patterns should be used according to norms for the participant's

age. The remaining patterns shown in Figure 8a, 8b, 8c, and 8d did not meet the criteria during the course of this study, rendering them insignificant.

Theoretical Implications

The participant's acquisition of English phonology did not satisfy developmental norms, possibly due to his underdeveloped Tagalog phonology system. Perhaps, then, it is more appropriate to classify the participant not as a simultaneous or successive bilingual learner, but as a subtractive bilingual learner. Subtractive bilingualism occurs when the internationally adopted child's L1 is learned and lost and then L2 is introduced (Glennen & Masters, 2002, Lubinski & Masters, 2001). Upon his arrival in the United States, the participant's development of L1 was halted and development of L2 began, leaving him with underdeveloped proficiency in both languages and classifying him as a subtractive bilingual learner.

Internationally adopted children whose phonology is intact should follow English patterns of development, but with a gap related to the age at which the adoption occurred. For example, a child adopted at 0-12 months will catch up to English peers relatively quickly, whereas a child adopted at 30 months will require a longer period of time to catch up (Glennen & Masters, 2002). The participant of this study was adopted at a late age in comparison to Glennen and Masters study, theoretically allowing him a greater time to catch up in term of English developmental norms. Over the 5 months of this study, however, the participant made little progress in his phonology acquisition, supporting disordered phonology rather than an acceptable gap or lag in phonology.

Practical Implications

The number of internationally adopted children in the United States rises each year, with 7, 093 children in 1990 and 19, 237 in 2001(U.S. Department of State, 2002). Due to the increase in number, many speech-language pathologists will encounter and possibly service internationally adopted children. Studies such as this one are essential to understanding and documenting patterns of English phonology acquisition in L2 learners, thus allowing the SLP to appropriately diagnose a disorder versus a difference.

The implications of this study are threefold. First, when conducting a diagnostic evaluation of a young bilingual child, whether successive, simultaneous, or subtractive, the speech-language pathologist should take notice of the child's production of the early developing nasal, stop, and glide phonemes, especially if these phonemes occur in both L1 and L2. It is speculated that if similar phonemes exist in L1, the child will have little difficulty acquiring English counterparts. Early developing phonemes should develop rather quickly in L2; delayed or deviant development should raise suspicion for the SLP. In relation to the present study, the participant had not developed several early developing phonemes that are similar in Tagalog and English. This strongly suggests disordered phonology in L2.

A second implication of this study is to analyze substitutions made by the child. Common substitutions in English for a speaker of another language may be available for the language in question. The task becomes one of transcribing the child's speech sample to determine if he/she is using common or idiosyncratic substitutions. The extent of idiosyncratic substitutions will assist the SLP in determining eligibility for services and possible phonemes/patterns to target. If primarily acceptable substitutions are used, it can be temporarily stated that the child is developing L2 phonology within normal limits. Phonology development should be monitored to ensure that the child begins to decrease the use of substitutions and increase use of the target sound. A limited decrease in the use of substitutions may indicate that phonology development has slowed and that therapy may be warranted.

The final implication of this study is the importance of monitoring phonological productions of the child learning L2 over time. The participant was followed for a period of five months, over which time little phonology development occurred. If he had been evaluated only once, it is possible that because several early developing sounds were emerging, he could have been diagnosed with a phonology difference, not disorder. It is evident after looking at his performance over the course of the study that a phonology disorder is a more appropriate diagnosis. Monitoring performance is vital to ensure that the child learning L2 phonology acquires later developing and dissimilar sounds.

Limitations

The findings of the present study should be interpreted in light of few limitations. The case study design of one young speaker of Tagalog limits specific generalizations to other Philippines languages. Nevertheless, support is provided for patterns of L2 phonology acquisition in general terms. A relatively small number of words was produced in all four testing sessions, due to the participant's limited expressive language. A related limitation to the small number of words produced is that there was only one opportunity for several phonemes to be produced. Therefore, only a percent accuracy of 0% or 100% could have been earned.

A final limitation is that the results indicate the participant to have disordered English phonology. An informal analysis conducted by a native speaker of Tagalog soon after the participant's arrival to the United States suggested 50% intelligibility. However, it is not known which phonemes were produced in error or the phonological patterns used in comparison with English phonology. How this affects the participant's production in terms of accepted substitutions and phonological patterns is unknown.

Having stated these limitations, the importance of this study should not be underestimated. The patterns of phonological development displayed by the participant enhance not only the literature pertaining to L2 phonology development in general, but also fills a void in the literature regarding Tagalog to English phonology development.

Additional Research

Perhaps the most necessary information needed is Tagalog phonology acquisition norms. Tagalog phonemes are presented in the literature, but a description of the order in which phonemes are acquired had not been published to date. Speech-language pathologists can only infer the developmental pattern based on similarities in sound class acquisition across languages. Varying place of articulation of similar phonemes in English and Tagalog may also affect the order of acquisition. As previously stated, Tagalog /t/ is a dental phoneme, whereas English /t/ is an alveolar phoneme. Research should be conducted to determine how place of articulation affects acquisition and how this relates to learning English as L2.

Moreover, future research should include both normally developing and disordered children who speak Tagalog as L1 and are learning English as L2. Acceptable versus deviant patterns of English development can then be described, thus providing more a definitive framework in deciding eligibility for services.

While suggestions for future research seem specific to Tagalog, trends for second language acquisition, in general, are likely to emerge. General trends will enhance and contribute to already existing literature concerning SFL, more specifically, phonology.

Conclusions

The opportunity for SLPs to service L2 children is on the rise. Current literature is limited in its reporting of L2 phonology acquisition, especially with languages such as Tagalog. This study shows, in agreement with previous research, that L2 phonology is acquired in a pattern (nasals, stops, glides, fricatives, affricates, and liquids) from high to low accuracy. The participant's lack of overall phonology development and inconsistent substitutions of individual phonemes, however, necessitated monitoring over time. His development of English phonology also suggested the potential for speech and language therapy. In similar cases to this study, SLPs should look for production of similar sounds across the two languages, use of substitutions, and any idiosyncratic patterns to determine a phonology difference versus disorder.

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REFERENCES

Anderson, P. J., & Graham, S. M. (1994). Issues in second-language phonological acquisition among children and adults. *Topics in Language Disorders*, *14*, 84-100.

Anderson, R.T. (2004). Phonological acquisition on preschoolers learning a second language via immersion: A longitudinal study. *Clinical Linguistics and Phonetics, 18,* 183-210.

Cheng, L. L. (1987). *Assessing Asian language performance: Guidelines for evaluated limited-English-proficiency students*. Rockeville, MD: Aspen Publishers.

Clarke, P. (1999). Investigating second language acquisition in preschools: A longitudinal study of four Vietnamese-speaking children's acquisition of English in a bilingual preschool. *International Journal of Early Years Education*, *7*, 17-24.

Crystal, D. (1991). *A dictionary of linguistics and phonetics*. (3rd ed). Cambridge, MA: Basil Blackwell, Inc.

Dodd, B., Holm, A., & Wei, L. (1997). Speech disorder in preschool children exposed to Cantonese and English. *Clinical Linguistics and Phonetics*, *11*, 229-243.

Edge, B. (1991). The production of word final voiced obstruents in English by L1 speakers of Japanese and Cantonese. *Studies in second language acquisition*, *13*, 377-393.

Ellis, R. (1994). *The Study of Second Language Acquisition*. New York, NY: Oxford University Press.

Flege, J. E., Munro, M. J., & MacKay, I. R. (1996). Factors affecting the production of word initial consonants in a second language. In R. Bayley, & D. R. Preston (Eds.), *Second Language Acquisition and Linguistic Variation*. (pp. 47-73). Philadelphia, PA: John Benjamins Publishing Company.

Foster-Cohen, S. H. (1993). Directions of influence in first and second language acquisition research. *Second Language Research, 9,* 140-152.

French, K. M. (1988). *Insights into Tagalog: Reduplication, infixation, and stress from nonlinear phonology*. Dallas, TX: Summer Institute of Linguistics, Inc.

Gindis, B. (2005) Cognitive, language, and educational issues of children adopted from overseas orphanages, *Journal of Cognitive Education and Psychology*, *4*, 290-315.

Glennen, S., & Masters, M. G. (2002). Typical and atypical language development in infants and toddlers adopted from Eastern Europe. *American Journal of Speech-Language Pathology*, *11*, 417-433.

Goldman, R., & Fristoe, M. (2000). *Goldman-Fristoe Test of Articulation.* (2nd ed). Circle Pines, MN: American Guidance Service, Inc.

Goldstein, B., & Cintron, P. An investigation of phonological skills in Puerto Rican Spanish-speaking 2-year-olds. *Clinical Linguistics & Phonetics*, *15*, 343-361.

James, A. R. (1988). *The acquisition of a second language phonology: A linguistic theory of developing sound structures*. Tubingen: Gunter Narr Verlag.

Khan, L., & Lewis, N. (2002). *Khan-Lewis Phonological Analysis*. (2nd ed). Circle Pines, MN: American Guidance Service, Inc.

Krakow, R. A., Tao, S. & Roberts, J. (2005) Adoption age effects on language acquisition: Infants and toddlers from China. *Seminars in Speech and Language*, *26*, 33-43.

Lakshmanan, U., & Selinker, L. (2001). Analysing interlanguage: How do we know what learners know? *Second Language Research*, *17*, 393-420.

Llamzon, T. A. (1976). *Modern Tagalog: A functional-structural description*. Paris: Mouton & Co.

Lester, M. (2001). *Grammar and usage in the classroom*. (2nd ed). Boston, MA: Allyn and Bacon.

Lubinski, R., & Masters, M. G. (2001). Special populations, special settings: New and expanding frontiers. In Lubinski, R., & Frattali, C. (Ed.), *Professional Issues in Speech-Language Pathology and Audiology*. (2nd ed) (pp. 123-145). San Diego, CA: Singular Publishing.

Major, R. C. (1995). Native and nonnative phonological representations. *International Review of Applied Linguistics in Language Teaching, 33,* 109-128.

O'Grady, W., Dobrovolsky, M., & Aronoff, M. (1993). *Contemporary Linguistics: An Introduction*. (2nd ed). New York, NY: St. Martin's Press.

Pena-Brooks, A., & Hedge, M. N. (2000). *Assessment and treatment of articulation and phonological disorders in children*. Austin, TX: Pro-ed, Inc.

Pollock, K. E., & Price, J. R. (2005) Phonological skills of children adopted from China: Implications for assessment. *Seminars in Speech and Language, 26*, 54-63

Rubino, C. *Tagalog: A brief look at a national language*. Retrieved August 15, 2002 from http://iloko.tripod.com/tagamida/html

Roberts, J.A., Pollock, K.E., Krakow, R., Price, J., Fulmer, K.C., Wang, P.P (2005) Language Development in Preschool-Age Children Adopted From China. *Journal of Speech, Language, and Hearing Research*, *48*, 93-107.

Schachter, P., & Otanes, F. T. (1972). *Tagalog reference grammar*. Las Angeles, CA: University of California Press.

Scott, K.A., Roberts, J.A., Glennen, S. Raade, A.S. (November 2010) Assessing Language Skills in Internationally Adopted Children (Seminar) American Speech Language Hearing Association Convention. Philadelphia, PA.

Singh, R., & Ford, A. (1987). Interphonology and phonology theory. In A. James, & J. Leather (Eds.), *Sound patterns in second language acquisition* (pp. 163-172) Providence, RI: Foris Publications.

Snedeker, J., Geren, J., & Shafto, C.L. (2007). Starting over: International adoption as a natural experiment in language development. *Psychological Science*, *18*, 79-87.

Tagalog (1998). Retrieved August 15, 2002, from http://ourworld.compuserve.com/homepages/GenX_jt_mtjr/GenXTagalog.html

U.S. Department of Health and Human Services. (2010) Statistics: Intercountry. Retrieved from http://www.childwelfare.gov/sysremswide/statistics/adioption.cmf

U.S. Department of State (2002). *Number of immigrant visas issued to orphans coming to the U.S.* Retrieved March 9, 2003, from http://travel.state.gov/orphan_numbers.html

White, P.F. (2001). *Pocket Reference of Diagnosis and Management for the Speech-Language Pathologist*. (2nd ed). Boston, MA: Butterworth-Heinemann.

AGE OR GRADE AS AN INDEX OF ORAL LANGUAGE DEVELOPMENT IN HISPANIC SCHOOL-AGE CHILDREN

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ABSTRACT

The increase in the number of Spanish-speaking English Language Learners (ELLs) in recent years (U.S Census Bureau, 2008) has highlighted the need for normative information regarding the language skills of this population. However, in order to obtain valid normative information, appropriate norming methods must be used. The purpose of this investigation was to determine whether age or grade was the most appropriate variable for obtaining normative data on the language skills of Spanish-speaking ELLs. Participants were 605 typically developing kindergarten to second grade Spanish-speaking ELLs enrolled in transitional bilingual programs. Narratives were elicited from each child in both English and Spanish through the use of a story retell procedure. Results indicated that age and grade are comparable indices of time for studying language skills in Spanish-speaking ELLs. However, it would be clinically advantageous to consider both of these indices simultaneously because age and grade scores could become disparate as children advance substantially in age and grade.

KEY WORDS

Age, Grade, Hispanic, Oral Language

INTRODUCTION

Chronological age is the predominant time metric used when evaluating language development. Although other metrics have been used (e.g. MLU by Brown, 1973; grade by Williams, 2007; and mental age by Abbeduto, Furman, and Davies, 1989), the majority of existing language assessment tools use chronological age as the metric. Examples include the *Clinical Evaluation of Language Fundamentals-4 English* (*CELF-4 English)*(Semel, Wiig, & Secord, 2003), the *Clinical Evaluation of Language Fundamentals-4 Spanish (CELF-4 Spanish)* (Wiig, Secord, & Semel, 2005), the *Expressive One-Word Picture Vocabulary Test: Spanish-Bilingual Edition (EWOPVT-SB)* (Brownell, 2001a), and the *Receptive One-Word Picture Vocabulary Test: Spanish-Bilingual Edition* (*ROWPVT-SBE)* (Brownell, 2001b). Some researchers (Alexander and Martin, 2004; Cahan & Cohen, 1989; Crone & Whitehust, 1999; Morrison, Griffith, & Alberts, 1997) have argued that grade, rather than age, is perhaps a more adequate time metric to use when examining school-age children. In general, the findings of several studies comparing age and grade metrics on development have found that contact with the educational system has a significantly greater effect on children's educational scores (e.g., academic language, emergent literacy and reading) than maturation (Alexander & Martin, 2004; Cahan & Cohen, 1989; Cahan & Noyman, 2001; Crone & Whitehurst, 1999). Very little data are available on whether oral language skills also vary as a function of the time metric used.

Our present bias for age-related normed tests is understandable as this is the time metric used in most developmental studies. It is also understandable that age and grade are highly correlated since most children enter school at approximately the same age. However, in every grade there are age outliers. For example, some children enter kindergarten at exactly age 5;0, some will be 5;11 at the time of matriculation, and some are even older as a result of voluntary (Frey, 2005) or involuntary retention (Cosden, Zimmer & Tuss, 1993; Graue & DiPerna, 2000).

Voluntary and Involuntary Retention

Voluntary retention (also referred to as redshirting) is the practice of delaying kindergarten entry in an attempt by parents to provide their children more time to develop socially and academically in order that their children might have more success in kindergarten (Shepard & Smith, 1988; Zill, Loomis, & West, 1997). It is also a strategy used by some parents to ensure that their already academically and socially prepared children gain a competitive academic advantage over their peers (Kagan, 1990). The 1993 and 1995 National Household Education Surveys (Zill et al., 1997) reported that 9 percent of first and second grade students had entered kindergarten at a later age than expected. Two major variables associated with voluntary retention are school districts' enrollment cut-off dates (Cosden et al., 1993; Graue & DiPerna, 2000) and ethnicity (Cosden et al., 1993). Survey results (Zill et al., 1997; Graue and DiPerna, 2000) have shown that delayed kindergarten entry occurred more frequently among first and second grade students who had late birthdays (July to December) than among children who were born earlier in the year (January to March). Graue and DiPerna (2000) examined the enrollment data of 8,000 students and found that delayed entry was very much related to summer birthdays that occurred shortly before the enrollment cut-off date. In a study examining the effect of age, gender, and ethnicity on decisions concerning kindergarten entry and retention, Cosden and colleagues (1993) analyzed enrollment data from three school districts. In all of the school districts studied, children who would have been the youngest in their class if they had entered school according to schedule, were the ones more likely to be held out.

While voluntary retention occurs across all ethnic and socioeconomic subgroups, some studies report a higher propensity for certain subgroups to be voluntarily retained (Cosden et al., 1993). The practice of voluntary retention is most prevalent among parents of middle-class White families who can often afford to pay for an additional year of preschool (Cosden et al, 1993). In contrast, parents from families of low socioeconomic status (SES) tend to refrain from delayed entry possibly due to the economic demands associated with both the cost of an additional year of daycare and the likely absence of a salary that results from the need of the primary caregiver to remain at home at least part of the day to care for the preschooler (Gredler, 1992). This delay in school entry has the potential of further increasing the language gap typically seen between children of different SES (Hart & Risley, 1992; Farkas & Beron, 2004). As noted by Farkas & Beron (2004), the gap in vocabulary development seen between the different social classes continues throughout the school years, but ceases to widen once children enter school.

Involuntary retention occurs in some cases when children experience social or academic challenges that would put them at risk for performing inadequately in the subsequent grade (Byrnes & Yamamoto, 1986; Frey, 2005; Shepard, 1989). In general, school districts make the determination of which children are retained. Variables impacting involuntary retention include the child's ethnicity, age at school entry, and ethnic composition of the school district, (Cosden et al., 1993; Graue & DiPerna, 2000; Willson & Hughes, 2006; Mantzicopoulos, 2003; Meisels & Liaw, 1993). Hispanic students are more likely to be involuntarily retained (Carstens, 1985; Cosden et al., 1993; Ellwein, Walsh, Eads, & Miller, 1991) than White Non-Hispanic students. Data based on a longitudinal study of 16,623 students from 1,000 schools demonstrated that 25.2% of Hispanics were retained compared to 17.2% of White Non-Hispanic students (Meisels & Liaw, 1993). Age at school entry is also a significant predictor of involuntary retention. In their study of 283 Latino children with below level literacy performance, Cosden and colleagues (1993) found that age was a major predictor for retention decision, with younger children retained at a

significantly higher rate than older students. Involuntary retention varies as a function of the school district's ethnic composition as well. In the district with the lowest percentage of Hispanic students of the three districts studied, Hispanic students were significantly more likely to be retained compared to White Non-Hispanic students (Cosden et al., 1993). However, ethnicity was not significantly related to retention in the other two school districts included in the study. Instead, for these two districts, student age was found to be the most significant predictor. It should be further noted that the likelihood of social promotion (advancing low-performing students to the next grade in order to have them remain with their same-age peers) also varied as a function of the school district's ethnic composition. In school districts with the largest population of Hispanics, there is a greater tendency for social promotion of Hispanic students as compared to non-Hispanic students (Cosden et al., 1993; Cosden, Zimmer, Reyes, and Gutierrez, 1995). Socially promoted Hispanic students tended to be male, the youngest in their grade, and at greater risk for academic failure at the end of their first school year.

Voluntary and involuntary retention have an impact on the age composition of the classroom. In some classrooms there will be children whose parents have voluntarily decided to retain them from entering first grade. Many of these children will participate in alternative structured learning situations (e.g. another year in preschool or kindergarten), which may provide opportunities to further enhance academic and linguistic skills. Classrooms will also consist of children who have been denied the opportunity to enter first grade as a result of lower than expected academic and social performance. Many of the children who are denied admission tend to be younger and from low-income families of African American and Hispanic backgrounds (Bredekamp & Shepard, 1989; Kagan, 1990; Willson & Hughes, 2006), the families who are least likely to afford to enroll their children in structured learning situations. The combination of voluntary and involuntary retention may result in classroom compositions that include a number of children who are substantially older than the typical students, and the presence of older children in the classroom tends to promote higher overall student expectation levels (Meisels, 1992; Shepard & Smith, 1988).

Age vs. Grade Effects

One would assume that the age discrepancies among the children in the classroom would likely place younger children at a disadvantage. In general, the research literature runs counter to this assumption (Dietz & Wilson, 1985; Graue & DiPerna, 2000; May & Welch, 1986; Shepard & Smith, 1987). The effects of age and grade on development have been studied primarily in the areas of literacy and mathematics (Morrison et al., 1997) and verbal cognitive ability (Cahan & Cohen, 1989). Morrison et al. (1997) studied the effects of entrance age on reading and mathematics achievement in first grade children by examining pre- and post performance of 539 older kindergarteners and younger and older first graders. They found that younger first graders made comparable progress to older first graders and substantially more progress than older kindergartners. Age at school entry alone was not a good predictor of academic improvement or delay.

Several studies have found that schooling has a significantly greater effect than maturation on cognition and academic skills. In the area of verbal cognitive ability, Cahan and Cohen (1989) found that the effect of one grade was more than twice the effect of one year of age for the majority of verbal cognitive ability subtests in fourth to sixth grade children in Hebrew language schools in Jerusalem. Studies in the area of reading have also demonstrated similar effects. Crone and Whitehurst (1999) studied the effects of age and schooling on the emergent literacy and early reading skills of 337 children from low-income backgrounds from the end of Head Start programs to the end of 1st grade. One hundred eighty-three of these children were also followed until the end of second grade. Findings indicated that children who began school earlier than peers of the same age, performed better in emergent literacy and reading skills at the end of first and second grades. Furthermore, the effect of a year of schooling on literacy skills was 1.7 times greater than the effect of development related to age. Additionally, the effect of a year of school on early reading was 4.3 times greater than that of age. Alexander and Martin (2004) studied the effects of age and grade for the reading mastery of 4,257 first and second grade children in a school that adheres to a stringent policy of age to grade assignment (in Tasmania). Results of three subtests of the *Woodcock Reading Mastery Test* indicated significant differences for both age and grade. However, the effect of grade was approximately twice that of age. The authors conclude by recommending that once children enroll in the educational system, developmental variables should be charted by grade because aspects of development typically studied by age "have less influence on children's verbal performance" (p. 403).

Thus, school accelerated learning has a greater effect than maturation on children's cognitive and academic skills. This finding has led researchers (Alexander & Martin, 2004; Cahan & Cohen, 1989; Cahan & Noyman, 2001; Crone & Whitehurst, 1999) to stress the empirical importance of separating age and grade effects and attending to the age within grade effect.

Hispanic English Language Learners

It is important to realize that age and grade concerns could be exacerbated when dealing with English Language Learners, who often enter school at varying ages and have a high propensity of being retained (Heubert & Hauser, 1999; Uriate, Lavan, Agusti, & Karp, 2009). Hispanics are likely to come from low socioeconomic families, enter school early, and be the youngest in their class and less academically prepared, all factors that contribute to retention and academic failure (e.g., Cosden et al., 1993).

The Hispanic population, the largest ethnic minority group in the United States, represented 15.1 % of the U.S. population in

2007 (Pew Hispanic Center, 2008). By 2050 this group is projected to represent 30 percent of the U.S. population (U.S. Census Bureau, 2008). Within the Hispanic student population there is a subgroup of students whose English skills are not sufficient to function adequately in an all-English classroom. All children, regardless of home language background, who present such limited English skills are referred to as English Language Learners (ELLs). ELLs comprise more than five million kindergarten to 12th grade students, and represented 10.5 percent of U.S. students in 2004 – 2005 (NCELA, 2006). According to U S Department of Education reports, 77.2 percent of ELLs enrolled during the 2008 – 2009 school year were speakers of Spanish (Batalova & McHugh, 2010).

Concerns about the use of culturally and linguistically biased assessments with Hispanic children have promoted the use of alternative assessments (Dunn, Flax, Sliwinski, & Aram, 1996; Gavin, Klee & Membrino, 1993; Scott & Windsor, 2000; Miller & Iglesias, 2010). One such alternative assessment is narrative language sampling (Hughes, McGillivray, & Schmidek, 1997). While language sampling has been established as appropriate for use across cultures and generates a wide range of language skills (e.g., Leadholm & Miller, 1992; MacLachlan & Chapman, 1988), there is a paucity of normative data based on language samples (Muñoz, Gillam, Peña, & Gulley-Faehnle, 2003) and there is a tendency to report these data using age, rather than grade. The question still remains whether age or grade is the appropriate metric to use.

Language Measures Based on Narratives

Narratives have been found to be a rigorous method of eliciting language from children because they generate a substantial variety and complexity of language forms (e.g., syntax and vocabulary) in natural communication contexts. Narratives have been found to be an appropriate means of examining the expressive language skills of children across cultures because in every culture children are engaged in storytelling activities (Hughes et al., 1997). Narrative skill has also been found to positively predict linguistic and academic skills of children from mainstream (Bishop & Edmundson, 1987) and cultural and linguistically diverse environments (e.g., Fazio, Naremore, & Connell, 1996). In their longitudinal study, Bishop and Edmundson (1987) demonstrated that the resolution of the language impairment (good or poor outcomes) was predicted with 90% accuracy based on measures taken at four years of age with the best predictor being story retelling with pictorial support. Other studies reported similar findings. Fazio et al. (1986) conducted a three-year longitudinal study with 34 kindergarten through second grade children from economically disadvantaged backgrounds, with an aim to differentiate between children with specific language impairment and those at the low normal range. They found that story telling was the best single predictor at kindergarten of academic level for 15 of the children who received remedial assistance.

As with English-speaking children, oral narratives from ELL children have been used to successfully assess language development. Miller, Heilman, Nockerts, Iglesias, Fabiano & Francis (2006) examined narratives of more than 1, 500 Spanish-English bilingual children from kindergarten to third grade. They found that oral language skill in Spanish predicted Spanish reading scores and that oral language skill in English predicted English reading scores. Cross-language effects were found, indicating that oral language scores in one language predicted reading scores in the other language. These findings suggest a strong relationship between oral language and academic skills within and across languages.

Narratives can be used to evaluate a number of linguistic skills. For example, syntactic complexity can be assessed by calculating mean length of utterance (MLU) (e.g., Brown, 1973). Vocabulary skills can be evaluated by measuring lexical diversity (e.g., number of different words/NDW) (e.g., Miller, 1991; Klee, 1992; Klee, Stokes, Wong, Fletcher, & Gavin, 2004). Moreover, language fluency can be determined by calculating number of words per minute/WPM (Riggenbach, 1991). Narratives have proven to be an appropriate alternative or supplement to standardized tests. However, norms concerning narrative measures are insufficient. Studies providing normative data derived from language samples of Spanish-speaking ELLs typically involve small sample sizes and assessment of mainly only one language (e.g., Muñoz et al., 2003). The norms included in the Systematic Analysis of Language Transcripts (SALT) database (Miller & Iglesias, 2010) are the only existing comprehensive language sample norms for Spanish-speaking ELLs in both of their languages. The "Bilingual Spanish/English Story Retell reference databases" currently include narratives of more than 2,000 kindergarten to third grade (ages 5;0 to 9;9) native Spanish-speaking children (SALT, 2010). SALT 2010 allows for the comparison of a child's language performance to the skills of either age, grade, or age and grade peers. Although these norms are valuable, further research must be conducted to ascertain how the various norms should be optimally utilized. For example, are the same metrics appropriate for all language measures?

Crucial to the determination of appropriate language norms is the resolution of issues concerning normative data construction. One issue that has received limited consideration in the developmental literature is the use of age or grade as an index of time in studies examining language development. In order to create appropriate norms for language acquisition in ELLs, it is important to determine whether there are differences in how the norms are constructed. This study examined whether age or grade is the best index of time for measuring performance on the language measures MLU, NDW, and WPM. Results from this study are expected to assist clinicians in using age and grade norms in their clinical decision making process.

METHOD

The aim of the present study was to determine whether age or grade should be used as an index of time for evaluating ELL language skills. Specifically, the language measures MLU, NDW and WPM were examined. Language samples were obtained from existing cross-sectional data derived from typically developing ELLs enrolled in transitional bilingual programs. All of the participants were Spanish-speaking ELLs enrolled in kindergarten through second grade in Texas from lower and middle-class backgrounds. The participants were part of a larger project involving children from kindergarten to third grade, referred to as the Bilingual Language and Literacy Project (BLLP), which served to investigate factors that influence the variability in reading and school achievement in Spanish-speaking ELL children (Francis, Carlson, Fletcher, Foorman, Goldenberg, & Vaughn et al., 2005). The children attended programs in two geographic areas of Texas: urban south-eastern Texas and the Rio Grande Valley- border between Texas and Mexico. One criterion for inclusion in the BLLP project was that the children were typically developing as indicated by lack of enrollment in special education programs. The transitional program in which the ELL children were enrolled provided primary instruction in Spanish, with gradual transitioning to English.

Participants

Participants in the current study consisted of 605 ELL children enrolled in kindergarten, first, and second grade, who were able to produce at least one four-utterance oral narrative sample in either English or Spanish (language sample elicitation procedure described below). Seven children whose ages appeared to have been incorrectly entered in the database were deleted (their ages were two years older than the oldest child in the final grade sample for a particular grade level). Two separate datasets (grade dataset and age dataset) were created for each language. The grade dataset was comprised of all children enrolled in kindergarten first, and second grade, regardless of their age. The 605 children in the grade dataset consisted of 138 children in kindergarten, 215 in first, and 252 in second grade, respectively.

Age outliers were also removed from the dataset. Only children who were six months above or below the mean age for the particular grade were included in the final analysis. Children outside of the age range for their particular grade included 15 children (11%) enrolled in kindergarten, 36 children (17%) enrolled in first grade, and 49 children (19%) enrolled in second grade. As expected, the largest group of children deleted from the current analysis because of being out of age range was composed of children enrolled in second grade. The final sample of 505 participants consisted of 123 children in kindergarten, 179 in first grade, and 203 in second grade. For the English sample, the mean age of kindergartners within the age range of 5.5 to 6.6 was 6.1 (*SD* = .27), the mean age of first graders within the age range of 6.5 to 7.6 was 7.1 (*SD* = .30) and the mean age of second graders within the age range of 7.5 to 8.6 was 8.1 (*SD* =.31). For the Spanish sample, the mean age of kindergartners within the age range of 5.5 to 6.5 was 6.0 (*SD* = .28), the mean age of first graders within the age range of 6.5 to 7.5 was 7.0 (*SD* = .29), and the mean age of second graders within the age range of 7.5 to 8.5 was 8.0 (*SD* =.30).

Language Sample Elicitation Procedure

The wordless picture book, "Frog, Where Are You?" by Mercer Myer (1969) was used to elicit the narratives. The examiner was seated across from the child and encouraged use of oral language rather than isolated labeling and pointing. The examiner told the story in Spanish as the child looked on using a standard examiner prepared script. Afterwards, the child was asked to retell the story using the wordless picture book for visual support. The examiner remained silent except to encourage the narration through backchannelling (e.g., 'Aha," "Si," "Tell me more") (Miller et al, 2006, p. 33) or immediately restating the child's utterance. The procedure was repeated for the English narrative about a week later. Testing was first done in Spanish since it was believed to be the children's stronger language. Once children had become familiar with the task in Spanish, they were expected to respond favorably when the task presented in English.

Digital recordings were made during collection of the narratives. Transcriptions were later completed by trained assistants using the SALT conventions for transcription and coding of bilingual samples (Miller, & Iglesias, 2010). Utterance segmentation was done using C-units (Loban, 1976). A C-Unit was comprised of a main clause and its subordinate clauses. A modification of Loban's method was made in the case of coordinated sentences with "ellipted subjects in the second main clause" ("la rana brincó y buscò al niño/the frog jumped and looked for the boy") (Miller et al., 2006, p. 34). They were considered individual C-Units instead of one comprehensive unit. The identical segmentation method was used with Spanish and English samples to allow for optimal comparisons. Following transcription by one transcriber, the transcripts were reviewed and coded by another transcriber for both the English and Spanish samples to ensure transcription and coding reliability. The transcripts were analyzed using SALT's rectangular data file procedure, providing MLU, NDW, and WPM scores for each child in each language.

Analysis Procedure

Descriptive and inferential analyses were conducted in order to answer the question posed by this study. The two languages of the ELLs (English and Spanish) were examined separately. Data from age and grade datasets were used to determine the effects of age and grade on MLU, NDW, and WPM scores.

RESULTS

The objective of this study was to determine whether grade or age variables should be used as an index of time in studies examining the development of MLU, NDW, and WPM. In

order to determine whether the means were significantly different across age and grade, MANOVAs and a series of univariate ANOVAs were conducted. The MANOVAs were conducted in order to ascertain whether there were significant differences across age and grade. These were followed by a series of univariate ANOVAs in order to determine for which language variables (MLU, NDW, and WPM) there was significance. Finally, post hoc analyses, using Tukey's specifications were conducted to determine for which ages and grades there were significant differences. Interpretation of effect size was done using Cohen's guidelines (1988) (.01 = small, .06 = moderate, .14 = large effect) for eta squared and Pallant's (2007) recommendation to use the eta squared guidelines as a general guide for partial eta squared. Each language was examined separately. The results of the analyses of the English data are presented first, followed by the analyses of the Spanish data.

Variable	Age Group	*M*	*SD*	*N*
EMLUW	5.45 to 6.45	6.05	1.12	123
	6.48 to 7.48	6.39	1.0	179
	7.52 to 8.52	6.73	.95	203
ENDW	5.45 to 6.45	64.78	23.7	123
	6.48 to 7.48	76.14	24.96	179
	7.52 to 8.52	85.44	25.10	203
EWPM	5.45 to 6.45	70.37	24.75	123
	6.48 to 7.48	70.85	23.64	179
	7.52 to 8.52	81.93	27.02	203

Table 1.
Mean Scores of EMLU, ENDW, and EWPM
as a Function of Age.

Examination of Tables 1 and 2 suggests that mean English MLU, NDW and WPM (EMLU, ENDW, and EWPM) tended to increase as a function of age and grade. In order to examine whether the increases were significantly different across age and grade, two MANOVAs and a series of univariate ANOVAs were conducted. The results of the MANOVAs, using Wilk's Lambda, indicated that there was significance for Age ($F(6, 1000) = 11.3$, $p < .001$, $\eta_p^2 = .06$) and Grade ($F(6, 1200) = 11.7$, $p <. 001$, $\eta_p^2 = .06$). Partial eta squared values suggested that effect size was medium for age and grade. In order to ascertain if the effects of age and grade were consistent across the language variables, a series of univariate ANOVAs was conducted. Results of the ANOVAs (Tables 3 and 4) indicated that age and grade were significant for all of the variables.

Variable	Grade	*M*	*SD*	*N*
EMLUW	K	6.04	1.12	138
	1	6.29	1.01	215
	2	6.65	.99	252
ENDW	K	64.03	24.22	138
	1	72.88	25.17	215
	2	82.92	26.26	252
EWPM	K	69.51	24.62	138
	1	68.24	23.88	215
	2	80.54	27.45	252

Table 2.
Mean Scores of EMLU, ENDW, and EWPM
as a Function of Grade.

Age was significant for EMLU, $p < .001$, $\eta_p^2 = .07$, ENDW, $p < .001$, $\eta_p^2 = .10$, and EWPM, $p < .001$, $\eta_p^2 =.05$. Partial eta squared values suggested that effect size was medium for MLU and NDW and small for WPM. In order to further examine the differences, Tukey post hoc analyses were performed. The post hoc analyses indicated significant differences among some age groups, but not all. As can be seen in Table 5, for EMLU and ENDW there was significance between all of the groups, $p < .05$. For EWPM, the older age group had a significantly higher mean than the other two age groups (5.45 to 6.45 and 6.48 to 7.48). There was no significant difference between age groups 5.45 to 6.45 and 6.48 to 7.48.

Grade was significant for EMLU, $p < .001$, $\eta_p^2 = .06$, ENDW, $p < .001$, $\eta_p^2 = .08$, and EWPM, $p < .001$, $\eta_p^2 = .05$. Partial eta squared values suggested that effect size was medium for MLU and NDW and small for WPM. In order to further examine the differences, Tukey post hoc analyses were performed. The post hoc analyses indicated significant differences among some

Source	Dependent Variable	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.	Partial Eta Squared
Corrected Model	EMLUW	35.715(a)	2	17.858	17.436	.000	.065
	ENDW	32947.228(b)	2	16473.614	26.980	.000	.097
	EWPM	15450.541(c)	2	7725.270	12.056	.000	.046
Intercept	EMLUW	19708.251	1	19708.251	19242.770	.000	.975
	ENDW	2748420.565	1	2748420.565	4501.336	.000	.900
	EWPM	2671112.177	1	2671112.177	4168.572	.000	.893
Age	EMLUW	35.715	2	17.858	17.436	.000	.065
	ENDW	32947.228	2	16473.614	26.980	.000	.097
	EWPM	15450.541	2	7725.270	12.056	.000	.046
Error	EMLUW	514.143	502	1.024			
	ENDW	306510.562	502	610.579			
	EWPM	321668.469	502	640.774			
Total	EMLUW	21511.161	505				
	ENDW	3342233.000	505				
	EWPM	3191993.829	505				
Corrected Total	EMLUW	549.859	504				
	ENDW	339457.790	504				
	EWPM	337119.010	504				

Table 3.
Univariate ANOVA Results for EMLU, ENDW, and EWPM as a Function of Age.

Source	Dependent Variable	Type III Sum of Squares	*Df*	Mean Square	*F*	Sig.	Partial Eta Squared
Corrected Model	EMLUW	36.416(b)	2	18.208	17.380	.000	.055
	ENDW	33381.405(c)	2	16690.703	25.834	.000	.079
	EWPM	20635.966(d)	2	10317.983	15.755	.000	.050
Intercept	EMLUW	22726.043	1	22726.043	21692.459	.000	.973
	ENDW	3045967.903	1	3045967.903	4714.485	.000	.887
	EWPM	3003460.906	1	3003460.906	4586.082	.000	.884
Grade	EMLUW	36.416	2	18.208	17.380	.000	.055
	ENDW	33381.405	2	16690.703	25.834	.000	.079
	EWPM	20635.966	2	10317.983	15.755	.000	.050
Error	EMLUW	630.684	602	1.048			
	ENDW	388944.390	602	646.087			
	EWPM	394254.459	602	654.908			
Total	EMLUW	25340.369	605				
	ENDW	3829502.000	605				
	EWPM	3697034.183	605				
Corrected Total	EMLUW	667.100	604				
	ENDW	422325.795	604				
	EWPM	414890.425	604				

Table 4.
Univariate ANOVA Results for EMLU, ENDW, and EWPM as a Function of Grade.

Dependent Variable	(I) Age	(J) Age	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Upper Bound	95% Confidence Interval Lower Bound
EMLUW	5.45 to 6.45	6.48 to 7.48	-.3309(*)	.11853	.015	-.6095	-.0522
		7.52 to 8.52	-.6741(*)	.11564	.000	-.9459	-.4023
	6.48 to 7.48	5.45 to 6.45	.3309(*)	.11853	.015	.0522	.6095
		7.52 to 8.52	-.3432(*)	.10376	.003	-.5871	-.0993
	7.52 to 8.52	5.45 to 6.45	.6741(*)	.11564	.000	.4023	.9459
		6.48 to 7.48	.3432(*)	.10376	.003	.0993	.5871
ENDW	5.45 to 6.45	6.48 to 7.48	-11.36(*)	2.894	.000	-18.16	-4.56
		7.52 to 8.52	-20.66(*)	2.823	.000	-27.29	-14.02
	6.48 to 7.48	5.45 to 6.45	11.36(*)	2.894	.000	4.56	18.16
		7.52 to 8.52	-9.30(*)	2.534	.001	-15.25	-3.34
	7.52 to 8.52	5.45 to 6.45	20.66(*)	2.823	.000	14.02	27.29
		6.48 to 7.48	9.30(*)	2.534	.001	3.34	15.25
EWPM	5.45 to 6.45	6.48 to 7.48	-.4814	2.96467	.986	-7.4504	6.4876
		7.52 to 8.52	-11.5607(*)	2.89242	.000	-18.3598	-4.7615
	6.48 to 7.48	5.45 to 6.45	.4814	2.96467	.986	-6.4876	7.4504
		7.52 to 8.52	-11.0792(*)	2.59543	.000	-17.1803	-4.9782
	7.52 to 8.52	5.45 to 6.45	11.5607(*)	2.89242	.000	4.7615	18.3598
		6.48 to 7.48	11.0792(*)	2.59543	.000	4.9782	17.1803

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

Table 5.
Post Hoc Tests for EMLU, ENDW and EWPM as a Function of Age.

Dependent Variable	(I) EGrade	(J) EGrade	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
			Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound
EMLUW	K	1	-.25	.112	.063	-.51	.01
		2	-.61(*)	.108	.000	-.87	-.36
	1	K	.25	.112	.063	-.01	.51
		2	-.36(*)	.095	.000	-.58	-.14
	2	K	.61(*)	.108	.000	.36	.87
		1	.36(*)	.095	.000	.14	.58
ENDW	K	1	-8.85(*)	2.773	.004	-15.37	-2.34
		2	-18.89(*)	2.692	.000	-25.22	-12.57
	1	K	8.85(*)	2.773	.004	2.34	15.37
		2	-10.04(*)	2.360	.000	-15.58	-4.49
	2	K	18.89(*)	2.692	.000	12.57	25.22
		1	10.04(*)	2.360	.000	4.49	15.58
EWPM	K	1	1.2686	2.79138	.892	-5.2898	7.8270
		2	-11.0353(*)	2.71008	.000	-17.4027	-4.6679
	1	K	-1.2686	2.79138	.892	-7.8270	5.2898
		2	-12.3039(*)	2.37590	.000	-17.8861	-6.7217
	2	K	11.0353(*)	2.71008	.000	4.6679	17.4027
		1	12.3039(*)	2.37590	.000	6.7217	17.8861

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

Table 6.
Post Hoc Tests for EMLU, ENDW and EWPM as a Function of Grade.

grades, but not all. As can be seen in Table 6, the post hoc analyses demonstrated that for ENDW, there were significant differences between all of the grades, with higher grades displaying higher scores. For EMLU and EWPM, the means for second grade were higher than those for kindergarten and first grade. No other comparisons were significant.

Examination of Tables 7 and 8 suggests that mean Spanish MLU, NDW, and WPM (SMLU, SNDW, and SWPM) tended to increase as a function of age and grade. In order to examine whether the increases were significantly different across age and grade, two MANOVAs and a series of univariate ANOVAs were conducted. The results of the MANOVAs, using Wilk's Lambda indicated that there was significance for Age (F (6, 1000) = 17.27, $p < .001$, $\eta_p^2 = .09$) and Grade (F(6, 1200) = 20.10, $p < .001$, $\eta_p^2 = .09$). Partial eta squared values suggested that effect size was medium for age and grade. In order to ascertain if the effects of age and grade were consistent across the language variables a series of univariate ANOVAs was conducted. Results of the ANOVAs (Tables 9 and 10) indicated that age and grade were significant for all of the variables.

Age was significant for SMLU, $p < .001$, $\eta_p^2 = .11$, SNDW, $p < .001$, $\eta_p^2 = .11$, and SWPM, $p < .001$, $\eta_p^2 = .09$. Partial eta squared values suggested medium effect sizes for SMLU, SNDW, and SWPM. In order to further examine these differences, Tukey post hoc analyses were performed. The post hoc analyses indicated significant differences among some age groups, but not all. As can be seen in Table 11, for SMLU and SNDW there was significance between all of the groups, $p < .05$. For SWPM, however, the older age group (7.52 to 8.52) had significantly higher means than the other two age groups (5.45 to 6.45 and 6.48 to 7.48). There was no significant difference between age groups 5.45 to 6.45 and 6.48 to 7.48.

Grade was significant for SMLU, $p < .001$, $\eta_p^2 = .11$, SNDW, $p < .001$, $\eta_p^2 = .12$, and SWPM, $p < .001$, $\eta_p^2 = .09$. Partial eta squared

values suggested medium effect sizes for SMLU, SNDW, and SWPM. In order to further examine these differences, Tukey post hoc analyses were performed. The post hoc analyses indicated significant differences between some grades, but not all. As can be seen in Table 12, the post hoc analyses demonstrated that for SMLU and SNDW, the means were significantly different between all of the grades, with increasing scores as grade became higher. For SWPM, the mean score for the second grade score was significantly higher than those of kindergarten and first grade. No other comparisons were significant.

Variable	Age group	*M*	*SD*	*N*
SMLUW	5.45 to 6.45	5.30	.83	123
	6.48 to 7.48	5.69	.78	179
	7.52 to 8.52	6.02	.78	203
SNDW	5.45 to 6.45	70.41	19.16	123
	6.48 to 7.48	79.33	21.66	179
	7.52 to 8.52	88.97	20.17	203
S WPM	5.45 to 6.45	65.45	20.37	123
	6.48 to 7.48	70.58	21.30	179
	7.52 to 8.52	81.76	22.99	203

Table 7.
Mean Scores of SMLU, SNDW, and SWPM as a Function of Age.

Variable	Grade	*M*	*SD*	*N*
SMLUW	K	5.30	.83	138
	1	5.61	.80	215
	2	6.00	.78	252
SNDW	K	69.98	19.02	138
	1	78.15	21.24	215
	2	88.44	19.62	252
SWPM	K	64.77	20.30	138
	1	69.52	21.25	215
	2	80.90	22.95	252

Table 8.
Mean Scores of SMLU, SNDW, and SWPM as a Function of Grade.

In summary, the results of the analyses indicate that MLU, NDW, and WPM for English and Spanish generally increased significantly as age and grade increased. It should be noted that compared to the other variables, all post hoc comparisons for NDW were significant. MLU was significant in all but one post hoc comparison, English grade, for which there was no significant difference between means for kindergarten and first grade. For WPM, there was significance only between the highest age group and grade level and their lower counterparts; there was no significance between the two lower groups for age and grade. Partial eta squared values for MLU and NDW were slightly higher than for WPM for age and grade in English and Spanish. Effect size was medium for all conditions except for EWPM for age and grade (small). These results indicate that, based on cross-sectional data, age and grade are comparable indices of time, with small to medium effect size (Cohen, 1988). Partial eta squared values were slightly higher for age than grade for English and slightly higher for grade than age in Spanish. However, according to guidelines suggested by Cohen (1988), effect sizes were not substantially different between age and grade.

DISCUSSION

The purpose of this study was to examine whether age or grade was the most appropriate index of time when measuring the language skills in the narratives of typically developing Spanish-speaking ELLs. Both age and grade have been used as indices of time in language development studies, with age being the preferred index used in standardized assessments. However, the majority of research evaluating delayed school entry or retention, has indicates that age does not adequately determine academic achievement (e.g., Cosden et al., 1995; Dietz & Wilson, 1985; Graue & DiPerna, 2000; May & Welch, 1986; Shepard & Smith, 1987). Additionally, the literature comparing age and grade as indices of language development suggests that using norms based on age is not ideal once children enter the educational system (Alexander & Martin, 2004). Once a child is exposed to the educational environment, factors associated with chronological age appear to lose their influence, resulting in a disparity between age and grade scores. Alexander and Martin (2004) recommended that once children enter the educational system, development should be evaluated by grade norms.

The question addressed in the present study asked whether age or grade variables should be used as an index of time for examining narrative language skills, specifically MLU, NDW, and WPM. The results indicated that age and grade values were similar and that there was an identical level of high statistical significance ($p < .001$) for age and grade for all of the language variables (MLU, NDW, and WPM). These results indicate that, at least in cross-sectional datasets, both age and grade variables are useful for accounting for differences in these language variables. With respect to the language variables (MLU, NDW, and WPM) it is important to note that they were all significantly related to age and grade. This finding differs from some of the

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	SMLUW	39.708(a)	2	19.854	31.798	.000	.112
	SNDW	27161.328(b)	2	13580.664	32.398	.000	.114
	SWPM	23283.050(c)	2	11641.525	24.541	.000	.089
Intercept	SMLUW	15522.917	1	15522.917	24861.576	.000	.980
	SNDW	3056536.847	1	3056536.847	7291.642	.000	.936
	SWPM	2544172.195	1	2544172.195	5363.244	.000	.914
Age	SMLUW	39.708	2	19.854	31.798	.000	.112
	SNDW	27161.328	2	13580.664	32.398	.000	.114
	SWPM	23283.050	2	11641.525	24.541	.000	.089
Error	SMLUW	313.436	502	.624			
	SNDW	210430.165	502	419.184			
	SWPM	238134.679	502	474.372			
Total	SMLUW	16920.581	505				
	SNDW	3553489.000	505				
	SWPM	3013555.766	505				
Corrected Total	SMLUW	353.143	504				
	SNDW	237591.493	504				
	SWPM	261417.729	504				

Table 9.
Univariate ANOVA Results for SMLU, SNDW, and SWPM as a Function of Age).

Source	Dependent Variable	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.	Partial Eta Squared
Corrected Model	SMLUW	45.938(b)	2	22.969	36.044	.000	.107
	SNDW	32351.843(c)	2	16175.922	40.117	.000	.118
	SWPM	27653.686(d)	2	13826.843	29.170	.000	.088
Intercept	SMLUW	18020.783	1	18020.783	28279.230	.000	.979
	SNDW	3527350.646	1	3527350.646	8747.889	.000	.936
	SWPM	2918778.614	1	2918778.614	6157.659	.000	.911
Grade	SMLUW	45.938	2	22.969	36.044	.000	.107
	SNDW	32351.843	2	16175.922	40.117	.000	.118
	SWPM	27653.686	2	13826.843	29.170	.000	.088
Error	SMLUW	383.621	602	.637			
	SNDW	242740.279	602	403.223			
	SWPM	285352.705	602	474.008			
Total	SMLUW	20094.218	605				
	SNDW	4202650.000	605				
	SWPM	3552794.748	605				
Corrected Total	SMLUW	429.559	604				
	SNDW	275092.122	604				
	SWPM	313006.391	604				

Table 10.
Univariate ANOVA Results for SMLU, SNDW, and SWPM as a Function of Grade.

Dependent Variable	(I) Age	(J) Age	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Upper Bound	Lower Bound
SMLUW	5.45 to 6.45	6.48 to 7.48	-.3829(*)	.09254	.000	-.6005	-.1654
		7.52 to 8.52	-.7159(*)	.09029	.000	-.9281	-.5036
	6.48 to 7.48	5.45 to 6.45	.3829(*)	.09254	.000	.1654	.6005
		7.52 to 8.52	-.3329(*)	.08102	.000	-.5234	-.1425
	7.52 to 8.52	5.45 to 6.45	.7159(*)	.09029	.000	.5036	.9281
		6.48 to 7.48	.3329(*)	.08102	.000	.1425	.5234
SNDW	5.45 to 6.45	6.48 to 7.48	-8.91(*)	2.398	.001	-14.55	-3.28
		7.52 to 8.52	-18.55(*)	2.339	.000	-24.05	-13.05
	6.48 to 7.48	5.45 to 6.45	8.91(*)	2.398	.001	3.28	14.55
		7.52 to 8.52	-9.64(*)	2.099	.000	-14.57	-4.70
	7.52 to 8.52	5.45 to 6.45	18.55(*)	2.339	.000	13.05	24.05
		6.48 to 7.48	9.64(*)	2.099	.000	4.70	14.57
SWPM	5.45 to 6.45	6.48 to 7.48	-5.1246	2.55084	.111	-11.1208	.8717
		7.52 to 8.52	-16.3047(*)	2.48867	.000	-22.1547	-10.4546
	6.48 to 7.48	5.45 to 6.45	5.1246	2.55084	.111	-.8717	11.1208
		7.52 to 8.52	-11.1801(*)	2.23314	.000	-16.4295	-5.9307
	7.52 to 8.52	5.45 to 6.45	16.3047(*)	2.48867	.000	10.4546	22.1547
		6.48 to 7.48	11.1801(*)	2.23314	.000	5.9307	16.4295

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

Table 11.
Post Hoc Tests for SMLU, SNDW and SWPM as a Function of Age.

Dependent Variable	(I) SGrade	(J) SGrade	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Upper Bound	Lower Bound
SMLUW	K	1	-.3124(*)	.08707	.001	-.5169	-.1078
		2	-.6969(*)	.08454	.000	-.8955	-.4982
	1	K	.3124(*)	.08707	.001	.1078	.5169
		2	-.3845(*)	.07411	.000	-.5586	-.2104
	2	K	.6969(*)	.08454	.000	.4982	.8955
		1	.3845(*)	.07411	.000	.2104	.5586
SNDW	K	1	-8.17(*)	2.190	.001	-13.32	-3.02
		2	-18.46(*)	2.126	.000	-23.46	-13.47
	1	K	8.17(*)	2.190	.001	3.02	13.32
		2	-10.29(*)	1.864	.000	-14.67	-5.91
	2	K	18.46(*)	2.126	.000	13.47	23.46
		1	10.29(*)	1.864	.000	5.91	14.67
SWPM	K	1	-4.7492	2.37477	.113	-10.3288	.8303
		2	-16.1282(*)	2.30561	.000	-21.5453	-10.7112
	1	K	4.7492	2.37477	.113	-.8303	10.3288
		2	-11.3790(*)	2.02130	.000	-16.1281	-6.6299
	2	K	16.1282(*)	2.30561	.000	10.7112	21.5453
		1	11.3790(*)	2.02130	.000	6.6299	16.1281

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

Table 12.
Post Hoc Tests for SMLU, SNDW and SWPM as a Function of Grade.

literature that found that NDW was not significant (Muñoz et al., 2003; Scott and Windsor, 2000). This lack of significance might be due to differences in methodology, particularly sample size.

Although the partial eta squared values were slightly higher for age than grade for English and slightly higher for grade than age in Spanish, they were not substantially different from each other as based on the effect size guidelines suggested by Cohen (1998). Effect sizes for all of the variables in this study were medium except for English WPM for grade, which was small. These findings suggest that, at least in cross-sectional datasets, age and grade variables are comparable.

The results of this study differ from what those found in the developmental educational literature, which reported significantly higher grade than age effects (Alexander & Martin, 2004; Cahan & Cohen, 1989; Crone & Whitehurst, 1999). For example, Cahan and Cohen (1989) used a quasi-experimental procedure that compared the performance on general ability tests of children who differed in chronological age and schooling to estimate the independent effects of age and schooling. Schooling was found to be the main factor in the increase of intelligence test scores as a function of age. The results also suggested that schooling had a greater effect on verbal than on nonverbal tests. Crone and Whitehurst (1999) examined the emergent literacy and early reading skills of children longitudinally. They found that children who began school earlier than their same age peers, performed better than their peers on those skills; the effect of a year of school on literacy skills was 1.7 times greater than the gains related to age and 4.3 times greater than age on reading skills. Alexander and Martin (2004) evaluated the age within grade effect on reading mastery of first and second grade children. While significance was found for both age and grade, the effect of grade was twice the effect of grade.

Differences in methodology might account for the difference in findings between the present study and those in the research reviewed above (e.g., Alexander & Martin, 2004; Cahan & Cohen, 1989; Cahan & Noyman, 2001; Crone & Whitehurst, 1999). An important difference between those studies (e.g., Alexander & Martin, 2004; Cahan & Cohen, 1989; Crone & Whitehurst, 1999) and the current one is the outcome measures. Cahan and Cohen (1989) used verbal cognitive ability tests, Crone and Whitehust (1999) evaluated emergent literacy and early reading skills, and Alexander and Martin (2004) compared reading scores. The measures used in previous studies are traditional standardized instruments designed to assess academic skills, whereas the current study measured productive oral language skills. It is possible that compared to academic skills, oral language skills are not substantially different when grade variables or age within grade variables are used.

Another difference between the current study and others in the literature is the criteria for age inclusion in the study. For the current study, children whose ages seemed to have been incorrectly entered in the database were deleted. Additionally, children who were out of range for grade were also excluded to create the age dataset. In the Alexander and Martin (2004) study, for example, there were strict age within grade requirements imposed by the school system. However, in a small number of cases, there were exceptions made to the rules, resulting in a small percentage (2.3%) of the children being outside of the typical age range within grade. Alexander and Martin (2004) included the out of age range children in their sample.

Currently, many educational tests include separate age and grade norms (e.g., the *Kaufmann Educational Achievement Tests-Revised (KTEA-II)* (Kaufman & Kaufman, 2004), the *Wechsler Individual Achievement Test – Second Edition* (*WIAT-II)* (Weschler, 2001), and the *Gray Oral Reading Test, Fourth Edition* (*GORT-4*) (Weiderhold & Bryant, 2001). In contrast, developmental oral language tests tend to use age norms. However, some test developers are beginning to include separate grade norms as well (e.g., the *Peabody Picture Vocabulary Test-Fourth Edition* (*PPVT IV)* (Dunn & Dunn, 2007). In light of the importance of grade norms in the educational literature (e.g., Alexander & Martin, 2004; Cahan & Cohen, 1989) and the findings of the current study that grade norms significantly determine differences between language variables (specifically MLU, NDW, and WPM), it might be advantageous for researchers and clinicians to begin to consider using grade as the index of time. If researchers and clinicians were to use grade as the index of time, it would provide them with the same time unit of measure for oral language and academic skills. This in turn will facilitate comparison of language skills and academic skills.

Age should not be totally dismissed once children enter the academic situation. Age comparisons might be useful for identifying outliers (e.g., children who are outside the age range for their grade). In such cases, it would be helpful to determine whether a child who is too young or too old for the normative information pertaining to his grade level performs in a comparable manner to peers the same age in another grade (e.g., a first grader could be compared to a group of kindergartners of the same age). If the score received is similar to those of same age peers, then the child would be performing age appropriately. The current study, like some others in the literature (e.g., Alexander & Martin), used an age within grade measure. The advantage of using age within grade scores is that outliers are eliminated. Subsequently this provides the opportunity to use alternative methods for examining the performance of outliers.

Future Research

A critical step in normative studies of Spanish-speaking ELLs is the determination of the time metric to be used. The present study begins to address the question of appropriate time metric using cross-sectional data of children's language skills in the early years of schooling. The findings of this study, coupled

with an analysis of longitudinal data that included older children, would provide a clearer picture of the relationship of age and grade. Additional variables not considered in the present study, such as retention, proficiency in each language, and SES, would further enhance our understanding of the children's language trajectory. In addition, future research should pay special attention to grade outliers since these are the children most likely to show the greatest discrepancy, from their peers, in communication skills.

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REFERENCES

Abbeduto, L., Furman, L. & Davies B. (1989). Relation between the receptive language and mental age of persons with mental retardation. *American Journal of Mental Retardation, 93(5), 535-43.*

Alexander, J. R.M. & Martin, F. (2004). The end of the reading age: grade and age effects in early schooling. *Journal of School Psychology*, *42*(5), 403-416.

Batalova, J. & McHugh, M. (2010). *Top languages spoken by English language learners nationally and by state*. Washington, DC: Migration Policy Institute.

Bredekamp. S. & Shepard, L. (1989). How best to protect children from inappropriate school expectations, practices, and policies. *Young Children, 44*(3), 14-24.

Bishop, D. V. M. & Edmundson, A. (1987). Language impaired four year olds: Distinguishing transient from persistent impairment. *Journal of Speech and Hearing Disorders, 52*, 156-173.

Brown, R. (1973). A first language: The early stages. Cambridge, MA: Harvard University Press.

Brownell, R. (2001a). *Expressive One-Word Picture Vocabulary Test – Bilingual Edition (EOWPVT-SBE).* San Antonio, TX: Pearson Education.

Brownell, R. (2001b*). Receptive One-Word Picture Vocabulary Test – Bilingual Edition (ROWPVT-SBE*). San Antonio, TX: Pearson Education, Inc.

Byrnes, D. A. & Yamamoto, K (1986). Views on grade repetition. *Journal of Research & Development in Education, 20*(1), 14-20.

Cahan, S. & Cohen, N. (1989). Age versus schooling effects on intelligence. *Child Development, 60*, 1239-1249.

Cahan, S. & Noyman, A. (2001). The Kaufman ability battery for children mental processing scale: A valid measure of "pure" intelligence. *Educational and Psychology Measurement, 61*, 827-840.

Carstens, A. (1985). Retention and social promotion for the exceptional child. *School Psychology Review, 14*, 48-63.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Cosden, M., Zimmer, J., Reyes. C. & Gutierrez, M. (1995). Kindergarten practices and first-grade achievement for Latino Spanish-speaking, Latino English-speaking, and Anglo students. *Journal of School Psychology, 33*(2), 123-141.

Cosden, M., Zimmer, J. & Tuss, P. (1993). The impact of age, sex, and ethnicity on kindergarten entry and retention decisions. *Educational Evaluation and Policy Analysis, 15*, 209- 222.

Crone, D.A. & Whitehurst, G.J. (1999). Age and schooling effect on emergent literacy and reading skills. *Journal of Educational Psychology, 91*, 604-614.

Dietz, C., & Wilson, B. (1985). Beginning school age and achievement. *Psychology in the Schools, 22*, 93 – 94.

Dunn, L. M. & Dunn, D. M. (2007). *Peabody Picture Vocabulary Test, Fourth Edition (PPVT*-4). San Antonio, TX: Pearson Education, Inc.

Dunn, M., Flax, J., Sliwinski, M., & Aram, D. (1996). The use of spontaneous language measures as criteria for identifying children with specific language impairment: An attempt to reconcile clinical and research incongruence. *Journal of Speech and Hearing Research, 39*, 643-654.

Ellwein, M. C. Walsh, D. J. Eads, G. M. & Miller, A. (1991). Using readiness tests to route kindergarten students: The snarled intersection of psychometrics, policy, and practice. *Educational Evaluation and Policy Analysis, 13*(2), 159-175.

Farkas, G. & Beron. K. (2004). The detailed age trajectory of oral vocabulary knowledge: differences by class and race. *Social Science Research*, *33*, 464-497.

Fazio, B., Naremore, R., & Connell, P. (1996). Tracking children from poverty at risk for specific language impairment: A 3-year longitudinal study. *Journal of Speech and Hearing Research, 39*, 611-624.

Francis, D., Carlson, C., Fletcher, J., Foorman, B., Goldenberg, C., Vaughn, S., et al.(2005). Oracy/literacy development of Spanish-speaking children: A multi-level program of research on language minority children and the instruction, school and community contexts, and interventions that influence their academic outcomes. *Perspectives*, 8-12.

Frey, N. (2005). Retention, social promotion, and academic redshirting: what do we know and need to know? *Remedial and Special Education, 26*(6), 332-346.

Gavin, W. J., Klee, T., & Membrino, I. (1993). Differentiating specific language impairment from normal language development using grammatical analysis. *Clinical Linguistics & Phonetics, 7*(3), 191-206.

Gredler, G. (1992). School readiness: Assessment and educational issues. Brandon, VT:*Clinical Psychology*.

Graue, M. E., & DiPerna, J. (2000). Redshirting and early retention. Who gets the "gift of time" and what are its outcomes? *American Educational Research Journal, 37*, 509 – 534.

Heubert, J. P., & Hauser, R. M. (Eds.). (1999). *High stakes: Test-*

ing for tracking, promotion, and graduation. Washington, DC: National Academy Press.

Hughes, D. McGillivray, L., & Schmidek, M. (1997). *Guide to narrative language: Procedures for assessment.* Eau Claire. WI: Thinking Publications.

Kagan, S. L. (1990). Readiness 2000: Rethinking rhetoric and responsibility. *Phi Delta Kappan, 72*, 272- 279.

Kaufman, A. S. & Kaufman, N. L. (2004). *Kaufman Test of Educational Achievement, Second Edition (KTEA-II).* Circle Pines, MN: American Guidance Service

Klee, T. (1992). Developmental and diagnostic characteristics of quantitative measures of children's language production. *Topics in Language Disorders,12*, 28-41.

Klee, T., Stokes, S., Wong, A., Fletcher, P. & Gavin, W. (2004). Utterance length and lexical diversity in Cantonese-speaking children with and without specific language mpairment. *Journal of Speech, Language, and Hearing Research, 47,* 1396-1410.

Leadholm, B., & Miller, J. (1992). *Language sample analysis: The Wisconsin Guide.* Madison, WI: Wisconsin Department of Public Instruction.

Loban, W. (1976), Language *development: Kindergarten through grade twelve* (Research Report 18). Urbana, IL: National Council of Teachers of English.

MacLachlan, B., & Chapman R. (1988). Communication break-downs in normal and language-learning disabled children's conversation and narration. *Journal of Speech and Hearing Disorders, 53*, 2-7.

Mantzicopolous, P. (2003). Flunking kindergarten after head start: An inquiry into the contribution of contextual and individual variables. *Journal of Educational Psychology 95* (2), 268 – 278.

May, D., & Welch, E. (1986). Screening for school readiness: The influence of birthday and sex. *Psychology in the Schools, 23*, 100 – 105.

Meisels, S. J. (1992). Doing harm by doing good: Iatrogenic effects of early childhood enrollment and promotion policies. *Early Childhood Research Quarterly, 7,* 155-174.

Meisels, S.J., & Liaw, F. (1993). Failure in grade: Do retained students catch up? *The Journal of Educational Research, 87*, 69-77.

Meyer, M. (1969). *Frog where are you?* New York, NY: Dial Books For Young Readers.

Miller, J. F. (1991). *Assessing language production in children: Experimental procedures.* Baltimore: University Park Press.

Miller, J. F., Heilmann, J., Nockerts, A., Iglesias, A., Fabiano, L., & Francis, J. (2006). Oral language and reading in bilingual children. *Learning Disabilities Research & Practice, 21*(1), 30-43.

Miller, J. & Iglesias, A. (2010). *Systematic Analysis of English and Spanish Language Transcripts (SALT) research version 9.* Madison, WI: SALT Software LLC.

Morrison, F. J,. Griffith, E.M. & Alberts, D. M. (1997). Nature-nurture in the classroom: Entrance age, school readiness, and learning in children. *Developmental Psychology, 33*, 254-262.

Muñoz, M. L., Gillam, R. B., Peña, E.D., & Gulley -Faehnle, A. (2003). Measures of language development in fictional narratives of Latino children. *Language, Speech, and Hearing Services in Schools, 34*, 332-342.

National Clearinghouse for English Language Acquisition and Language Instruction in Educational Programs (NCELA) (2006). *NCELA FAQ: How many school-age English language learners (ELLs) are there in the U.S?* Retrieved from http: www.ncela.gwu.edu/expert/gaq/011eps.html.

Pallant, J. F. (2007). *SPSS survival manual: A step by step guide to data analysis using SPSS.* Syney: Allen & Unwin.

Pew Hispanic Center (2008). Latinos *account for half of U.S. population growth since 2000.* Retrieved from http://pewhispanic.org/reports/report.php?ReportID=96.

Riggenbach, H. (1991). Toward an understanding of fluency: A microanalysis of nonnative speaker conversations. *Discourse Processes, 14*, 423-441.

Scott, C. M. & Windsor, J.(2000). General language performance measures in spoken and written narrative and expository discourse of school-age children with language learning disabilities. *Journal of Speech, Language, and Hearing Research, 43*, 324-339.

Semel, E., Wiig, E. H., & Secord, W. A. (2003). *Clinical Evaluation of Language Fundamentals, Fourth Edition.* San Antonio, Tx: Pearson Education, Inc.

Shepard, L., & Smith, M. (1987). Effects of kindergarten retention at the end of first grade. *Psychology in the Schools, 24*, 346-357.

Shepard, L., & Smith, M. (1988). Escalating academic demand in kindergarten: Counterproductive policies. *The Elementary School Journal, 89*, 135-145.

Uriate, M., Lavan, N. Agusti, N. & Karp, F. (2009*). English learners in Boston public schools: Enrollment and educational outcomes of native Spanish speakers.* Paper 113. Boston, MA: Gaston Institute for Latino CommunityDevelopment and Public Policy. Retrieved from http://scholarworks.umb.edu/gaston_pubs/113

U. S. Census Bureau (2008). *Hispanic heritage month 2008: September 15 – October 15.* Retrieved from http://www.census.gov/newsroom/releases/archives/facts_for_features_special_editions/cb08-ff15.html

Weiderhold, J. L. & Bryant, B. R. (2001). *Gray Oral Reading Test-Fourth Edition. (GORT-4).* San Antonio, TX: Pearson.

Weschler, D. (2001). *Weschler Individual Achievement Test-Second Edition. (WIAT-II).* San Antonio, TX: Pearson.

Wiig, Secord, & Semel (2005). *Clinical Evaluation of Language Fundamentals –Fourth Edition Spanish (CELF-4 Spanish).* San Antonio, TX: Pearson Education, Inc.

Williams, K. T. (2007). *Expressive Vocabulary Test, Second*

Edition (EVT-2). San Antonio, TX: Pearson Education, Inc.

Willson, V. L, & Hughes, J. N. (2006). Retention of Hispanic and Latino students in first grade: Child, parent, teacher, school, and peer predictors. *Journal of School Psychology, 44*(1), 31-49.

Zill, N., Loomis, L. S., & West, J. (1997). *The elementary school performance and adjustment of children who enter kindergarten late or repeat kindergarten: Findings from the National Surveys*. Washington, DC: Office of Educational Research and Improvement.

A COMPARISON OF ADULT- AND PEER-MEDIATED INTERVENTION FOR AUTISM: A CASE STUDY

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ABSTRACT

This study examined the response of a young child with autism to two play-based intervention conditions: adult-mediated and peer-mediated. The client was five years old, demonstrated moderate-to-severe autism, and exhibited developmental functioning between the 14 to 34 month level. The peer-mediated condition, based on a modified Integrated Play Group approach, utilized a typically developing peer who was three years of age. The study utilized an ABAB alternating treatment design to compare the impact of the adult- and peer-mediated interventions. Results from the current study suggest that the adult-mediated intervention resulted in increased engagement and more sophisticated social-communicative behaviors than the peer-mediated approach for the child with autism. Clinical implications, limitations, and future research directions are discussed.

KEY WORDS

Peer-Mediated Intervention, Adult-Mediated Intervention, Autism

INTRODUCTION

Providing effective interventions that improve social and communicative functioning in children with autism and promote their inclusion in regular education is a high priority (McConnell, 2002; Odom, 2000). A variety of intervention approaches have been investigated in the literature, including peer-mediated interventions (PMIs). PMIs utilize typically developing peers trained in various therapeutic techniques for promoting the acquisition of communication and social skills in children with autism (Rogers, 2000; Chan, Lang, Rispoli, O'Reilly, Sigafoos, & Cole, 2009). PMI approaches have been shown to yield improvements in various social-communicative skills, including the number of initiations made, increased joint attention, duration of engagement, and symbolic play behavior (e.g., Roeyers, 1996; Wolfberg & Schuler, 1993; Zercher, Hunt, Schuler, & Webster, 2001).

The interest in PMIs has been fueled by growing skepticism of approaches solely utilizing adults as agents of intervention. For example, adult-mediated interventions have been criticized for failing to incorporate the natural context of children's social interactions (e.g., the play that occurs between peers), thus limiting the extent to which children generalize learned communication and social skills to new situations (DiSalvo & Oswald, 2002; Rogers, 2000). In addition, the social-communicative behaviors of children with autism may differ when interacting with adults versus children. For example, Hauck, Fein, Waterhouse and Feinstein (1995) observed that when children with autism interact with adults, they typically request actions and objects (i.e., behavioral regulation) and engage in routine behavior. In contrast, with peers they more often engage in naturalistic interactions such as giving information and greeting.

Recently, Chan et al. (2009) conducted a systematic review of 42 studies investigating the effectiveness of PMI intervention approaches for individuals with autism spectrum disorders. Their review indicated that verbal explanation and modeling were the most frequently used methods for training peers who ranged from 3 to 13 years old (M = 8.6 years). Common intervention techniques included having peers initiate interactions with participants and prompting participants to engage in desired behaviors. The dependent variables typically measured social interaction (e.g., communication, initiations), academic skills, and/or challenging behaviors. Overall, the authors concluded that PMIs are potentially effective interventions for individuals with ASD given that outcomes were positive in 91% of the studies they reviewed.

One evidence-based peer-mediated approach that merits further attention is the Integrated Play Group (IPG; Neufeld & Wolfberg, 2010; Wolfberg, 2003; Wolfberg & Schuler, 1993). According to Schuler and Wolfberg (2000), reduced opportunity for peer play and lack of support needed to be successful in peer interactions are primary causes of the skill deficits exhibited by children with autism. In the IPG approach, children with autism, referred to as Novices, participate in play activities with socially competent peers, referred to as Experts, under the guidance of a playgroup guide (i.e., Adult). The IPG model is characterized by the following significant features: natural integrated settings; well-designed play spaces; selection of play materials based on interactive potential and developmental level; establishment of a consistent schedule and routine; play-groups balanced in age and developmental status; a focus on child competence and motivation; guided participation; and full engagement in play (DiSalvo & Oswald, 2002; Wolfberg & Schuler, 1993; Zercher et al., 2001). Because schedule and routine offer the most tangible support structures, the play-groups meet on a regular basis over an extended period of time, two or more times a week for approximately 30 minutes to an hour. Routines provide reciprocal interaction patterns that represent the turn-taking aspect of conversation as well as assist a child's understanding of his/her active role in the social dynamic (Quill, 1995).

The roles of the play-group guide as well as the peers are integral to the success of the IPG. Prior to the interactions between the expert and novice, a peer-mediated social interaction training program occurs. The training program consists of social interaction skills instruction and teaching the experts to understand the child with autism's modes of communication (Garrison-Harrell & Kamps, 1997). The expert players are instructed prior to each session through direct instruction, such as role-play, adult cuing around play materials and activities, and reinforcement (Prelock, 2004). The play-group guide provides examples of specific ways in which the novice players could be included at their own level. Goals for the peers include learning to wait for the initiation of communication, offering bids for social interaction, reading the communicative attempts of the child with autism, and responding in a manner that will encourage continued interaction (Wetherby & Prizant, 1999). The play-group guide concomitantly mediates social exchanges and extends individual play themes as well as monitors individual and group behaviors (DiSalvo & Oswald, 2002; Quill, 1995). Research demonstrates that some level of prompting by a play-group guide appears necessary to ensure that normally developing preschoolers maintain their use of active initiation strategies (see Goldstein & Wickstrom, 1986 for a review).

The IPG approach is modeled upon the developmental theories of Vygotsky (1978) who identified play as a primary means by which children acquire symbolic capacities, interpersonal skills, and social knowledge. The IPG method relies heavily on Vygotsky's concept of the zone of proximal development (ZPD), which posits that children can reach higher levels of ability when supported by more experienced partners during meaningful social interactions. Specifically, play guides (i.e., adults) scaffold the social and communicative behaviors of children with autism to more developmentally advanced levels. Moreover, within the integrated play groups, typically

developing children provide models of more advanced behaviors and are encouraged by the play guides to support and reinforce the participation of the novice players (Neufeld & Wolfberg, 2010).

Although PMIs have yielded positive results in previous research, effective planning of PMI and its relative benefits compared to other intervention methods need further investigation. In a meta-analysis of interventions targeting social interactions in children with autism, Miller (2006) suggested that PMIs may not be as beneficial for younger children due to their less developed play and social interaction skills (e.g., early play is solitary rather than reciprocal). Miller's results indicated that collateral skills intervention may be more appropriate for young children with autism, and peer-mediated interventions may be more appropriate for school-age children with autism. Chan et al. (2009) also suggested that future research should examine what can be expected from peers of various ages and developmental levels. In addition, they described the need for further investigation into identifying the relative effectiveness of PMIs versus professionally implemented interventions and how the two approaches differentially influence behavior (see also Carter, Cushing, Clark, & Kennedy, 2005).

Purpose

The purpose of this study was to explore the response of a young child with moderate to severe autism to two play-based intervention conditions: adult-mediated and peer-mediated. The peer-mediated condition was based on a modified Integrated Play Group approach using a preschool-age peer. Of specific interest was the impact of both approaches on the child with autism's engagement in social interactions and the types of social behaviors he produced. Results of the current study will contribute to answering questions raised by researchers about the differential impact of adult-mediated versus peer-mediated interventions on the social and communicative behaviors of children with ASD (Carter et al., 2005; Chan et al., 2009; Miller, 2006). If the PMI approach results in greater benefits in terms of increased engagement and social communication in the child with autism, the current study would lend support the incorporation of PMI strategies in a variety of therapeutic settings.

METHOD

Participants

Novice. The child with autism, referred to as the Novice, was 5;6 years old (years; months) at the beginning of the study. He was diagnosed at 2;6 with autism by a pediatric neurologist. Previous evaluations described his autism as moderate to severe, and clinical observations were consistent with this diagnosis. Previous to this study, he had been a client for 18 months in the university-based clinic where this study took place (in addition to his public school programming). IRB approval was obtained for the Novice's participation and his mother provided informed consent. The Novice's developmental level at the beginning of the study was assessed using the *Vineland Adaptive Behavior Scale* (VABS; Sparrow, Balla, & Chicchetti, 1984). The VABS is a parent/caregiver checklist that assesses various aspects of development. The mother of the Novice responded to questions concerning his communication, daily living skills, socialization, and motor skills. All domains were documented to be three standard deviations below age-level expectations (age equivalencies ranged from 1;2 to 2;10; see Table 1). Previous therapy goals included increasing verbal and nonverbal communication and engaging in play interactions. Modest gains were observed in the frequency of spontaneous verbalizations, following one-step directions, initiating play activities, and engaging in reciprocal play with the clinician. The Novice attended a full-day public school program where he received speech-language and occupational therapy. He spent mornings in an inclusive classroom for children with disabilities and afternoons in a mainstream kindergarten classroom assisted by an educational aide. At the beginning of the current study, the Novice continued to display significant delays in his social-communicative skills and engagement in play interactions. Expressively, he imitated words when prompted and produced minimal spontaneous language, which mainly consisted of requesting objects or actions using single words (e.g., *more*, *open*). In terms of engagement, he exhibited infrequent interactions with people other than his mother. He rarely initiated interactions with others and primarily directed his attention toward stimulating objects (e.g., a spinning chair or ball). When others initiated interactions with the Novice, he generally ignored their attempts and continued in his solitary play.

Expert. The typically developing child, referred to as the Expert, was 3;8 years old at the beginning of the study. IRB approval was obtained for the Expert's participation and his mother provided informed consent. The VABS was administered and results indicated that all developmental domains were within typical limits for his age (see Table 1). The Expert was selected because he was approximately the desired age, the same sex as the client, and demonstrated age-appropriate language and social skills. Compared to the Novice, the Expert was developmentally advanced in order to provide more sophisticated models of play and language, yet he was young enough to enjoy the same activities as the Novice. Previous research has indicated that developmentally advanced peers may be able to scaffold more complex levels of play for children with autism than peers who are at similar developmental levels (Wolfberg & Schuler, 2006). Given the Novice's functional level (i.e., 1;2 – 2;10), a peer matched on developmental level would not have the maturity to comprehend the instructions and coaching provided by the Adult. The Expert did not have any previous play interactions or training with children with autism.

Setting and materials. The intervention occurred in a 300 square foot therapy room typically used for preschool language therapy

	Novice	Expert
Chronological Age (years; months)	5;6	3;8
VABS[a] Communication Domain		
Standard Score[b]	44	100
Age Equivalence	1;2	3;9
VABS Daily Living Skills Domain		
Standard Score	45	100
Age Equivalence	1;7	3;8
VABS Socialization Domain		
Standard Score	51	101
Age Equivalence	1;9	3;10
VABS Motor Skills Domain		
Standard Score	54	97
Age Equivalence	2;10	3;7

[a] *Vineland Adaptive Behavior Scales* [b]Mean=100, SD=15

Table 1.
Participant Characteristics.

at a university speech and hearing clinic located within a large Midwestern city. The toys were chosen based on developmental appropriateness and the likelihood that they would facilitate spontaneous communication and social interaction. The toys included a trampoline, large ball, blocks, bubble gun, blanket, assorted toy vehicles, kitchen set, and a spinning disk. The creation of an enticing space with spatially organized materials that are accessible and encourage imaginative and interactive play are essential for an effective play-based approach for children with autism (Schuler & Wolfberg, 2000). The interests and developmental level of the Novice were taken into account when choosing the materials and organizing the play space. As reviewed by Schuler and Wolfberg (2006), children with autism are more likely to show interest in toys that were matched to their interest, developmental level, and prevailing object initiations (e.g., banging, stacking).

Procedure

This study consisted of an ABAB alternating-treatment single subject design (A = adult-mediated, B = peer-mediated). The A phase (adult-mediated intervention) is the baseline phase, given that it represents the traditional therapy approach (Meline, 2010) and was the approach used during the Novice's previous 18 months of therapy at the clinic where the study occurred. The use of a traditional or "treatment as usual" intervention as the baseline phase is a common methodological approach in single-subject research (Horner, Carr, Halle, McGee, Odom, & Wolery, 2005) and has been used in previous autism research (e.g., Mechling, Gast, & Cronin, 2006). The duration of each phase of intervention was as follows: (a) four weeks of adult-mediated intervention (AMI), (b) four weeks of peer-mediated intervention (PMI), (c) four weeks of AMI, and (d) four weeks of PMI. Thirty-two sessions (eight per treatment phase) occurred over 16 weeks. Each session was 30 minutes in length and followed a similar sequence of activities regardless of treatment condition.

Intervention A. Intervention A treatment sessions utilized an adult as the agent of intervention and included play-based/naturalistic interactions. A child-centered approach was utilized where the Adult followed the Novice's lead, used rich affect, and imitated his spontaneous behavior to build imitation and reciprocity (Wolfberg & Schuler, 2006). The Adult prompted and elicited targeted behaviors (i.e., engagement and social communication; see descriptions below) through modeling, scaffolding and reinforcement (e.g., praise, providing a desired toy). The Adult also utilized attention-directing behaviors and language such as "Ready, Set, Go!" or "Jump!" to increase interaction. Sessions followed a routine of play and clean-up. Play activities included blowing and popping bubbles, jumping on a trampoline, building with blocks, playing with toy cars, and hide-and-seek.

Intervention B. Intervention B brought together the Novice and Expert into a modified Integrated Play Group. While Wolfberg (2003) recommends play groups of three to five children with a higher proportion of Experts to Novices, our play group consisted of one Expert and one Novice. Prior to each intervention session, the Expert received approximately 15 minutes of instruction and coaching from the Adult in the use of the attention-directing behaviors described in Intervention A. The adult served to monitor the play initiations between the

Novice and Expert, prompting the Expert to engage the Novice in play and acting as an interpreter to help the Expert understand and respond to the Novice's communicative attempts (Prendeville et al., 2006; Wolfberg & Schuler, 2006For example, the Adult might prompt the Expert to "Put bubbles on his arm," "Ask him to play," and "[The Novice] is looking out the window – go ask him what he sees." This sociocommunicative guidance (Schuler & Wolfberg, 2000) facilitates a common focus of play between the Novice and Expert, encourages initiations of communicative and play behavior, and also appropriate responses from participating children. In addition, the adult scaffolded the interactions, particularly encouraging the Novice to engage in more complex play and communicative behaviors (e.g., prompting the Novice engage in turn-taking with the Expert; prompting verbal behavior; Schuler & Wolfberg, 2000).

The Adult (second author) was a graduate student in speech language pathology at the university clinic where the research took place. She was trained and closely supervised by a clinical instructor (certified speech-language pathologist) who had supervised the Novice's therapy for several semesters prior to this study. She provided input into the study's design and was fully supportive of the research aims. To ensure fidelity to the intervention approaches, the clinical instructor observed the sessions regularly and provided the Adult with written and oral feedback on a weekly basis. The first author (a certified SLP) also viewed live or videotaped sessions on a regular basis to ensure treatment fidelity.

Data collection and analysis. All sessions were videotaped and the dependent variables (see descriptions below) were later analyzed. Changes in the Novice's engagement in play interactions and social communication were the primary areas of interest, as these skills have been shown to be positively impacted by PMIs (Prendeville, Prelock, & Unwin, 2006; Chan et al., 2009). The specific behaviors chosen for analysis were based on variables used in previous studies investigating the effect of PMIs in children with autism spectrum disorders (Goldstein, Kaczmarek, Pennington, & Shafer, 1992; Hauck, Fein, Waterhouse, & Feinstein, 1995; Murdock, Cost, & Tieso, 2007; Prendeville et al., 2006). The Novice's developmental level and current therapy goals were also taken into consideration when choosing the dependent variables.

Engagement. Engagement was assessed through the measurement of three variables: *Communicative Exchanges*, *Initiations*, and *Corrective Responses*. *Communicative Exchanges* (CEs) occurred when two or more individuals interacted and the behavior of one evoked a response or modified the behavior of another (Dunst & Lowe, 1986). Adult-Novice CEs were analyzed in the A phases, and Adult-Novice and Expert-Novice CEs were analyzed in the B phases. *Initiations* by the Novice were CEs initiated by the Novice that evoked a response or behavior of the Adult or Expert. *Corrective Responses* by the Adult occurred when the Adult responded to inappropriate behaviors by the Novice (e.g., spitting). The rate of *Corrective Responses* was considered to indicate the Novice's lack of engagement in social-interactive play.

Social-Communication. Social-Communication was measured by coding four types of behaviors exhibited by the Novice when CEs occurred: *Behavioral Regulation*, *Attention to Play*, *Nonverbal Play*, and *Verbal Play* (Wolfberg & Schuler, 1999). *Behavioral Regulation* behaviors occurred when the Novice communicated a need or preference nonverbally (e.g., pulling the Adult's hand to the door to open it) or verbally (e.g., saying "open" when he wanted the Adult to open the door). *Attention to Play* behaviors occurred when the Novice gazed toward or physically approached the Adult or Expert engaged in a play activity. *Nonverbal Play* behaviors occurred when the Novice engaged in a play activity without an accompanying verbalization (e.g., Adult blew bubbles and said, "[Novice], pop the bubbles!" and the Novice popped the bubbles). *Verbal Play* behaviors occurred when the Novice engaged in a play activity while simultaneously producing a verbalization, either spontaneously or though imitation (e.g., Adult blows bubbles and says, "Look [Novice], bubbles!" and the Novice says, "Bubbles," while popping the bubbles).

RESULTS

Reliability

Every session was reviewed via videotape and occurrences of the dependent variables were scored by the second author. To determine interrater reliability, a second trained observer scored one session randomly chosen from each phase of the study for a total of four sessions (13%) and 636 data points (12%). Interrater agreement was based on the total number of agreements divided by the total number of judgments. The resulting interrater reliability was 85%, which is within the accepted range of interrater agreement (≥ 80%; Kennedy, 2005; Horner et al., 2005).

Dependent Variables

Each session was analyzed and occurrences of the dependent variables were recorded. The data were graphed and visually analyzed for level (e.g., mean frequency), trend, and variability of performance (Horner et al., 2005; Kennedy, 2005). Kennedy (2005) defines variability as the degree to which individual data points deviate from the general trend, and these judgments are qualitative in nature. Changes in the dependent variables across treatment conditions (i.e., A or B phases) were examined in order to determine if functional relations between the independent and dependent variables were evident, being mindful of overlap in data points when interpreting the results (Kennedy, 2005).

Communicative Exchanges. The frequency of *Communicative Exchanges* (CEs) varied greatly between treatments and phases (see Figure 1). Specifically, there were 1464 CEs in phase A1 (mean per session = 183), 644 CEs in phase B1 (mean per session

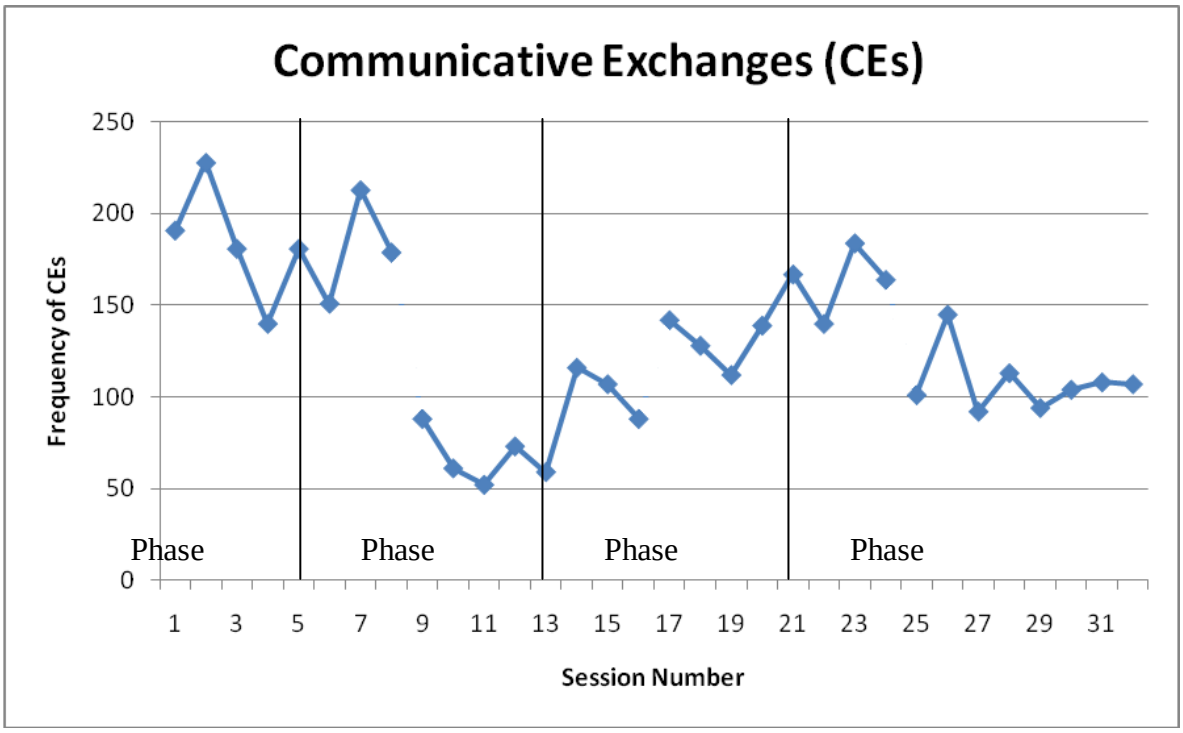

Figure 1.
Frequency of Communicative Exchanges (A Phases: Adult-Mediated; B Phases: Peer-Mediated).

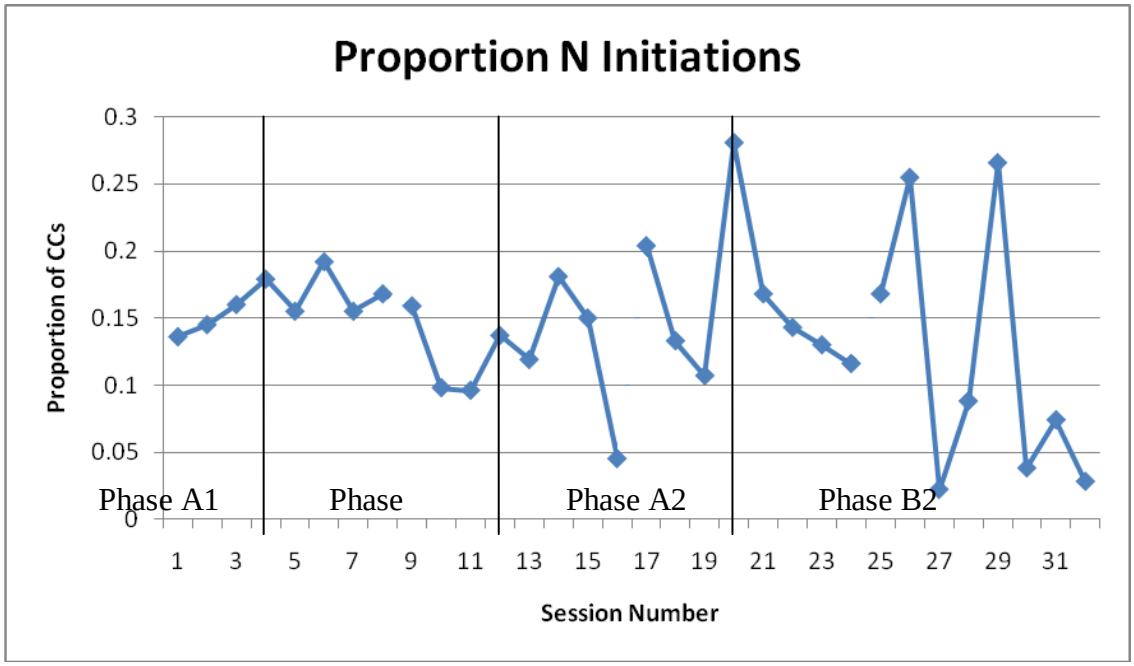

Figure 2.
Proportion of Communicative Exchanges (CEs) Initiated by the Novice
(A Phases: Adult-Mediated; B Phases: Peer-Mediated).

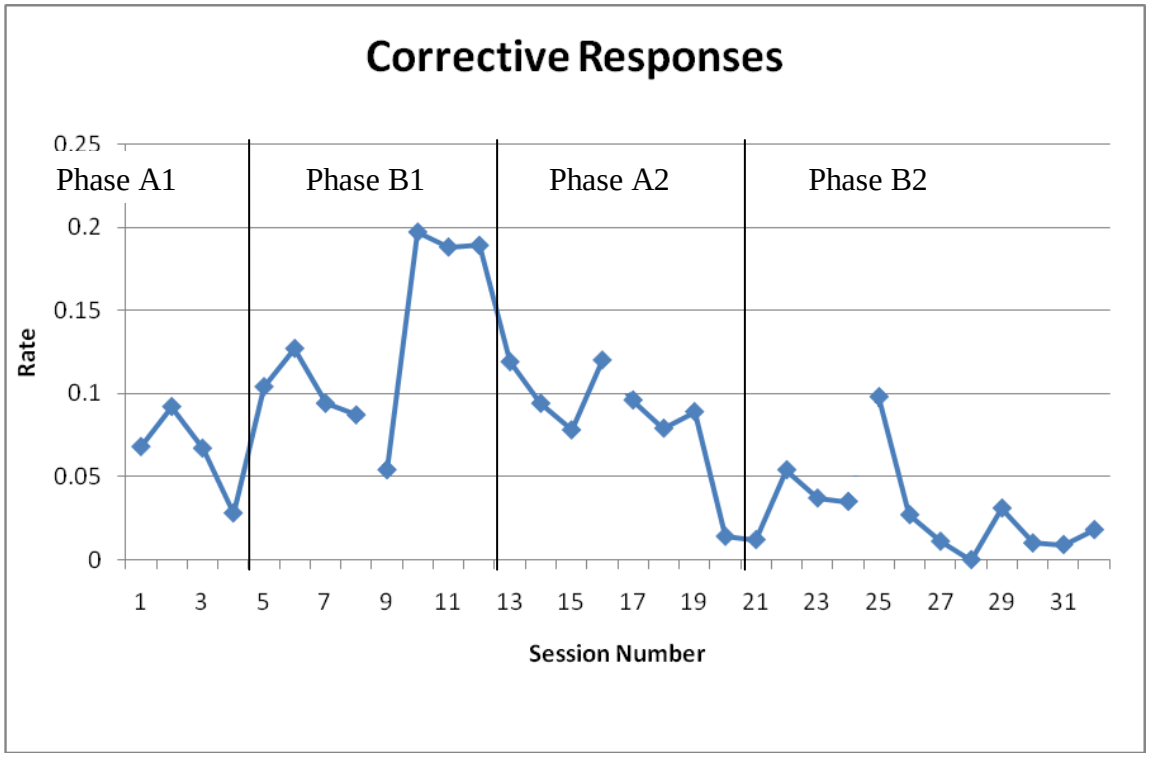

Figure 3.
Rate of Corrective Responses (A Phases: Adult-Mediated; B Phases: Peer-Mediated).

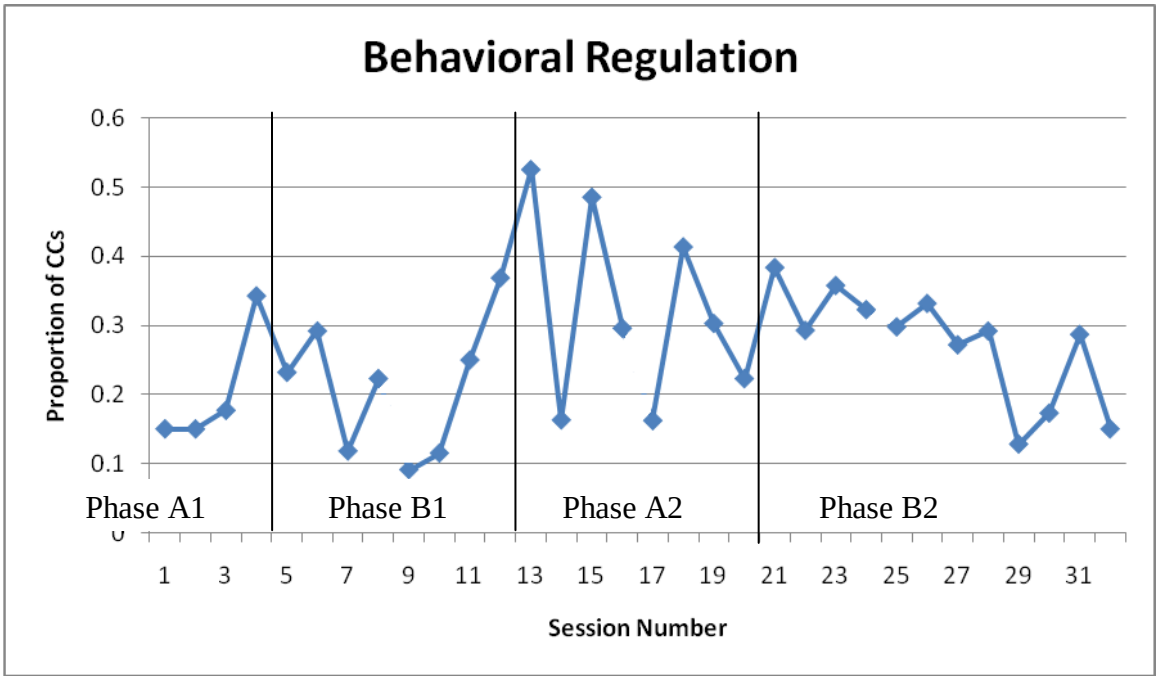

Figure 4.
Behavioral Regulation Behaviors (A Phases: Adult-Mediated; B Phases: Peer-Mediated).

= 81), 1176 CEs in phase A2 (mean per session = 147), and 864 CEs in phase B2 (mean per session = 108). Overall the frequency of CEs was higher in the A phases (Adult-Novice) than the B phases (Adult-Novice-Expert) with few overlapping data points between treatment conditions. An upward trend was apparent in A2, but for the remaining three phases trends were not exhibited. Due to the large variability in the frequency of CEs between sessions and phases, the remaining variables will be discussed in terms of proportions of CEs.

Initiations by the Novice. The proportion of CEs initiated by the Novice was calculated for each session (see Figure 2). In phase A1, the Novice initiated 16% of the CEs (range 14-19% across sessions). In phase B1, he initiated 13% (range 5 – 18%); in A2, 16% (range 11 – 28%); and B2, 12% (range 2 – 27%). The rates of initiations by the Novice were increasingly variable as the study progressed. Trends within phases were not apparent, and data values overlapped across phases.

Corrective Responses. The rate of *Corrective Responses* (CRs) by the Adult was measured by dividing the number of CRs by the number of CRs plus CEs for each session (see Figure 3. In phase A1, rate of CRs was 8.5% (range 3 – 13% across sessions); phase B1, 12% (range 5.4 – 20%); phase A2, 5% (range 1 – 9.6); and phase B2, 2.6% (range 0 – 10%). After a sharp increase in the rate of CRs in phase B1 (see sessions 2-4), the rate of CRs exhibited a steady decrease as the study progressed.

Behavioral Regulation. The rate of *Behavioral Regulation* behaviors (BRs) by the Novice was measured by dividing the number of BRs by the total number of CEs for each session (see Figure 4). In phase A1, rate of BRs was 20% (range 10 – 22% across sessions); phase B1, 29% (range 7 – 47.5%); phase A2, 31% (range 8 – 27); and phase B2, 25% (range 7.5 – 25%). The rates of BRs were moderately variable except for phase B1, where high variability was observed. Trends within phases were not apparent, and data values overlapped across phases.

Attention to Play. The rate of *Attention to Play* behaviors (ATPs) by the Novice was measured by dividing the number of ATPs by the total number of CEs for each session (see Figure 5). In phase A1, rate of ATPs was 28% (range 19 – 41% across sessions); phase B1, 46% (range 35 – 60%); phase A2, 24% (range 11.5 – 30.4%); and phase B2, 44% (range 25.5 – 54%). Upward trends were evident in phases A1 and B2. A downward trend was exhibited in phase B1 and no trend was apparent in A2. Variability was moderate within phases. Rates of ATPs were higher overall in the B phases, with few overlapping data points between treatment conditions.

Nonverbal Play. The rate of *Nonverbal Play* behaviors (NPs) by the Novice was measured by dividing the number of NPs by the total number of CEs for each session (see Figure 6). In phase A1, rate of NPs was 34% (range 26 – 51% across sessions); phase B1, 23% (range 5 – 42%); phase A2, 28% (range 19 – 39); and phase B2, 24% (range 12 – 44%). Rates of nonverbal play were moderately to highly variable across the study. Trends within phases were not apparent, except for a downward trend in phase A1. Across phases, data values overlapped.

Verbal Play. The rate of *Verbal Play* behaviors (VPs) by the Novice was measured by dividing the number of VPs by the total number of CEs for each session (see Figure 7). In phase A1, rate of VPs was 18% (range 26 – 51% across sessions); phase B1, 2% (range 5 – 42%); phase A2, 17% (range 19 – 39); and phase B2, 7.3% (range 12 – 44%). High variability in the rates of VPs were observed in the A phases, compared to moderate variability in the B phases. No trends were apparent within any phases. Overall, the Novice's rate of VPs were higher in the A phases with minimal overlap in data points between treatment conditions.

To investigate differences in the Adult's focus of attention between conditions, a post hoc analysis was conducted. Two sessions (one from each treatment condition) were transcribed and analyzed for the percentage of Adult utterances directed toward the Novice and/or Expert. Each session was 30 minutes in length and the Adult produced a similar number of utterances in each session (278 in the adult-mediated session; 281 in the peer-mediated session). In the adult-mediated session, the Adult directed 278 of her utterances (100%) toward the Novice. In the peer-mediated session, the Adult directed 65 of her utterances (23%) specifically toward the Novice, 50 utterances (18%) toward both the Novice and Expert, and 166 utterances (59%) specifically toward the Expert.

An additional post-hoc analysis was conducted to examine if the Expert became more proficient at engaging the Novice and responding to his initiations during the course of the study. The percentages of CEs that were initiated by the Expert or included the Expert as the responder were calculated. In phase B1 the Expert initiated 255 CEs and was the responder in 45 CEs initiated by the Novice (40% and 7% of total CEs in B1, respectively). In phase B2 the Expert initiated 410 CEs and was the responder in 61 CEs initiated by the Novice (47% and 7% of total CEs in B2, respectively). Results indicate that the frequency of CEs involving the Expert rose from B1 to B2, and the proportion of CEs he initiated also increased slightly from B1 to B2.

DISCUSSION

The current study examined the response of a five-year-old child with moderate to severe autism to two play-based intervention conditions: adult-mediated and peer-mediated. The dependent variables measured engagement and social-communication. Engagement was assessed by measuring *Communicative Exchanges* (CEs) involving the Novice, *Initiations* by the Novice, and *Corrective Responses* by the Adult. Results indicated that the frequency of CEs was higher in the adult-mediated phases than in the peer-mediated phases. The results are not surprising, given that during the peer-

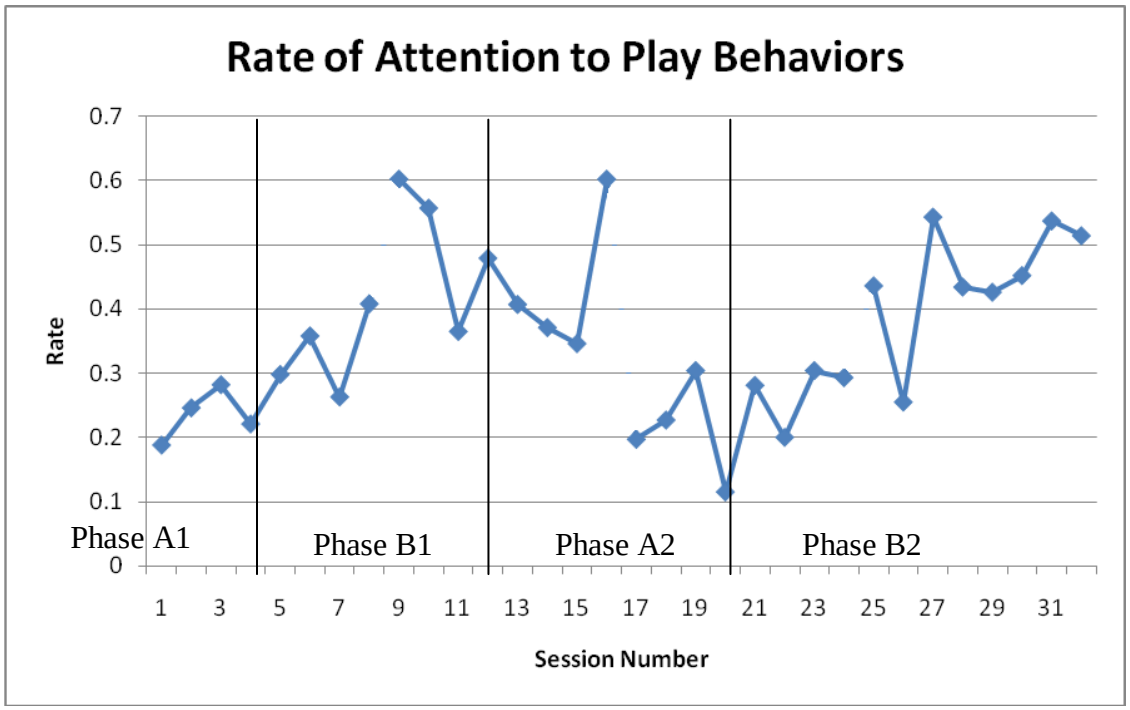

Figure 5.
Rate of Attention to Play Behaviors (A Phases: Adult-Mediated; B Phases: Peer-Mediated).

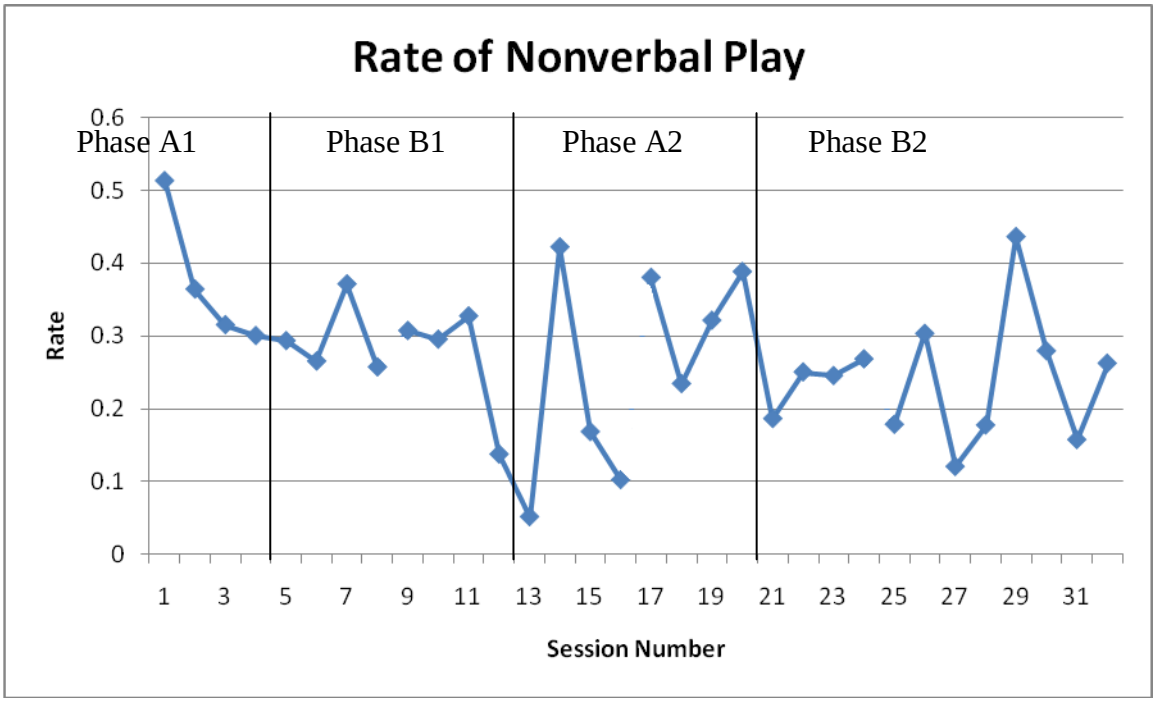

Figure 6.
Rate of Nonverbal Play (A Phases: Adult-Mediated; B Phases: Peer-Mediated)

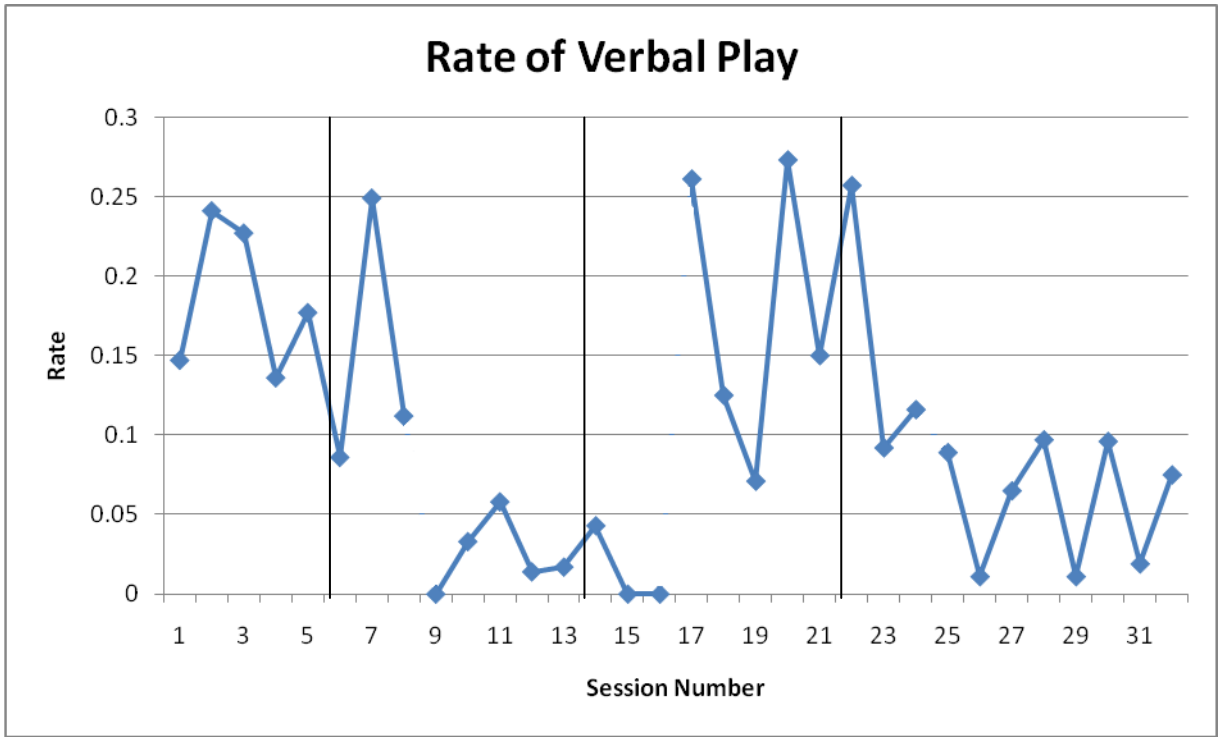

Figure 7.
Rate of Verbal Play (A Phases: Adult-Mediated; B Phases: Peer-Mediated).

mediated phases the Adult spent a large proportion of her time providing verbal guidance and modeling for the Expert, encouraging him to engage the Novice in play and respond to the Novice's initiations. As a result, the Adult's focus on the Novice decreased considerably in the peer-mediated condition (results of the post-hoc analysis supports these observations). The authors speculate that the Expert required on-going guidance and attention during the sessions (despite individual training before every session) due to characteristics related to his developmental level (discussed under Future Directions). On the other hand, the frequency of CEs rose from B1 to B2, which may have been partially due to an increased proficiency of the Expert in engaging the Novice in interactions. The post-hoc analysis indicated that the Expert's involvement in CEs increased from B1 go B2 (both as the initiator and responder). Perhaps with more intervention phases and additional training of the Expert, the frequency of CEs between the Expert and Novice would have continued to increase.

Rate of *Initiations* by the Novice was similar across phases and did not appear to be differentially impacted by treatment condition. Rate of *Corrective Responses* exhibited an increase from phase A1 to B1, perhaps due to the presence of the unfamiliar Expert, which elicited more anti-social behaviors from the Novice. Midway through phase B1 the rate of *Corrective Responses* started to steadily decline and continued to decrease as the study progressed, indicating that the Novice was increasingly more engaged in positive play behaviors regardless of treatment condition.

Social Communication was assessed by measuring *Behavioral Regulation*, *Attention to Play*, *Nonverbal Play*, and *Verbal Play*. The rates of *Behavioral Regulation* behaviors (BRs) were similar when comparing the adult- and peer-mediated intervention, which was not expected given Hauck et al.'s findings that children with autism exhibit more behavioral regulation with adults than with peers.

The rates of *Attention to Play* behaviors (ATPs) were higher in the peer-mediated phases than in the adult-mediated phases. These behaviors (i.e., gaze toward play, approach to play) were lower in terms of social complexity than the other play behaviors measured. This result is consistent with the findings of Hauck et al. who observed that the school-age children with autism in their study exhibited more low-level behaviors, such as frequent looking (interpreted as social monitoring), during lunch vs. free play due to the forced proximity to peers at mealtime. Treatment condition did not impact the rates of *Nonverbal Play* behaviors (NPs). In contrast, *Verbal Play* behaviors were higher in the adult-mediated phases than in the peer-mediated phases.

Overall, the Novice exhibited more sophisticated social-communicative behaviors (*i.e., Verbal Play*) in the adult-mediated conditions than in the peer-mediated conditions.

These findings are unexpected given that previous research suggests that the play of children with disabilities is more complex in inclusive settings when interacting with typically developing peers than in segregated settings when interacting with adults or peers with disabilities (Hanline & Daely, 2002). One potential explanation of this finding may be related to the client's developmental level. Literature on the development of social play suggests that toddlers and young preschoolers engage in predominately solitary and parallel play that involves adult guidance (cf. L'Abate, 2009). Cooperative social play with peers develops in late preschool and kindergarten. Recall that the Novice's chronological age was 5;6 while his age-equivalencies in communication and socialization skills ranged from 1;2 to 2;10. Perhaps greater interaction during the adult-mediation is an indicator of this developmental sequence in social development. Consequently, our results suggest that clinicians should carefully consider the clients' level of social play skills when evaluating the use of adult-mediated and peer-mediated intervention.

In addition to the developmental level of the Novice, the current results may also have been influenced by the developmental level of the Expert, which may have limited his effectiveness as a peer in this study. The Expert was a preschool-age boy who exhibited typical social skills for his age and gender, including limited prosocial behaviors such as empathy and altruism. The authors observed that the Expert did not seem to fully appreciate the purpose of his role and the extent of the Novice's disability. For example, the Expert often refused to stop his own activity in order to join the Novice in a different game, unless it was something that truly interested him. Also, the Expert often did not want to share toys with the Novice which stifled potential play interactions, despite appearing to understand the importance of sharing during the pre-session trainings. According to Moreno, Klute, & Robinson (2008), children between two and four years of age are transitioning between the emotional behaviors of infancy and the more sophisticated emphatic behavior of older children. Research has also shown that boys demonstrate considerably less empathy than girls (Auyeung et al., 2009); however, caution should be taken when extending the results of group studies to the behavior of one individual. The challenges described above are consistent with various criticisms that have been made against PMIs, including the need to utilize peers with highly developed social skills, the extensive training of peers required for interventions to be successful, and the continued need for adults to facilitate and guide interactions (for a review see Bass & Mulick, 2007). Our results suggest that when evaluating the social skills of potential peer models, clinicians should specifically consider the characteristics of empathy and altruism.

Limitations

The results and implications should be taken cautiously given that the study involved only one child with autism. Additional research with more participants examining the differential effects of adult- and peer-mediated interventions is greatly needed. In addition, the current research examined only two cycles of each treatment condition. Perhaps additional cycles would have resulted in more positive results for the peer-mediated intervention. Also, a modified Integrated Play Group was implemented with two children, including one Expert (rather than three to five children and a higher ratio of Experts to Novices, as recommended). Some researchers have suggested that training groups of typically developing peers is more effective than training one peer, because the peers reinforce each other (e.g., Owen-DeSchryver, Carr, Cale, & Blakeley-Smith, 2008); however, including another preschool peer in the current study may have further divided the Adult's attention. Other factors affecting the results may be related to developmental characteristics of the Novice and Expert (described above), which have implications for effective planning of PMI. Additionally, objective data examining treatment fidelity or the generalization of social-communicative behaviors were not collected.

Future Directions

Despite the limitations described above, single-case studies are valuable mechanisms for generating directions of future research (Meline, 2010). The results of the current study highlight the need for more evidence-based recommendations on the optimal characteristics and developmental levels of the Novices and Experts participating in PMIs in order to produce maximum treatment effects (Chan, et al., 2009; DiSalvo & Oswald, 2002; McConnell, 2002; Miller, 2006; Owen-DeSchryver et al., 2008). The meta-analysis by Miller (2006) was unable to detect specific moderating factors of Novices and Experts that influence treatment effectiveness, due in part to the lack of participant information provided within the studies themselves. The current study suggests that typically developing preschoolers may not be the most effective peers. If preschoolers are included in PMI, clinicians may want to consider evaluating their ability to empathize, share, and follow directions. Increased training may also be warranted. An alternative that warrants further exploration is using an older empathetic child or sibling who could model developmentally appropriate play (Bass & Mulick, 2007).

Additional research is needed to compare the benefits of inclusive and segregated settings for children of various abilities and developmental levels. Kishida & Kemp (2009) examined the engagement and interaction of children with autism who regularly attended both inclusive and segregated early childhood centers. They concluded that one setting was not superior to another; instead, both had strengths and weaknesses, and individual children responded differently within each setting. Similarly, the mother of the Novice noted advantages to both treatment conditions in the current study. She thought the adult-mediated approach elicited more engagement from her son, while the peer-mediated approach contributed to his ability to observe and imitate other peers.

Conclusion

The purpose of the current research was to examine the differential impact of adult- and peer-mediated intervention for a child with moderate to severe autism who was a client in a university-based speech and hearing clinic. Results from the current study suggest that the adult-mediated intervention resulted in increased engagement and more sophisticated social-communicative behaviors than the peer-mediated condition during this particular period of intervention. Future research directions include providing recommendations for intervention type depending on the characteristics of the child with autism (e.g., age), and guidelines for ideal characteristics of children participating in PMIs (both clients and peers). In addition, the benefits and disadvantages of various interventions and settings (e.g., inclusive, segregated) for children with autism need to be explored further.

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REFERENCES

Auyeung, B., Wheelwright, S., Allison, C., Atkinson, M., Samarawickrema, N., & Baron-Cohen, S. (2008). The children's empathy quotient and systemizing quotient: Sex differences in typical development and in autism spectrum conditions. *Journal of Autism and Other Developmental Disorders, 39*, 1509-1521.

Bass, J. D., & Mulick, J. A. (2007). Social play skill enhancement of children with autism using peers and siblings as therapists. *Psychology in the Schools, 44*(7), 727-735.

Carter, E. W., Cushing, L. S., Clark, N. M., & Kennedy, C. H. (2005). Effects of peer support interventions on students' access to the general curriculum and social interactions. *Research and Practice for Persons with Severe Disabilities, 30*, 15-25.

Chan, J. M., Lang, R., Rispoli, M., O'Reilly, M., Sigafoos, J., & Cole, H. (2009). Use of peer-mediated interventions in the treatment of autism spectrum disorders: A systematic review. *Research in Autism Spectrum Disorders, 3*, 876-889.

DiSalvo, C.A. & Oswald, D.P. (2002). Peer-mediated interventions to increase the social interaction of children with autism: Consideration of peer expectancies. *Focus on Autism and Other Developmental Disabilities*, *17*(4), 198-207.

Dunst, C.J., & Lowe, L. W. (1986). From reflex to symbol: Describing, explaining, and fostering communicative competence. *Augmentative and Alternative Communication, 2*(1), 11-18.

Garrison-Harrell, L. & Kamps, D. (1997). The effects of peer networks on social-communicative behaviors for students with autism. *Focus on Autism & Other Developmental Disabilities*, *12*(4), 241-265.

Goldstein, H., Kaczmarek, L., Pennington, R., & Shafer, K. (1992). Peer-mediated intervention: Attending to, commenting on, and acknowledging the behavior of preschoolers with autism. *Journal of Applied Behavior Analysis*, *25*(2), 289-305.

Goldstein, H. & Wickstrom, S. (1986). Peer intervention effects on communicative interaction among handicapped and nonhandicapped preschoolers. *Journal of Applied Behavior Analysis*, *19*(2), 209-214.

Hanline, M.F. & Daely, S. (2001). 'Mom, will Kaelie always have possibilities?' The realities of early childhood inclusion. *Phi Delta Kappan,* 84(1), 73.

Hauck, M., Fein, D., Waterhouse, L., & Feinstein, C. (1995). Social initiations by autistic children to adults and other children. *Journal of Autism and Developmental Disorders*, *25*(6), 579-595.

Horner, R. H., Carr, E. G., Halle, J., McGee, G., Odom, S., & Wolery, M. (2005). The use of single-subject research to identify evidence-based practice in special education. *Exceptional Children, 71*(2), 165-179.

Kennedy, C. H. (2005). *Single-case designs for educational research.* Boston: Allyn and Bacon.

Kishida, Y., & Kemp. C. (2009). The engagement and interaction of children with autism spectrum disorder in segregated and inclusive early childhood center-based settings. *Topics in Early Childhood Special Education, 29*(2), 108-118.

L'Abate, L. (2009). *The Praeger handbook of play across the life cycle: Fun from infancy to old age.* Santa Barbara, CA: ABC-CLIO, LLC.

McConnell, S. (2002). Interventions to facilitate social interaction for young children with autism: Review of available research and recommendations for educational intervention and future research. *Journal of Autism and Developmental Disorders, 32*(5), 351-372.

Mechling, L. C., Gast, D. L., & Cronin, B. A. (2006). The effects of presenting high-preference items, paired with choice, via computer-based video programming on task completion of students with autism. *Focus on Autism and Other Developmental Disabilities, 21*(1), 7-13.

Meline (2010). *A research primer for communication sciences and disorders.* Boston, MA: Pearson.

Miller, L. (2006). *Interventions targeting reciprocal social interaction in children and young adults with autism spectrum disorders: A meta-analysis* (Doctoral dissertation). Available from ProQuest Dissertations and Theses (AAT 3217476).

Moreno, A. J., Klute, M. M., & Robinson, J. L. (2008). Relational and individual resources as predictors of empathy in early childhood. *Social Development, 17,* 613-637.

Murdock, L.C., Cost, H. C., & Tieso, C. (2007). Measurement of social communication skills of children with autism spectrum disorders during interactions with typical peers. *Focus on Autism and Other Developmental Disabilities, 22*(3), 160-172.

Neufeld, D., & Wolfberg, P. (2010). From novice to expert: Guiding children on the autism spectrum in integrated play groups. In C. E. Schaefer (Ed.), *Play therapy for preschool children* (pp. 277-299). Washington, DC: American Psychological Association.

Odom, S. (2000). Preschool inclusion: What we know and where we go from here. *Topics in Early Childhood Special Education, 20*(1), 20-27.

Owen-DeSchryver, J., Carr, E., Cale, S., & Blakeley-Smith. A. (2008). Promoting social interactions between students with autism spectrum disorders and their peers in inclusive school settings. *Focus on Autism and Other Developmental Disabilities, 23*(1), 15-28.

Prelock, P. (2004). *From evidence to practice: Interventions for children with autism.* Paper presented at the convention of the American Speech-Language and Hearing Association, Philadelphia, PA.

Prendeville, J., Prelock, P. A., & Unwin, G. (2006). Peer play interventions to support the social competence of children with autism spectrum disorders. *Seminars in Speech and Language, 27*(1), 32-46.

Quill, K.A. (Ed.). (1995). *Teaching children with autism: strategies to enhance communication and socialization*. Albany, NY: Delmar Publishers.

Roeyers, H. (1996). The influences of nonhandicapped peers on the social interactions of children with pervasive developmental disorder. *Journal of Autism and Developmental Disorders*, *26*(3), 303-320.

Rogers, S. J. (2000). Interventions that facilitate socialization in children with autism. *Journal of Autism and Developmental Disorders*, *30*(5), 399-409.

Schuler, A. L. & Wolfberg, P. J. (2000). Promoting peer play and socialization: The art of scaffolding. In A. Wetherby & B. M Prizant (Eds.), Transactional foundations of language intervention (pp. 251-277). Baltimore, MD: Brookes.

Sparrow, S.S., Balla, D.A., & Cicchetti, D.V. (1984). *Vineland Adaptive Behavior Scales*. Circle Pines, MN: American Guidance Service.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* Cambridge, MA: Harvard University Press.

Wetherby, A.M. & Prizant, B.M. (1999). Enhancing language and communication development in autism: assessment and intervention guidelines. In D.B. Zager (Ed.), *Autism: identification, education and treatment* (pp. 141-174). Mahwak, NJ: Lawrence Erlbaum Associates.

Wolfberg, P. J. (2003). *Peer play and the autism spectrum: The art of guiding children's socialization and imagination.* Shawnee Mission, KS: Autism Asperger Publishing Company.

Wolfberg, P. J. & Schuler, A.L. (1993). Integrated play groups: A model for promoting the social and cognitive dimensions of play in children with autism. *Journal of Autism and Developmental Disorders*, *23*, 467-489.

Wolfberg, P.J. & Schuler, A.L. (1999). Fostering peer interactions, imaginative play, and spontaneous language in children with autism. *Child Language Teaching and Therapy*, *15*(1), 41-52.

Wolfberg, P.J. & Schuler, A.L. (2006). Promoting social reciprocity and symbolic representation in children with ASD: Designing quality peer play interventions (p. 180 – 219). In T. Charman & W. Stone (Eds.). *Early social communication in Autism Spectrum Disorders.* NY: Guilford Publications.

Zercher, C., Hunt, P., Schuler, A, & Webster, J. (2001). Increasing joint attention, play and language through peer supported play. *SAGE Publications and the National Autistic Society, 5*(4), 374-398.

PREVALENCE OF LARYNGOPHARYNGEAL AND GASTROESOPHAGEAL REFLUX SYMPTOMS IN THE YOUNG ADULT POPULATION

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ABSTRACT

Laryngopharyngeal and gastroesophageal reflux have been attributed to the development and maintenance of voice disorders. The purpose of the present study was to examine the reported prevalence of laryngopharyngeal and gastroesophageal reflux symptoms among the young adult population and to determine if there are demographic differences with reported symptoms. A 35-item questionnaire was administered to 273 undergraduate college students. The mean total reflux symptom index score was comparable to previous studies with older adults. Participants who reported being diagnosed with gastroesophageal reflux disease were significantly more likely to indicate problems on each item of the reflux symptom index, including hoarseness or voice problems. Males may be at greater risk of developing reflux based on differences in reported eating habits between genders. The results of the study suggest that reflux is not a prevalent condition among young adults and that voice problems are not consistent with reported symptoms among young adults.

KEY WORDS

College Students, GERD, LR, RSI

INTRODUCTION

Gastroesophageal reflux disease (GERD) is a condition in which excessive amounts of gastric content flow back into the esophagus (Koufman, 1991). Laryngopharyngeal reflux (LPR) occurs when gastric content enters the pharynx and laryngopharynx (Makhadoom et al., 2007). Due to the physiological differences between the directions of refluxed material, there are several distinctions between GERD and LPR. These distinctions can often be determined based on differences in reported symptoms among patients. While heartburn is the most notable symptom of GERD, symptoms of LPR include hoarseness or dysphonia, chronic throat clearing, chronic coughing, globus sensation, and dysphagia (Koufman, Aviv, Casiano, & Shaw, 2002; Koufman, Sataloff, & Toohill, 1996). In fact, few patients with LPR report symptoms of heartburn or regurgitation (Koufman, 2002). Another notable distinction between GERD and LPR is when reflux events take place. Patients with GERD often experience more nocturnal reflux, although they can also experience it during the day. In contrast, reflux events associated with LPR frequently occur during the daytime in an upright position (Koufman, 2002). In addition, Koufman et al. (1996) noted that patients with LPR typically experience intermittent symptoms of reflux episodes, a finding that is not as likely with GERD.

Physiologically, GERD is believed to be the result of lower esophageal dysfunction and LPR is likely related to upper esophageal sphincter dysfunction (Koufman, 2002). Smith, Woodcock, and Houghton (2010) discussed the possible relationship between GERD and chronic cough, such that reflux may elicit a cough response or that coughing might encourage additional reflux events. Gastroenterologists typically treat GERD and otolaryngologists generally manage LPR (Koufman, 1991). In addition, speech-language pathologists have increasingly become involved in the assessment and management of LPR among patients with voice disorders. Koufman (2002) described that GERD and LPR require different diagnostic assessment procedures and treatment plans. It should be noted that although management of GERD often includes a combination of medication and behavior modification through dietary and lifestyle changes, treatment for LPR requires longer trials of greater doses of medication. It should be expected that patients with LPR will need several months of treatment, unlike patients with GERD who require several weeks of treatment (Koufman, 2002).

Although it is most typical for patients to present with symptoms of only one condition, it is possible for LPR and GERD to co-occur (Koufman, 2002). Compared to the esophagus, the larynx is more sensitive to contact with refluxed acid and pepsin, an enzyme found in gastric juice that aids in digestion (Cesari, Galli, Ricciardiello, Cavaliere, & Galli, 2004; Koufman, 1991). There are currently two theories of how refluxed material might affect laryngeal structures: 1) gastric content may come into direct contact with laryngeal tissues, or 2) a Vagus nerve reflex may be triggered when acid approaches the esophagus, resulting in chronic throat clearing and coughing which may lead to eventual laryngeal irritation and potential lesions (Cesari et al., 2004; Gumpert, Kalach, Dupont, & Contencin, 1998; Koufman et al., 1996; Makhadoom et al., 2007). Since the laryngeal tissues are more vulnerable to acid and pepsin, Koufman (2002) suggested that patients with LPR may be at increased risk of developing pathologies from only a small number of reflux episodes.

There has been consistent evidence that both LPR and GERD contribute to laryngeal structure changes and voice disorders. LPR has been associated with the development and maintenance of vocal fold nodules (Kuhn et al., 1998), Reinke's edema (Chung et al., 2009), muscle tension dysphonia (Koufman, Amin, & Panetti, 2000), vocal cord dysfunction (Suttithawil, Chakkaphak, Jaruchinda, & Fuangtong, 2006), and laryngeal carcinoma (Bercin et al., 2008). The exact prevalence of reflux in the voice disordered population is unknown. Koufman et al. (2000) found that half of patients with laryngeal abnormalities had LPR, indicating a strong relationship between reflux and laryngeal pathologies. A separate study found that 80% of patients with vocal fold nodules, polyps, and hyperplasia had LPR (Bercin et al., 2008). In contrast, other studies indicated that LPR was present in only 11% (Toros et al., 2009) and 16% (Cesari et al., 2004) of patients with voice disorders.

Despite the lack of establishment of a causal relationship between LPR, GERD, and laryngeal pathologies in humans, several studies have tested the effects of induced gastric acid on the vocal folds of animal models. Delahunty and Cherry (1968) studied the effect of exposure to gastric juice on the vocal folds of dogs. The experimental dogs developed ulcers with granulation tissue, chronic inflammation, and edema on the vocal folds that were exposed to gastric juice compared to a control dog. Similarly, the effect of gastric acid on vocal fold healing following subglottic injuries has been studied in dogs (Little, Koufman, Kohut, & Marshall, 1985). Dogs that were exposed to gastric acid showed significantly greater inflammation than those not exposed to acid, suggesting that reflux may be a contributing factor in either creating or worsening subglottic stenosis, even with mild laryngeal injuries. In contrast, Cohen, Huang, Garrett, and Courey (2005) found that compared to saline solution exposure, acid and pepsin exposure did not result in greater severity of vocal fold injuries following surgery in dog models. In addition, the introduction of acid on the larynges of growing rabbits was found to cause laryngospasm, central apnea, and obstructive apnea (Wetmore, 1993).

There has been disagreement regarding the best diagnostic approach to assessing patients with LPR (Book, Rhee, Toohill, & Smith, 2002). Many otolaryngologists have considered ambulatory pH probe monitoring to be the gold standard in reflux assessment. However, this procedure tends to be invasive and lacks sensitivity (Toros et al., 2009). Other diagnostic

procedures include laryngeal examination, upper endoscopy, and patients' subjective symptoms. Cesari et al. (2004) found that laryngeal examination was a poor indicator of LPR. Other studies observed high degrees of variability between otolaryngologists when classifying visual signs of LPR using laryngoscopy (Branski, Bhattacharyya, & Shapiro, 2002) and poor inter-rater reliability between speech-language pathologists and otolaryngologists when rating physical signs of LPR (Kelchner et al., 2007).

Due to inconsistencies with diagnostic approaches to LPR, there have been numerous attempts to create an objective and valid assessment tool to aid the diagnosis and treatment of reflux. Belafsky, Postma, and Koufman (2002) developed the reflux symptom index (RSI), a brief 9-item questionnaire used by patients as a self-assessment instrument. To determine the subjective severity of symptoms associated with LPR within the past month, patients must rate each item on a scale ranging from 0 to 5 (0 = *no problem* to 5 = *severe problem*). Belafsky et al. found that the RSI was a highly reliable tool during pretreatment evaluations, as there was a significant Pearson's r correlation ($r = 0.81$, $p < .001$) between the initial and second administrations of the RSI (19.9 and 20.9, respectively). Following treatment, there was a statistically significant improvement in RSI scores. Therefore, these authors advocated that the RSI be used to assist otolaryngologists and voice clinicians in the assessment and management of symptoms associated with LPR. Since clinicians should incorporate multiple tools in the assessment of patients suspected of having LPR, the RSI should not be used alone for diagnostic purposes. The RSI has been found to be significantly correlated with the Reflux Finding Score, a rating scale that assesses the severity of LPR based on laryngoscopic findings (Mesallam, Stemple, Sobeih, & Elluru, 2007).

While some patients clearly reach diagnostic criteria for GERD and/or LPR, refluxing gastric acids may exist on a continuum with different severity levels. Several studies have found that most individuals experience some degree of reflux (Belafsky et al., 2002; Hicks, Ours, Abelson, Vaezi, & Richter, 2002; Ozturk et al., 2006). Koufman (2002) noted that it is considered normal for individuals to experience up to 50 events of gastroesophageal reflux per day. These reflux episodes are most likely to occur following meal competition. In addition, there have been documented reports of "pharyngeal acid exposure in subjects known to be without physical findings or symptoms of LPR" (Richardson, Heywood, Sims, Stoner, & Leopold, 2004, p. 249). Therefore, Richardson and colleagues suggested that pharyngeal reflux exists on a physiological range.

It is important to determine the expected amount of LPR and GERD in the general population to apply norms when diagnosing patients suspected of having excessive reflux episodes. Using the RSI, the prevalence and severity of LPR were assessed among the adult population attending a general practice setting (Lowden, McGlashan, Steel, Strugala, & Dettmar, 2009). The most frequently reported symptoms included throat clearing, excessive throat mucus, and heartburn. The mean total RSI score was 7.36. While the majority of participants scored less than 10, more than 25% received a score of 11 or higher. Lowden et al. concluded that as many as one-fourth of patients in a general practice may present with unknown LPR and that patients who report four to five symptoms on the RSI may have an increased risk of problems with reflux.

The prevalence of LPR and GERD has been investigated in patients with laryngeal pathologies and voice disorders with a large degree of variation. While the literature has concentrated on LPR and GERD in normal, older adults (Lowden et al., 2009; Ozturk et al., 2006) and the pediatric population (Gilger, 2003; Gumpert et al., 1998; Simons et al., 2008; Wetmore, 1993), there are no existing studies on the objective or subjective prevalence of these disorders in younger adults. There is a need to contribute normative data to the prevalence of reported symptoms among the younger adult population to assist in the assessment of younger patients suspected of having LPR and GERD. It is also necessary to determine if there are demographic differences among young people on reported dietary and lifestyle behaviors that are believed to trigger episodes of GERD and LPR. Thus, the purpose of the present study was to bridge this gap in the literature by examining the prevalence of LPR and GERD among college students using the RSI through a descriptive study. In addition, the study would investigate if there were differences between males and females, those who reported a medical diagnosis of GERD and those who did not, and if younger adults are at risk of developing GERD and LPR.

METHOD

Participants

Participants were 273 undergraduate students (68 males, 205 females) between 18 and 25 years of age ($M = 19.3$, $SD = 1.5$) attending a public state university of the Pennsylvania State System of Higher Education. The university has more than 10,000 enrolled students with a female-to-male ratio of 60:40. Participants were recruited from general education classes. Some participants were offered extra credit in a course for participation.

Materials

A 35-item questionnaire (Appendix A) was administered to participants. The questionnaire included closed-ended, multiple choice questions and was divided into four sections: (1) background information, including age, sex, race, medical diagnosis of GERD, and knowledge about GERD (Questions 1 to 9); (2) self-reported symptoms and behaviors associated with GERD based on a 6-point Likert scale ranging from (1 = *strongly disagree* to 6 = *strong agree*) (Questions 10 to 17); (3) the 9-item RSI (Belafsky et al., 2002) (Table 1) to assess subjective symptoms associated with LPR within the past month based on a

Within the last month, how did the following problems affect you?
Circle the appropriate response.
0= No Problem. 5 = Severe Problem.

1.	Hoarseness or a problem with your voice	0	1	2	3	4	5
2.	Clearing your throat	0	1	2	3	4	5
3.	Excess throat mucus or postnasal drip	0	1	2	3	4	5
4.	Difficulty swallowing food, liquids, or pills	0	1	2	3	4	5
5.	Coughing after you ate or after lying down	0	1	2	3	4	5
6.	Breathing difficulties or choking episodes	0	1	2	3	4	5
7.	Troublesome or annoying cough	0	1	2	3	4	5
8.	Sensations of something sticking in your throat or a lump in your throat	0	1	2	3	4	5
9.	Heartburn, chest pain, indigestion, or stomach acid coming up	0	1	2	3	4	5

Table 1.
Reflux Symptom Index (Belafsky et al., 2002)

scale ranging from (0 = *no problem* to 5 = *severe problem*) (Questions 18 to 26); and (4) self-reported average consumption of foods and beverages believed to trigger reflux episodes per week (Questions 27 to 35).

Questions about background information were included to obtain general demographic information and to determine if there were differences between males and females on survey questions. In addition, the survey included a question about a medical diagnosis of GERD to ascertain possible differences between participants with known GERD and those with no known diagnosis of GERD. The rationale for including an item about only a medical diagnosis of "acid reflux" was because the general population would likely be more familiar with this term rather than GERD. Since the primary purpose of the study was not to examine existing knowledge about GERD, only two questions targeted participants' knowledge (Questions 8 and 9). Both questions were chosen to gain a preliminary baseline of existing knowledge about GERD among younger adults. The drug, *Nexium*, was selected due to its popular advertising slogan and greater likelihood that participants were previously exposed to it. The questionnaire neglected to include an item about a medical diagnosis of LPR.

The RSI was included to investigate the prevalence of LPR among the young adult population. Additional questions that targeted self-reported symptoms, behaviors, and consumption of foods and beverages associated with increased risk of GERD were developed based on Kaltenbach, Crockett, and Gerson's (2006) literature review on GERD management. In particular, Questions 10 and 17 (I wake up in the night with discomfort in my throat or chest, I go to sleep at least two hours after eating, respectively) addressed Kaltenbach et al.'s recommendation to avoid late evening meals, while Question 15 (I tend to sleep with my head elevated) was adapted from their suggestion to elevate the head of the bed (2006). Questions 12, 14, and 16 (I experience a gurgling sensation in my throat after meals, I often feel full after eating quickly, I experience pain in my throat and/or chest after eating, respectively) were created based on the subjective symptoms associated with episodes of GERD, such a heartburn (Koufman et al., 2000). The rationale for the title of the questionnaire ("Feel the Burn: Acid Reflux Survey") was to gain attention from the participants and to motivate them to complete the questionnaire.

Procedure

The Institutional Review Board approved the protocol of the study. A representative sample of college students was found by administering surveys to students in undergraduate courses. The authors obtained permission from faculty members of several general education classes to administer paper and pencil questionnaires during class. The researchers chose the selected classes based on their current course schedules, rapport with faculty members who were willing to volunteer their students, and classes that included students from different majors and concentrations to obtain a more representative sample. Participants signed informed consent forms and were instructed to complete the questionnaires during class. They were instructed to detach the informed consent form from the questionnaire. It took approximately 15 minutes to complete

the questionnaire. The questionnaires and informed consent forms were separately collected immediately after completion. The return rate was 86.5%.

Each questionnaire was assigned a number code and no identifying information was included on the questionnaires. The survey data were entered into an Excel spreadsheet (Microsoft Office, 2007) and rechecked for accuracy. Incomplete questionnaires and questionnaires with unclear responses were excluded. The data were analyzed using SPSS-16.0 statistical software. The study was descriptive in nature to obtain the frequency of responses on each item of the questionnaire. In addition, s series of chi-square analyses were computed to determine if there were demographic differences on selected questionnaire items. In particular, differences were investigated between males and females, as well as participants who reported a medical diagnosis of GERD and those who did not reported a GERD diagnosis.

RESULTS

The demographic and background information of participants is provided in Table 2. The majority of participants were female (75.1%), which is a slightly higher number compared to the university's overall enrollment. The majority of participants reported their race as White/Caucasian (90.5%), while the remaining reported their race as Black/African American, Other, Asian/Pacific Islander, and American Indian/Alaskan Native (5.1, 2.6, 1.4, and 0.4%, respectively). While 24.9% of participants reported having a biological family member with a diagnosis of acid reflux, 5.5% of participants reported that they themselves had a medical diagnosis of acid reflux. In addition, 5.1% reported having a diagnosis of other digestive or stomach disorders. This background information also indicated that the majority of participants incorrectly wrote what GERD stands for and that 68.9% reported they did not know or were unsure if they had previously heard of the Little Purple Pill, an advertising slogan for the over-the-counter GERD medication, *Nexium*.

The mean total RSI score was 8.18 ($SD = 7.66$). Figure 1 shows the percentages of responses on the total RSI. A trend was observed in which there was a decrease in the percentage of participants as the RSI score increased. Over 20% of participants reported a total score of greater than 13. The percentages of responses for individual items on the RSI are presented in Table 3. Based on combined self-ratings of 4 and 5, the most frequently reported symptoms on the RSI were excess throat mucus or postnasal drip (Question 20), heartburn, chest pain, indigestion, or stomach acid coming up (Question 26), and clearing the throat (Question 19) (13.2, 10.3, and 6.3%, respectively). The least commonly reported symptoms were hoarseness or a problem with the voice (Question 18), difficulty swallowing food, liquids, or pills (Question 21), and breathing difficulties or choking episodes (Question 23) (2.5, 2.6, and 2.6%, respectively).

Questions 10 to 17 addressed self-reported symptoms of GERD and reported behaviors that may trigger GERD events. Based on a 6-point Likert scale (1 = *strongly disagree*, 6 = *strong agree*), 9.2, 12.8, and 12.5% of participants moderately to strongly agreed that they wake up in the night with discomfort in the throat or chest (Question 10), experience a gurgling sensation in the throat after meals (Question 12), and experience pain in the throat or chest after eating (Question 16). While 30% of participants reported moderately to strongly agreeing that they go to sleep at least two hours after eating (Question 17), approximately half agreed that they tend to sleep with the head elevated (Question 15).

The frequency of participants' consumption of foods and liquids that are believed to trigger GERD episodes are shown in Table 4. The most commonly reported consumed items per week included caffeinated beverages, fatty foods, and carbonated beverages (31.1, 20.5, and 20.1% for five to seven days per week, respectively). Alcohol, peppermint, and spicy foods (1.8, 5.1, and 5.5% for five to seven days per week, respectively) were the least frequently reported items.

Differences on the RSI were found between participants who reported being medically diagnosed with GERD and those who did not report this diagnosis. The RSI scores were reclassified into two groups according to the continuum: Group 1 included scores 0, 1, and 2 (*no to mild problem*) and Group 2 included scores 3, 4, and 5 (*moderate to severe problem*). The data were then analyzed using a series of chi-square tests. Participants who reported having a medical diagnosis of GERD were statistically more likely to indicate greater severity of problems on all nine items on the RSI. Figure 2 displays that participants with GERD were statistically more likely to report problems with hoarseness and other voice problems than participants who did not report having a diagnosis (Question 18), $\chi^2(1, N = 273) = 6.33$, $p < .05$. The remaining items of the RSI are shown in Table 5. However, there were no statistical differences between participants diagnosed with GERD and participants who were not diagnosed with reported consumption of foods and beverages believed to trigger GERD episodes. For instance, there was no statistical difference between reported diagnosis and consumption of spicy foods (Question 30), $\chi^2(2, N = 273) = 1.37$, $p > .05$.

In addition, the present study found gender differences in eating habits and consumption of beverages believed to trigger GERD. Based on the 6-point Likert scale, ratings were reclassified into three groups: Group 1 (*strongly disagree to disagree*), Group 2 (*moderately disagree to moderately agree*), and Group 3 (*strongly agree to agree*). A series of chi-square analyses were conducted. Fewer males were statistically more likely than females to consider themselves slow eaters, $\chi^2(2, N = 273) = 17.3$, $p < .05$ (Question 13). Females were statistically more likely than males to report feeling full after eating quickly, $\chi^2(2, N = 273) = 6.70$, $p < .05$ (Question 14). A difference in reported alcohol consumption was also found between genders. Males

Question	Response	Percent
(02) Sex	Male	24.9
	Female	75.1
(03) Race	American Indian/Alaskan Native	00.4
	Asian/Pacific Islander	01.4
	Black/African American	05.1
	White/Caucasian	90.5
	Other	02.6
(04) Medically Diagnosed with Acid Reflux	Yes	05.5
	No	94.5
(05) Diagnosis of Reflux in Biological Family	Yes	24.9
	No	75.1
(07) Diagnosed with Other Digestive Disorders	Yes	05.1
	No	94.9
(08)Heard of Little Purple Pill	Yes	31.1
	No	61.2
	I Don't Know	07.7
(09) Know What GERD Stands for	Correct Response	05.1
	Incorrect Response	94.9

Note. The values represent the percentages of responses.

Table 2.
Responses for Background Information

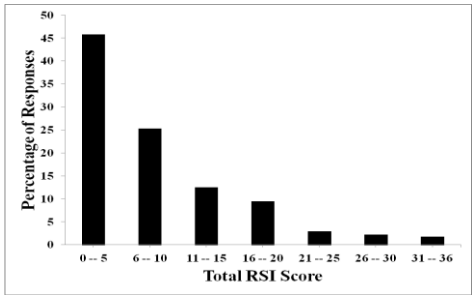

Figure 1.
Frequency of total RSI scores. The data represent percentages of responses on the total RSI score.

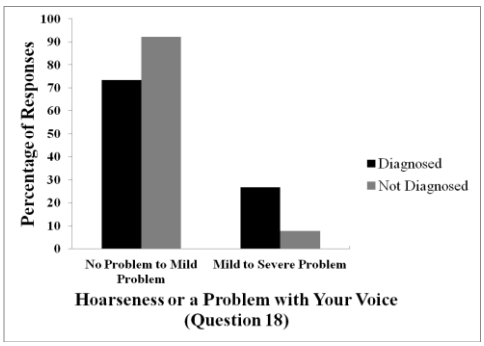

Figure 2.
Differences between participants with and without a reported diagnosis of GERD on reported hoarseness or voice problems. The data represent percentages of responses.

Question	Response (%)						
	0	1	2	3	4	5	Total
(18) Hoarseness or a problem with your voice	62.3	17.9	11.0	6.2	1.8	0.7	100
(19) Clearing your throat	31.5	21.2	21.2	19.8	4.8	1.5	100
(20) Excess throat mucus or postnasal drip	34.1	19.4	16.5	16.8	10.3	2.9	100
(21) Difficulty swallowing food, liquids, or pills	72.5	16.1	4.4	4.4	2.6	0	100
(22) Coughing after you ate or after lying down	71.4	13.9	7.0	3.7	2.6	1.5	100
(23) Breathing difficulties or choking episodes	75.8	13.6	5.5	2.6	1.5	1.1	100
(24) Troublesome or annoying cough	61.9	15.0	9.2	8.4	3.3	2.2	100
(25) Sensation of something sticking in your throat or lump in your throat	52.7	19.4	12.5	10.3	3.7	1.5	100
(26) Heartburn, chest pain, indigestion, or stomach acid coming up	50.2	19.4	12.1	8.1	6.6	3.7	100

Note. The values represent the percentages of responses.

Table 3.
Responses for Individual Items of RSI.

Question	Response (%)			
	0 - 2	3 - 4	5-7	Total
(27) Citrus fruits or juices	60.7	26.1	13.2	100
(28) Carbonated beverages	55.7	24.2	20.1	100
(29) Caffeinated beverages	42.9	26.0	31.1	100
(30) Spicy foods	75.5	19.0	05.5	100
(31) Fatty foods	26.0	53.5	20.5	100
(32) Tomatoes or tomato sauces	64.8	28.9	06.3	100
(33) Alcohol	87.9	10.3	01.8	100
(34) Peppermint	81.3	13.6	05.1	100
(35) Chocolate	61.6	28.9	9.5	100

Note. The values represent the percentages of responses regarding the number of days per week that each item is consumed on average.

Table 4.
Responses for Frequency of Food and Beverage Consumption.

RSI Item	DF	χ^2	p
(18) Hoarseness or a problem with your voice	1	6.33	.033
(19) Clearing your throat	1	9.53	.002
(20) Excess throat mucus or postnasal drip	1	10.13	.001
(21) Difficulty swallowing food, liquids, or pills	1	17.05	.000
(22) Coughing after you ate or after lying down	1	8.05	.005
(23) Breathing difficulties or choking episodes	1	7.22	.007
(24) Troublesome or annoying cough	1	4.99	.025
(25) Sensation of something sticking in your throat or lump in your throat	1	11.93	.001
(26) Heartburn, chest pain, indigestion, or stomach acid coming up	1	32.11	.000

Note. The values represent the degrees of freedom, chi-square results, and p values.

Table 5.
Chi-Squares between Participants Diagnosed and Not Diagnosed with GERD on Individual Items of RSI.

were statistically more likely than females to report consuming alcohol more frequently, $\chi^2(2, N = 273) = 8.37$, $p < .05$ (Question 33). No statistical differences were found between gender and items of the RSI.

DISCUSSION

The findings of this study suggest that the prevalence of LPR is relatively uncommon among the young adult population. The average score on the RSI was 8.18. Since Belafsky et al. (2002) suggested that scores greater than 13 are indicative of abnormal degrees of reflux, this is consistent with a possible lower risk of LPR in younger adults. These findings are consistent with those of Lowden et al. (2009), who found that the mean total RSI score was similar for older adults ($M = 7.36$). It appears that younger adults experience a comparable degree of reported symptoms of LPR with older adults. However, this is inconsistent with previous studies that reported that the mean RSI score increased with age (Schindler et al., 2010). Similarly, Chan et al. (2010) found that people of increasing age were more likely to have GERD.

Likewise, the percentage of participants in the present study who reported a RSI score of 11 or higher was consistent with Lowden et al. (28.9 and 26.5%, respectively). Although the younger population showed both a slightly higher mean RSI score and percentage of severity on the RSI than the older population, direct comparisons between studies cannot be made. Lowden et al. administered the RSI to patients in a general practice healthcare setting, while the present study surveyed undergraduate college students. Since Lowden et al. and the present study did not exclude participants who may have had conditions similar to the symptoms on the RSI, further investigation of the effects of normal aging on symptoms of LPR is warranted. Of the 28.9% of participants in the present study who reported an RSI score of 11 or more, it might be possible that a number of young adults experience symptoms related to undiagnosed LPR. Lowen et al. discussed the possibility of patients being undiagnosed with this condition.

Since the most frequently reported symptoms on the RSI included excess throat mucus, heartburn, and clearing the throat, it is likely that these symptoms are indicative of signs of the expected range of reflux episodes among normal young adults. These same symptoms were reported by Lin et al. (2009) in normal older adults. It may be necessary for future studies to examine the degree that these symptoms would be considered within normal range to excessive range to differentiate between normal and abnormal events of refluxed material. It may also be possible, however, that these symptoms were associated with other factors, such as upper respiratory tract infections and seasonal allergies. Musser, Kelchner, Neils-Strunjas, and Montrose (2011) believed that the RSI can incorrectly identify patients with LPR who have respiratory conditions because these symptoms occasionally show similarities. Therefore, they concluded that the RSI could over-identify patients as having LPR.

In contrast, the present study found that the least reported symptom on the RSI was hoarseness or problems with the voice. This finding suggests that voice problems are not commonly experienced by normal young adults and would likely be considered less typical signs of expected LPR. This supports that laryngeal and voice disturbances may be associated specifically with excessive LPR episodes. Likewise, participants who reported a medical diagnosis of GERD were more likely than the general population of younger adults to report severe problems on all nine items of the RSI. Specifically, young adults with

GERD reported more problems with hoarseness or other problems with their voice. This result is consistent with previous literature on the relationship between reflux and voice disorders (Bercin et al., 2008; Chung et al., 2009; Koufman, Amin, & Panetti, 2000; Kuhn et al., 1998; Lowden et al., 2009; Suttithawil, Chakkaphak, Jaruchinda, & Fuangtong, 2006). For instance, Lin et al. (2009) found that the symptom of hoarseness was the most clinically useful item on the RSI to predict LPR and GERD in patients with esophagitis and advocated that hoarseness was a good predictor of excessive reflux events.

The results of the present study also found differences between genders on reported eating habits and consumption of foods and beverages believes to trigger GERD. Males were more likely than females to consume alcohol more frequently during the week. Being male has previously been considered a risk factor for the development of LPR and GERD (Chan et al., 2010; Lin et al., 2009). In addition, alcohol consumption has been associated as a factor that may trigger LPR and GERD (Koufman, 1991; Koufman et al., 1996; Lin et al.). The finding of the present study suggests that young adult males may be at greater risk of developing conditions such as LPR and GERD. Males were less likely than females to consider themselves slow eaters, while females were more likely to report feeling full after eating quickly. This may be related to sensory differences between males and females, suggesting that males have less awareness of satiety. These results may also place males at a higher risk of LPR and GERD. This study found that younger adults consume foods and beverages that are believed to trigger GERD in relatively moderate amounts. Participants reported infrequent consumption of spicy foods, which studies have found to be contributing factors in triggering GERD episodes (Kaltenbach et al., 2006; Makhadoom et al., 2007).

In conclusion, younger adults likely experience a similar amount of reported LPR symptoms based on the RSI as compared with older adults, as few younger individuals reported severe LPR symptoms. This finding suggests that norms for older adults on the RSI may also be generalized to the younger adult population, specifically between the ages of 18 and 25. The present study suggests that otolaryngologists and voice clinicians may have greater confident in applying these same values to younger patients during the assessment and treatment of LPR when using the RSI as one of several tools. In addition, hoarseness or other voice problems appear to be a key clinical symptom when differentiating between young adults who have a medical diagnosis of GERD and those who do not, suggesting that dysphonia is not an expected problem in the normal young adult population. This study also found that males might be at an increased risk of developing LPR and/or GERD based on self-reported eating habits and frequency of food and beverage consumption.

It is observed that there are several limitations to the present study. Since the participants in the study were limited to undergraduate college students, one cannot generalize these findings to the entire young adult population. It is possible that the lifestyles of college students and other potential extraneous factors may make it difficult to summarize LRR anad GERD symptoms among young adults. In addition, a small sample of participants with GERD was included in the study (N = 15). Since an overwhelming majority of the participants surveyed identified their race as Caucasian and the majority of participants were female, future studies should include a more diverse sample to examine potential differences in reported RSI scores between racial groups and gender. It is recognized that the questionnaire only included an item about a medical diagnosis of GERD and not a separate item about a medical diagnosis of LPR. Therefore, it is not possible to determine if participants had LPR or a combination of LPR and GERD, and caution should be used when interpreting the results of the study. However, since only 5% of the participants reported having GERD, it is the authors' belief that a similarly small percentage of the participants would have a medical diagnosis of LPR and that the findings would remain relatively unchanged. Since this study found that young adults with GERD were more likely to report problems on every item of the RSI, it is possible that those with GERD may also be presenting symptoms that are more consistent with LPR. However, this cannot be determined since participants were not asked if they were medically diagnosed with LPR.

Future studies should include different age groups to make direct comparisons on the effects of normal aging and prevalence of LPR and GERD. Lastly, few questions targeted participants' knowledge and awareness about LPR and GERD. In the future, studies should target the young adult male population and examine potential methods of educating them about potential risk factors and symptoms of both disorders.

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REFERENCES

Belafsky, P. C., Postma, G. N., & Koufman, J. A. (2002). Validity and reliability of the reflux symptom index (RSI). *Journal of Voice*, *16*(2), 274-277.

Bercin, S., Kutluhan, A., Yurttas, V., Yalciner, G., Bozdemir, K., & Sari, N. (2008). Evaluation of laryngopharyngeal reflux in patients with suspected laryngopharyngeal reflux, chronic otitis media and laryngeal disorders. *European Archives of Oto-Rhino-Laryngology*, *265*(12), 1539-1543.s

Book, D. T., Rhee, J. S., Toohill, R. J., & Smith, T. L. (2002). Perspectives in laryngopharyngeal reflux: An international survey. *Laryngoscope*, *112*, 1399-1406.

Branski, R. C., Bhattacharyya, N., & Shapiro, J. (2002). The reliability of the assessment of endoscopic laryngeal findings associated with laryngopharyngeal reflux disease. *Laryngoscope*, *112*(6), 1019-1024.

Cesari, U., Galli, J., Ricciardiello, F., Cavaliere, M., & Galli, V. (2004). Dysphonia and laryngopharyngeal reflux. *Acta Otorhinolaryngologica Italica*, *24*(1), 13-19.

Chan, K., Liu, G., Miller, L., Ma, C., Xu, W., Schlachta, C. M., & Darling, G. (2010). Lack of correlation between a self-administered subjective GERD questionnaire and pathologic GERD diagnosed by 24-h esophageal pH monitoring. *Journal of Gastrointestinal Surgery*, *14*(3), 427-436.

Chung, J. H., Tae, K., Lee, Y. S., Jeong, J. H., Cho, S. H., Kim, K. R., Park, C. W., & Han, D. S. (2009). The significance of laryngopharyngeal reflux in benign vocal mucosal lesions. *Otolaryngology Head and Neck Surgery*, *141*(3), 369-373.

Cohen, S. M., Huang, S., Garrett, C. G., & Courey, M. S. (2005). Acute histologic effects of extraesophageal reflux on vocal fold healing. *Ann Otol Rhinol Laryngol*, *114*(4), 296-303.

Delahunty, J. E., & Cherry, J. (1968). Experimentally produced vocal cord granulomas. *Laryngoscope*, *78*(11), 1941-1947.

Gilger, M. A. (2003). Pediatric otolaryngologic manifestations of gastroesophageal reflux disease. *Current Gastroenterology Reports*, *5*(3), 247-252.

Gumpert, L., Kalach, N., Dupont, C., & Contencin, P. (1998). Hoarseness and gastroesophageal reflux in children. *The Journal of Laryngology and Otology*, *112*(1), 49-54.

Hicks, D. M., Ours, T. M., Abelson, T. I., Vaezi, M. F., & Richter, J. E. (2002). The prevalence of hypopharyngeal findings associated with gastroesophageal reflux in normal volunteers. *Journal of Voice*, *16*(4), 564-579.

Kaltenbach, T., Crockett, S., & Gerson, L. B. (2006). Are lifestyle measures effective in patients with gastroesophageal reflux disease? *American Medical Association*, *166*, 965-971.

Kelchner, L. N., Horne, J., Lee, L., Klaben, B., Stemple, J. C., Adam, S., Kereiakes, T., & Levin, L. (2007). Reliability of speech-language pathologist and otolaryngologist ratings of laryngeal signs of reflux in an asymptomatic population using the reflux finding score. *Journal of Voice*, *21*(1), 92-100.

Koufman, J. A., Aviv, J. E., Casiano, R. R., & Shaw, G. Y. (2002). Laryngopharyngeal reflux: Position statement of the committee of speech, voice, and swallowing disorders of the American Academy of Otolaryngology-Head and Neck Surgery. *Otolaryngology-Head and Neck Surgery*, *127*(1), 32-35.

Koufman, J. A. (2002). Laryngopharyngeal reflux is different from classic gastroesophageal reflux disease. *Ear, Nose and Throat Journal*, *2*, 7-9.

Koufman, J. A., Amin, M. R., & Panetti, M. (2000). Prevalence of reflux in 113 consecutive patients with laryngeal and voice disorders. *Official Journal of American Academy of Otolaryngology-Head and Neck Surgery*, *123*(4), 385-388.

Koufman, J., Sataloff, R. T., & Toohill, R. (1996). Laryngopharyngeal reflux: Consensus conference report. *Journal of Voice*, *10*(3), 215-216.

Koufman, J. A. (1991). The otolaryngologic manifestations of gastroesophageal reflux disease (GERD): A clinical investigation of 225 patients using ambulatory 24-hour pH monitoring and an experimental investigation of the role of acid and pepsin in the development in laryngeal injury. *The Laryngoscope*, *101*(4 Pt 2 Suppl 53), 1-78.

Kuhn, J., Toohill, R. J., Ulualp, S. O., Kulpa, J., Hofmann, C., Arndorfer, R., & Shaker, R. (1998). Pharyngeal acid reflux events in patients with vocal cord nodules. *Laryngoscope*, *108*(8 Pt 1), 1146-1149.

Little, F. B., Koufman, J. A., Kohut, R. I., & Marshall, R. B. (1985). Effect of gastric acid on the pathogenesis of subglottic stenosis. *Ann Otol Rhinol Laryngol*, *94*(5 Pt 1), 516-519.

Lowden, M., McGlashan, J. A., Steel, A., Strugala, V., & Dettmar, P. W. (2009). Prevalence of symptoms suggestive of extra-oesophageal reflux in a general practice population in the UK. *Logopedics Phoniatrics Vocology, 34*, 32-35.

Makhadoom, N., Abouloyoun, A., Bokhary, H. A., Dhafar, K. O., Gazzaz, Z. J., & Azab, B. A. (2007). Prevalence of gastroesophageal reflux disease in patients with laryngeal and voice disorders. *Saudi Medical Journal*, *28*(7), 1068-1071.

Mesallam, T. A., Stemple, J. C., Sobeih, T. M., & Elluru, R. G. (2007). Reflux Symptom Index versus Reflux Finding Score. *Annals of Otology, Rhinology, Laryngology*, *116*(6), 436-440.

Musser, J., Kelchner, L., Neils-Strunjas, J., & Montrose, M. (2011). A comparison of rating scales used in the diagnosis of extraesophageal reflux. *Journal of Voice*, *25*(3), 293-300.

Ozturk, O., Oz, F., Karakullukcu, B., Oghan, F., Guclu, E., & Ada, M. (2006). Hoarseness and laryngopharyngeal reflux: A cause and effect relationship or coincidence? *European Archives of Oto-Rhino-Laryngology*, *263*, 935-939.

Richardson, B. E., Heywood, B. M., Sims, H. S., Stoner, J., & Leopold, D. A. (2004). Laryngopharyngeal reflux: Trends in diagnostic interpretation criteria. *Dysphagia*, *19*, 248-244.

Schindler, A., Mozzanica, F., Ginocchio, D., Peri, A., Bottero, A., & Ottaviani, F. (2010). Reliability and clinical validity of the Italian reflux symptom index. *Journal of Voice*, *24*(3), 354-358.

Simons, J. P., Rosen, C. A., Casselbrant, M. L., Chi, D. H., Schaitkin, B. M., Rubinstein, E. N., & Mandell, D. L. (2008). Comparison of pediatric voice outcome survey, reflux symptom index, reflux finding score, and esophageal biopsy results. *Arch Otolaryngol Head Neck Surg*, *134*(8), 837-841.

Smith, J., Woodcock, A., & Houghton, L. (2010). New developments in reflux-associated cough. *Lung*, *188*(1), S81-S86.

Suttithawil, W., Chakkaphak, S., Jaruchinda, P., & Fuangtong, R. (2006). Vocal cord dysfunction concurrent with a nutcracker esophagus and the role of gastroesophageal reflux disease. *Ann Allergy Asthma Immunol*, *96*(2), 373-375.

Toros, S. Z., Toros, A. B., Yuksel, O. D., Ozel, L., Akkaynak, C., & Naiboglu, B. (2009). Association of laryngopharyngeal manifestations and gastroesophageal reflux. *European Archives of Oto-Rhino-Laryngology*, *226*(3), 403-409.

Wetmore, R. F. (1993). Effects of acid on the larynx of the maturing rabbit and their possible significance to the sudden infant death syndrome. *Laryngoscope*, *103*(11 Pt 1), 1242-1254.

Appendix A

35-Item Questionnaire

"Feel the Burn"

Acid Reflux Survey

Please do not write your name anywhere on this survey.

Background Information

Instructions: Please circle your responses to the right of the following questions.

1.	What is your age?	18 19 20 21 22 23 24 25 or older
2.	What is your sex?	Male Female
3.	What is your race?	American Indian/Alaskan Native Asian/Pacific Islander Black/African American White/Caucasian Other
4.	Have you been medically diagnosed with acid reflux?	Yes No
5.	Has anyone in your biological family been diagnosed with acid reflux?	Yes No
6.	If you answered yes to question #5, please indicate their relation(s) to you by circling the following:	Mother Father Sibling Grandparent Aunt/Uncle Other
7.	Have you been diagnosed with any other stomach or digestive disorder(s)?	Yes No
8.	Have you ever heard of the Little Purple Pill?	Yes No I Don't Know
9.	Do you know what GERD stands for?	Yes No I Don't Know

Agreement Questions

Instructions: Please circle the number that best corresponds to your level of agreement based on the scale below:
1 = Strongly Disagree 2 = Disagree 3 = Moderately Disagree 4 = Moderately Agree 5 = Agree 6 = Strongly Agree

10.	I wake up in the night with discomfort in my throat or chest.	1 2 3 4 5 6
11.	I rarely overeat.	1 2 3 4 5 6
12.	I experience a gurgling sensation in my throat after meals.	1 2 3 4 5 6
13.	I consider myself a slow eater.	1 2 3 4 5 6
14.	I often feel full after eating quickly.	1 2 3 4 5 6
15.	I tend to sleep with my head elevated.	1 2 3 4 5 6
16.	I experience pain in my throat and/or chest after eating.	1 2 3 4 5 6
17.	I go to sleep at least two hours after eating.	1 2 3 4 5 6

Symptom Questions

Instructions: Please circle the number to the right of each statement based on if and how the following problems affected you within the last month. 0 indicates no problem and 5 indicates severe problem.

18.	Hoarseness or a problem with your voice.	0 1 2 3 4 5
19.	Clearing your throat.	0 1 2 3 4 5
20.	Excess throat mucus or postnasal drip.	0 1 2 3 4 5
21.	Difficulty swallowing food, liquids, or pills.	0 1 2 3 4 5
22.	Coughing after you ate or after lying down.	0 1 2 3 4 5
23.	Breathing difficulties or choking episodes.	0 1 2 3 4 5
24.	Troublesome or annoying cough.	0 1 2 3 4 5
25.	Sensation of something sticking in your throat or lump in your throat.	0 1 2 3 4 5

26. Heartburn, chest pain, indigestion, or stomach acid coming up.	0	1	2	3	4	5

Food Questions

Instructions: *Please circle your responses to the right of the following statements.*

On average, how many days of the week do you eat or drink the following:

a. Citreous fruits or juices?	0	1–2	3–4	5–7
b. Carbonated beverages?	0	1–2	3–4	5–7
c. Caffeinated beverages?	0	1–2	3–4	5–7
d. Spicy foods?	0	1–2	3–4	5–7
e. Fatty foods?	0	1–2	3–4	5–7
f. Tomatoes or tomato sauces?	0	1–2	3–4	5–7
g. Alcohol?	0	1–2	3–4	5–7
h. Peppermint?	0	1–2	3–4	5–7
i. Chocolate?	0	1–2	3–4	5–7

STUDENTS' SELF-PERCEPTIONS OF SPEECH RATE, FLUENCY, AND INTELLIGIBILITY

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ABSTRACT

The purpose of this investigation was to determine the self-perceptions of speech-language pathology students regarding speech rate, fluency, and intelligibility. Investigators developed the 12-item *Students Self-Perceptions of Speech Rate, Fluency, and Intelligibility* questionnaire and administered it to 225 undergraduate and graduate speech-language pathology students. Results of the questionnaire indicated that students perceived themselves to have ideal speech rate, fluency, and intelligibility. Results further indicated that despite have had no coursework in speech rate or fluency (i.e., stuttering), students were confident and willing to provide speech rate modification services. Implications of these perceptions as they relate to assessing and treating communication disorders are discussed.

KEY WORDS

Stuttering, Speech Rate, Intelligibility, Perceptions, Students

INTRODUCTION

Speaking rate is defined as a measurement of the speed in which articulatory processes are coordinated for speech (Tumanova, Zebrowski, Throneburg, & Kulak Kayikci, 2010). Speaking rate is calculated in a variety of ways; however, it is frequently computed by measuring the number of words or syllables a speaker uses per minute in a speech sample (Guitar, 2006). The speaking rate value considered to be ideal in facilitating speech fluency is 115-165 words per minute (Guitar, 2006). While increased rates of speech do not cause communication difficulties for the majority of speakers, increased rates may lead to communication difficulties in some speakers. As a result of these difficulties, speech rate modification is frequently used to treat individuals with various communication disorders including specific language impairment, hearing impairment, neurological disorders, apraxia, memory deficits, and more recently stuttering (Logan, Roberts, Pretto, & Morey, 2002; Mauszycki & Wambaugh, 2008).

Speech rate modification is a therapy technique in which an individual intentionally changes their speech rate in order to facilitate communication (Conture, 2001). Speech rate may be reduced or modified by decreasing articulatory rate, increasing the number or duration of pauses within an utterance, or increasing the duration of pauses between turn-switching in partners during conversation (Logan et al., 2002). Specifically, reducing articulatory rate refers to slowing the speed at which speech sounds are produced, while increasing pause frequency and duration refers to increasing the length of time between words or utterances. While speech rate modification has obvious applications with many communication disorders, speech rate modification is particularly useful as it applies to modifying or reducing stuttering.

While there is no one known cause of stuttering, speech rate is thought to be one of the many factors that contribute to its frequency of occurrence. Starkweather and Gottwald's (1990) *Demands and Capacity* model provides one explanation for how speech rate may contribute to stuttering. This theory states that speech production and language formation processes involve many different domains (including those that contribute to fluency of speech), and often times these domains place simultaneous demands on one's capacity for speech and language (Conture, 2001; Guitar, 2006; Starkweather & Gottwald, 1990). When the demands of one dimension are too high, a speaker's system can become stressed or "overworked", which may lead to a diminished capacity in other domains. Thus, an increased rate of speech may stress a speaker's system (for example, creating a heightened demand for word finding or articulation), leading to a decreased capacity to generate fluent speech (Guitar, 2006).

Johnson and Rosen (1937) were among the first researchers to report that the amount of stuttering increased in individuals who stuttered when they were instructed to speak more rapidly than their natural rate of speech (as cited in Guitar, 2006). Additionally, Guitar (2006) reported an increase in disfluencies in children who used increased speech rates while attempting to produce longer utterances. These disfluencies were attributed to an increase in the demands imposed on speech motor control. For these reasons, speech rate modification has been suggested as a treatment for stuttering given that implementation of a slower speaking rate may allow for increased motor planning time. Specifically, reducing rate of speech may allow for more accurate and fluent speech, since it presumably alleviates some of the pressure created by time constraints (Starkweather, Gottwald, & Halfond, 1990).

Speech rate modification treatment procedures can be implemented in a number of ways. For example, speech rate can be modified directly, in which case the client would be explicitly instructed to monitor their own rate of speech by implementing techniques such as use of a pacing board (Logan et al., 2002). In this situation, clinicians are expected to instruct the client to slow his/her speech rate by identifying and modeling, as well as trying to produce and highlight the difference between "slow" and "fast" speech rates (Conture, 2001). Alternatively, speech rate can be modified indirectly, which is the case with most preschool age children. In this scenario, the individual's communication partner would implement a slower speaking rate (Logan et al., 2002). When indirect speech rate modification is used, the clinician is often responsible for training a parent or frequent communication partner to slow their rate of speech using similar strategies to those used with direct modification. Specifically, parents are urged to use a slower speaking rate especially during activities where their children are most likely to be disfluent (Johnson & Rosen, 1937, as cited in Guitar, 2006; Kelly & Conture, 1992; Logan et al., 2002; Meyers & Freeman, 1985).

A number of studies have addressed the relationship between parental rate of speech and instances of stuttering in children (Guitar et al, 2002; Guitar & Marchinowski, 2001; Logan et al., 2002; Stephanson-Opsal & Bernstein Ratner, 1988). Collectively, results from these studies have found that the more rapidly a mother speaks to their child, the more disfluencies the child will produce depending on their stuttering severity (Guitar, Schaefer, Donahue-Kilburg, & Bond, 1992). Parental speech rate modification was also shown to be successful in remediating stuttering in a case study where a 4-year-old child's mother was taught to reduce the number of questions asked, use less complex sentences, slow her rate of speech, avoid talking at the same time as her child, and allow for longer turn taking pauses (Langlois & Long, 1988, as cited in Guitar, 2006). Additionally, it has been shown that even in instances where parental rate modification did not influence a child's speech rate, stuttering instances still decreased (Guitar & Marchinkowski, 2001). These results suggest that although parental speech rate modification may not directly decrease communicative stress or demands, it may lead to increased fluency as a result of improved feelings of support and empathy from the parent. These findings indicate that parental speech

rate modification is effective in treating stuttering in children for the reasons listed above.

Although the effects of parental speech rate modification have been investigated, few investigators have studied the speech rates of the speech-language pathologists who are working with these clients. Results from Pellowski (2010) concluded that many speech-language pathologists exhibit a lack of knowledge and confidence with regards to measuring and defining speaking rate. Given the effectiveness of speech rate modification, it is vital that speech-language pathologists who treat individuals who stutter possess the ability to train their clients and communication partners in speech rate reduction. Likewise, clinicians should be able to modify their own speech rates in order to provide accurate models of slow and easy speech. Given the above, the purpose of this study was to investigate speech-language pathology students' perceptions of their own speaking rates, intelligibility, and fluency utilizing a survey-based research design.

METHOD

Participants

The participants for this study included 225 speech-language pathology (SLP) students. Participants were both undergraduate (N=182) and graduate students (N=43), and at the time of the study all participants were enrolled at a large metropolitan university in the mid-Atlantic region of the United States. Specifically, all undergraduate participants were registered as majoring in a Council on Academic Accreditation (CAA) accredited major of Speech Pathology and Audiology. Graduate students were registered in the CAA accredited Speech-Language Pathology Master of Science program. At this university, undergraduate and graduate students were required to maintain a 2.5 and 3.0 grade point average (GPA), respectively, to maintain academic standing within the Department of Audiology, Speech-Language Pathology, and Deaf Studies. Participants were selected randomly from SLP courses during the fall 2010 semester and asked to voluntarily complete a survey. Selection criteria required that students were full-time students (i.e., taking at least 12 credits for undergraduates and 9 credits for graduate students) majoring in speech pathology and audiology or speech-language pathology, and that they had no prior coursework in stuttering or speech rate reduction. Undergraduate students at this particular university had not completed any clinical coursework, whereas graduate students had completed 0 to 2 semesters of clinical coursework at the on-campus university clinic. Participants signed informed consent forms and were assured that confidentiality would be maintained throughout the completion of the study. The participants ranged in age from 18-48 years, and the average age was 22 years (SD = 3.8). The student group was largely made up of female participants (n=218) and significantly less males (n=7). Table 1 presents the demographic information related to gender and age. The demographic characteristics of this group were consistent with the population of SLP students at the university at which the study was conducted.

Category	M	SD	Range
Age (in years)	22	3.8	18-48
Category	**n**		**Percentage**
Gender			
Male	7		3.1%
Female	218		96.9%
Class Status			
Freshman	35		16%
Sophomore	34		15%
Junior	59		26%
Senior	55		24%
Graduate	42		19%

Table l.
Demographic Information of Participants (N = 225)

Materials

To collect information regarding how students perceived their speech, the *Students' Self-Perceptions of Speech Rate, Fluency, and Intelligibility Questionnaire* was developed. The questionnaire consisted of 12 items and was designed to assess SLP students' perceptions of their own speech rate, fluency, and intelligibility based on a 7-point Likert scale. The Appendix Apresents a copy of the questionnaire used in the current study.

Procedures

The questionnaire was administered to 225 SLP students during speech-language pathology courses, and participation was voluntary. Specifically, two research assistants requested permission from faculty and staff members to enter classes during the first 5-10 minutes during the fall 2010 semester to distribute and administer surveys. The research assistants read pre-scripted instructions to the participants and remained present in each classroom until all surveys were completed and returned. No time limits were imposed on the participants; however, all surveys were returned within 10 minutes. The response rate from the participants was 100% (i.e., all of the distributed surveys were returned). Following collection of the surveys, responses to all twelve questions were analyzed, which were based on a 7-point Likert scale. Specifically, the Likert scale was divided into three subgroups; the upper extreme (including scores from 6-7), neutral (including scores from 3-5), and the lower extreme (including scores from 1-2). The most popular subgroup was determined for each question by calculating the sums of the percentages of participants who chose each response within each subgroup.

#	Question		1	2	3	4	5	6	7	
1	My speech rate is	Too Fast	.4%	12.4%	44%	38.2%	4%	.9%	0%	Too Slow
2	My speech rate is	Appropriate	21.8%	32.4%	21.3%	17.3%	6.7 %	.4%	0%	Inappropriate
3	My fluency is	Fluent	34.8%	38.9%	12.1%	9.8%	4.5 %	0%	0%	Disfluent
4	My speech intelligibility is	Intelligible	45.8%	35.1%	10.7%	6.7%	1.8 %	0%	0%	Unintelligible
5	The relationship between my speech rate and fluency	Related	29.8%	33.3%	19.6%	8.4%	3.1 %	4%	1.8%	Unrelated
6	My ability to monitor and modify my speech rate	Able	47.6%	30.2%	13.8%	4.9%	3.1 %	.4%	0%	Not Able
7	My ability to monitor and modify my fluency	Able	40.9%	34.2%	16%	4.9%	3.1 %	.9%	0%	Not Able
8	My ability to monitor what I want to say	Able	47.6%	30.7%	13.3%	6.2%	1.8 %	0%	.4%	Not Able
9	My confidence as a speaker	Confident	26.7%	40.9%	22.2%	7.1%	3.1 %	0%	0%	Not Confident
10	My willingness to modify my speech rate if treating a person who stutters	Willing	76.4%	15.6%	3.6%	2.7%	.9%	.9%	0%	Not Willing
11	I am often asked to slow down when talking	Often	1.8%	4.4%	13.3%	10.2%	10.2 %	31.1 %	28.9 %	Not Often
12	I am often asked to repeat myself when talking	Often	0%	1.3%	13.8%	12%	20.9 %	37.8 %	14.2 %	Not Often

Table 2.

Percentage of Participant Responses Based on a 7-Point Likert Scale for Twelve Questions from the Questionnaire (N=225)

#	Question		Lower Extreme	Neutral	Upper Extreme	
1	My speech rate is	Too Fast	12.8%	86.6%	0.9%	Too Slow
2	My speech rate is	Appropriate	54.2%	45.3%	0.4%	Inappropriate
3	My fluency is	Fluent	73.7%	26.4%	0.0%	Disfluent
4	My speech intelligibility is	Intelligible	80.9%	19.2%	0.0%	Unintelligible
5	The relationship between my speech rate and fluency	Related	63.1%	31.1%	5.8%	Unrelated
6	My ability to monitor and modify my speech rate	Able	77.8%	21.8%	0.4%	Not Able
7	My ability to monitor and modify my fluency	Able	75.1%	24.0%	0.9%	Not Able
8	My ability to monitor what I want to say	Able	78.3%	21.3%	0.4%	Not Able
9	My confidence as a speaker	Confident	67.6%	32.4%	0.0%	Not Confident
10	My willingness to modify my speech rate if treating a person who stutters	Willing	92.0%	7.2%	0.9%	Not Willing
11	I am often asked to slow down when talking	Often	6.2%	33.7%	60.0%	Not Often
12	I am often asked to repeat myself when talking	Often	1.3%	46.7%	52.0%	Not Often

Table 3.
Percentage of Participant Responses Based on a 7-Point Likert Scale for Twelve Questions from the Questionnaire Including Subgrouping (N=225)

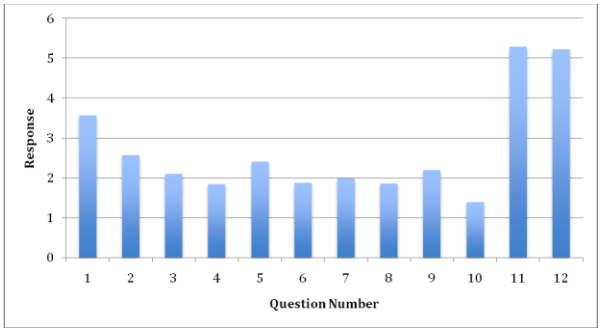

Figure 1.

Average response for all participants based on a 7-point Likert scale for all questions from the Students' Self-Perceptions of Speech Rate, Fluency, and Intelligibility questionnaire (N=225).

RESULTS

This investigation utilized a survey-based research design to assess 225 SLP students self-perceptions of speech rate, intelligibility, and fluency using a 7-point Likert scale for 12 questions. Responses are presented in Table 2 (and sub-grouped responses are presented in Table 3). Results indicated that 86.6% of students reported possessing a speech rate that was neither too fast nor too slow, and 54.2% of students reported that they felt their speech rate was appropriate. Likewise, 73.7% and 80.9% of students reported that their speech was mostly fluent and intelligible, respectively. Moreover, 63.1% of students demonstrated some understanding of the relationship between speech rate and fluency. The majority of students reported being able to monitor and modify their speech rate (77.8%) and fluency (75.1%) for therapy purposes, and 92% of students reported that they would be willing to modify their speech rate when working with a client who stutters.

With regards to students' perceptions of their speaking competency, 78.3% of the students reported a general ability to monitor what they say and 67.6% perceived that they were confident speakers. Of those surveyed, 60% reported that they were rarely or never asked to slow their rate of speech, and 52% reported that they were rarely or never asked to repeat themselves. The average response for each question is presented in Figure 1, and analysis of average responses revealed that the average response for question 1 (i.e., "My speech rate is too fast/too slow") was 3.7 (+/- 1.1), which fell in the neutral subgroup. An average response of approximately 4 indicated that on average, most students perceived their speech rate to be neither too fast nor too slow, indicating an adequate or appropriate speech rate. Overall, these findings indicated that the majority of students perceived their speech rate, intelligibility, and fluency to be within acceptable or ideal limits for providing speech-language therapy services.

DISCUSSION

The purpose of this investigation was to determine the self-perceptions of undergraduate and graduate SLP students regarding speech rate, fluency, and intelligibility. Results indicated that the majority of participants perceived their speech rates, fluency, and intelligibility to be ideal for providing speech-language therapy. Specifically, students perceived that they spoke neither too fast nor too slow, that their speech rates were adequate, and that they spoke intelligibly and fluently. Results also indicated that SLP students were confident in speaking and possessed the ability to monitor and modify their speech rate and fluency.

This investigation also aimed to examine the clinical implications of these self-perceptions, especially as they related to speech rate modification. Speech rate modification is an important therapy technique that is used to treat various communication disorders including specific language impairment, hearing impairment, neurological disorders, apraxia, memory deficits, and more recently stuttering (Logan, Roberts, Pretto, & Morey, 2002; Mauszycki & Wambaugh, 2008). Specifically, the *Demands and Capacity model* suggests that speech rate modification is useful treatment for stuttering; that is, by decreasing speech rate, the stress on a speaker's system is also decreased, thus allowing for more fluent speech (Guitar, 2006). Speech rate modification treatment requires a speech language pathologist (SLP) to be aware of ideal speech rates, to implement ideal speech rates, and to train clients and caregivers in the use of ideal speech rates. For these reasons, it is important for SLPs to be confident in their own speech rate, intelligibility, and fluency, and in their ability to provide these services.

In the present study, SLP students perceived themselves to possess ideal speech rates, fluency, and intelligibility, and they perceived that they were confident and willing to monitor and modify these aspects of speech despite having had no coursework in stuttering or speech rate modification. It is surprising that a high number of students reported feeling confident in providing treatment for an impairment in which they had little or no education or training. This is particularly notable, because the participants of this study were largely undergraduate students with no previous clinical experience. A similar phenomenon was also reported by O'Donoghue and Dean-Claytor (2008) who reported that SLPs without continuing education units (CEUs) in dysphagia were more confident in treating dysphagia than those with CEUs.

Students must obtain training to familiarize themselves with speech rate modification techniques and become aware of ideal speech rates so they can be successful at treating individuals who stutter. However, many SLP students do not receive adequate training, education, or clinical experiences in the treatment of stuttering (Block, Onslow, Packman, Gray, & Dacakis, 2005; Pellowski, 2010). Considering the findings of this investigation and the literature regarding speech rate modification, SLP students would benefit from receiving more coursework in the areas of speech rate and speech rate modification. This coursework may be particularly beneficial at the undergraduate level, before students begin acquiring clinical experience.

The present investigation included some limitations that warrant discussion. Specifically, this investigation may have been limited by a relatively small sample size. Additionally, the participants in this investigation were a homogenous group. Most of the participants were female SLP students at a metropolitan university in the mid-Atlantic region; therefore findings about speech self-perceptions and speaking confidence may be indicative of specific trends among this population rather than SLP students as a whole. Future research should perhaps include more diverse participants from multiple locations and/or universities in an attempt to rule out any potential gender and/or cultural differences or trends. Additional research is also needed to investigate students'

awareness of ideal speech rates (in words per minute) as related to treating stuttering and other communication disorders, of specific techniques that can be used for speech rate modification, and of the populations in which speech rate modification is useful. To date, there are no known studies that have assessed students' self-perceptions of speech rate, fluency, and intelligibility; therefore, findings from this investigation will hopefully broaden our knowledge in this area.

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REFERENCES

Block, S., Onslow, M., Packman, A., Gray, B., & Dacakis, G. 2005. Treatment of chronic stuttering: outcomes from a student training clinic. *International Journal of Language Communication Disorders. 40(4),* 455-466. doi: 10.1080/03093640500088161

Conture, E. (2001). *Stuttering: Its nature, diagnosis, and treatment*. Needham Heights, MA: Allyn & Bacon.

Guitar, B. (2006). *Stuttering: An integrated approach to its nature and treatment* (3rd ed.). Baltimore, MD: Lippincott, Williams, & Williams.

Guitar, B., & Marchinkoski, L. (2001). Influence of mothers' slower speech on their children's speech rate. *Journal of Speech, Language, & Hearing Research, 44,* 853-861. doi:10.1044/1092-4388(2001/067)

Guitar, B., Schaefer, H.K., Donahue-Kilburg, G., & Bond, L. (1992). Parent verbal interactions and speech rate: A case study in stuttering. *Journal of Speech, Language, & Hearing Research, 35,* 742-754.

Kelly, E.M., & Conture, E.G. (1992). Speaking rate, response time latencies, and interrupting behaviors in young stutterers, nonstutterers, and their mothers. *Journal of Speech and Hearing Research, 35,* 1256-1267.

Logan, K.J., Roberts, R.R., Pretto, A.P., & Morey, M.J. (2002). Speaking slowly: Effects of four self-guided training approaches on adults' speech rate and naturalness. *American Journal of Speech-Language Pathology, 11,* 163-174.

Mauszycki, S.C., & Wambaugh, J.L. (2008). The effects of rate control treatment on consonant production accuracy in mild apraxia of speech. *Aphasiology, 22*(7-8), 906-920.

Meyers, S., & Freeman, F. (1985). Are mothers of stutterers different? An investigation of social communicative interactions. *Journal of Fluency Disorders, 10,* 193-209.

O'Donoghue, C. R., & Dean-Claytor, A. (2008) Training and Self-Reported Confidence for Dysphagia Management Among Speech-Language Pathologists in the Schools. *Language, Speech, and Hearing Services in Schools, 39,* 192-198. doi: 0161-1461/08/3902-0192

Pellowski, M.W. (2010). Speech-language pathologists' knowledge of speaking rate and its relationship to stuttering. *Contemporary Issues in Communication Science and Disorders, 37,* 51-58.

Starkweather, C.W., & Gottwald, S.R. (1990). The Demand and Capacity model II: Clinical applications. *Journal of Fluency Disorders, 15,* 143-157.

Starkweather, C.W., Gottwald, S.R., & Halfond, M. (1990). *Stuttering prevention: A clinical method.* Englewood Cliffs, NJ: Prentice Hall.

Stephanson-Opsal, D., & Bernstein Ratner, B. (1988). Maternal speech rate modification and childhood stuttering. *Journal of Fluency Disorders, 13,* 49-56.

Tumanova, V., Zebrowski, P.M., Throneburg, R.N., & Kulak Kayikci, M.E. (2010). Articulation rate and its relationship to disfluency type, duration, and temperament in preschool children who stutter. *Journal of Communication Disorders, 44,* 116-129.

APPENDIX A

Students' Self-Perceptions of Speech Rate, Fluency, and Intelligibility Questionnaire

1) My speech rate is:

Too Fast	1	2	3	4	5	6	7	Too Slow

2) My speech rate is:

Appropriate	1	2	3	4	5	6	7	Inappropriate

3) My speech fluency is:

Fluent	1	2	3	4	5	6	7	Disfluent

4) My speech intelligibility is:

Intelligible	1	2	3	4	5	6	7	Unintelligible

5) The relationship between my speech rate and fluency:

Related	1	2	3	4	5	6	7	Unrelated

6) My ability to monitor and modify my speech rate:

Able	1	2	3	4	5	6	7	Not Able

7) My ability to monitor and modify my speech fluency:

Able	1	2	3	4	5	6	7	Not Able

8) My ability to plan what I want to say:

Able	1	2	3	4	5	6	7	Not Able

9) My confidence as a speaker:

Confident	1	2	3	4	5	6	7	Not Confident

10) My willingness to modify my speech rate if treating a person who stutters:

Willing	1	2	3	4	5	6	7	Not Willing

11) I am asked to slow down when talking:

Often	1	2	3	4	5	6	7	Not Often

12) I am asked to repeat myself when talking:

Often	1	2	3	4	5	6	7	Not Often

STUDENT PREFERENCES FOR LEARNING SPEECH ACOUSTICS USING ACTIVE LEARNING METHODS

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ABSTRACT

The current study explored student preferences regarding course activities in an undergraduate speech science course and students' familiarity and comfort level with acoustical concepts after participation in the course. Thirteen of 20 students enrolled in a hybrid undergraduate speech science course completed a survey aimed at eliciting student preferences for course learning activities. A paper-based survey was administered to discern students' comfort and familiarity with acoustic principles after completing the course. Learning activities included the use of electronic lectures in lieu of face-to-face lectures, online group discussions, and completion of an electronic portfolio consisting of laboratory results and interpretations. Results suggested that the students preferred the use of laboratory activities over more traditional lectures and hypothetical in-class quizzes. Also, students reported feeling more comfortable with basic acoustic principles after completion of the course. Results are discussed as well as the significance of the research and future research directions.

KEY WORDS

Student Preferences, Speech Science,
Electronic Lectures, Laboratory Activities

INTRODUCTION

The physical sciences play an important role in many academic fields across a long continuum of interests. The physical sciences have unique qualities when viewed from an active learning stance; physical sciences can be measured using visible, audible, palpable, and instrumental means. In terms of active learning methodologies, the physical sciences are a subject matter requiring active participation from the learner to truly integrate physical science principles into one's existing knowledge base (Brekelmans, Sleegers, & Fraser, 2002; Hofstein & Lunetta, 2004; Lammers & Murphy, 2002). In fact, experimentation in the physical sciences is probably a prerequisite to understanding and integrating scientific principles (Wolf & Fraser, 2008). Such is the case with the use of acoustics in speech science courses to explain and measure speech production as well as portions of hearing and speech perception.

Education in basic acoustical concepts plays a critical role in the communication sciences and disorders (American Speech-Language-Hearing Association, 2009). Speech-language pathologists participate in academic preparation in which acoustical concepts form a large part of the knowledge base regarding basic principles of speech production, hearing, and speech perception. Alongside anatomic, physiologic, and neurological considerations, basic acoustical concepts provide one avenue through which speech production and perception behaviors are physically realized and measured clinically. Given the large role acoustics plays, it could be expected that speech-language pathologists readily appreciate the clinical utility of acoustic measurements in assessing and treating disorders of communication. Bringing the science of acoustics into clinical practice may provide the practicing clinician a level of clinical accountability through objective measurement of speech phenomena (Finan, 2008; Sapienza & Stathopoulos, 1998). These clinicians may, however, be less than amenable to utilizing acoustic data in clinical decision-making due to several barriers, one of which is lack of training (Shuster, 2001).

Deficits in the acoustics education of pre-professional speech-language pathologists is likely multi-faceted. Wilcox (2004) posited that speech science has taken a subservient role in education due to academic programs' major foci on clinical practice preparation in speech-language pathology and audiology. Finan (2008), on the other hand, described a lack of student interest in speech science as potentially attributed to passive teaching styles (e.g., lectures). He recommended the use of active learning strategies in speech science in which students take a more dynamic role in interacting with course content and concepts. Actively engaging students in speech science content will likely bridge the gap between learning scientific constructs in a classroom and the reality of clinical practice. Teaching and learning of acoustics for the speech and hearing sciences are unique and stem from the direct applicability of acoustics to the human communication process. Thus, any place in which humans use speech communication holds the potential to become a laboratory in which students may actively gain, evaluate, interpret and integrate acoustics-based knowledge.

Studies on Active Learning in the Physical Sciences

Published accounts of educational efforts in communication sciences and disorders (CSD) are few, even more so when the focus of education is on acoustics and speech communication. Seikel, Drumright, Whites, and Seikel (1995) compared the use of laboratory activities in graduate and undergraduate speech science courses with control groups not completing labs. Results of their study supported the use of laboratory activities in the speech science classroom based on content learned. The authors concluded that students showed more interest in activities which used their own speech production, required more advanced problem-solving and critical thinking, and were directly related to clinical measurement of speech. Other accounts focusing on acoustical concepts consist mostly of full-text papers from conference proceedings outlining models (without testing learning outcomes) for use in the speech science classroom (such as Arai, 2002; and Cole, 1999) or abstracts from conference proceedings (such as Arai, 2006; Sanders, 2009; and Weiler, Boyce, & Steger, 2003). Currently, the speech science instructor who seeks guidance in course design principles and implementation is left largely to informal channels of support (e.g., more experienced colleagues). More detailed research regarding students' preferences for active classroom activities designed to learn basic acoustic concepts is necessary to ascertain which methods of instruction are more student-centered and result in improved acquisition of acoustical concepts.

Walden (2010) explored student perceptions of learning speech science concepts through a hybrid delivery format. He reported that students perceived laboratory activities and asynchronous online discussions to enhance their learning of speech science concepts in addition to gaining a better understanding of how speech science is used clinically by speech-language pathologists. The current study, while related, explored student preferences (versus perceptions) for learning activities geared toward speech science. The constructs of preference and perception are viewed as separate and possibly divergent in the current study. While students may perceive a learning activity to be helpful, they may prefer not to engage in that activity.

Further, course design and implementation will inevitably include some form of assessment of student learning. In speech science courses, "courses perceived by students as 'more difficult' may benefit from the application of formative assessment to enhance learning and retention as we move toward the goal of true learner-centered teaching" (Steckol, 2007, para. 13.). In fact, formative assessment is a required component for graduate programs to prepare students to meet the Standards and Implementation for the Certificate of Clinical Competence in Speech-Language Pathology (American Speech-Language-Hearing Association, 2001). Therefore, students completing

speech science courses may benefit from an approach in which their learning is assessed with a combination of both formative and summative approaches.

In the chemistry field, much attention has been paid to process oriented guided inquiry learning (POGIL). In the POGIL approach, lectures are rare. Instead, students are given tasks which apply theory, models, and concepts to a problem. Students work cooperatively to solve these problems during class. All the necessary information to solve each problem is provided for the study (e.g., formulas and graphs). During learning assessments, no multiple choice-type questions are asked. Instead, only a few problems make up the examination. The problems require critical thinking and application of concepts versus memorization of facts and figures.

Seattle University began teaching all chemistry course offerings using the POGIL model (Minderhout & Loertscher, 2007). While piloting the POGIL approach, the chemistry department's POGIL students were reported to outperform students who took chemistry via lecture format (no hands-on activities). Further, 92% of POGIL students reported that they made "major gains in taking responsibility for their own learning and respect for the opinions of others" (p. 178).

Brown (2010) replaced one-half of the lectures in a two-semester anatomy and physiology course with POGIL activities. Brown attributed an increase in the student exam score mean from 68% to 88% on the use of POGIL activities to introduce course concepts. Also, the percentage of students receiving a D grade or below was halved after introduction of the POGIL approach. Further, students in Brown's study reported high levels of satisfaction with the POGIL approach.

The purpose of the current study was to explore student preferences for technology-enhanced learning activities in an undergraduate speech science course. The study's secondary purpose was to survey students' familiarity and comfort level with acoustical concepts after participation in the course. Specifically, the study asked: (1) In order to meet the learning objectives in an undergraduate speech science course, which course learning activities (both active and traditional) did enrolled students prefer?; and (2) Did the participant students report becoming more familiar and comfortable with acoustical concepts due to participation in the undergraduate speech science course?

METHOD

Survey research techniques and the qualitative research of Bogdan and Biklen (2007) were generally applied for the design and analysis of data collected. The field notes for the data collected and the thematic analysis, in particular, followed recommendations made by Bogdan and Biklen.

In addressing the research purposes in this study, three distinct methods were implemented. First, a course in speech science was designed for high levels of active student engagement. Next, an anonymous, online survey focusing on student preferences in learning course content was constructed and distributed to the course participants two weeks prior to the course's conclusion. A second anonymous, paper-based survey was also constructed and distributed to the course participants after the final exam. Then the resultant data were analyzed in an attempt to discern the student participants' preferences for course activities as well as their level of comfort and familiarity with basic acoustical concepts. Each of these is described in detail next.

Participants and IRB Approval

Twenty female undergraduate students in a speech-language pathology and audiology major who were also registered for a course in speech science were asked to participate, voluntarily, in the current study. No student had been previously acquainted with acoustic principles in an academic setting. Before registering for the speech science course, the student participants had completed courses in phonetics, language acquisition, and anatomy and physiology of speech. Prior to collecting data for the current study, Institutional Review Board (IRB) approval was sought and gained at the cooperating institution.

Design of Course

The speech science course was offered as an elective in the speech-language pathology and audiology undergraduate major. It was designed to meet five goals: 1) to provide the student with an understanding of the complexity of the acoustic speech signal, the most commonly used medium of human communication; 2) to introduce the student to basic theories of speech production; 3) to introduce the student to basic theories of speech perception; 4) to introduce methods and instrumentation for measures of speech perception and production; and 5) to provide introductory-level material on possible causes of disorders of speech communication.

The course instructor designed the course activities and assessment approaches using a Humanist orientation to education (Merriam, Caffarella, & Baumgartner, 2007). According to Hiemstra and Brockett (1994), humanistic education is based on Carl Rogers' (1961) idea that self-direction "means that one chooses -- and then learns from the consequences" (p. 171). Patterson (1973) and Rogers (1983) believed that the "essential characteristics of the humanistic educator are empathic understanding, respect or acceptance, and genuineness or authenticity" (as cited in Hiemstra and Brockett, 1994, p. 65).

The course was designed to foster students' self-directed learning via hands-on, guided experimentation based on course concepts. For example, students participated in a nasality lab in which nasalance scores were derived using the *Nasometer II*.

The students then compared their nasalance scores to published norms and were required to interpret the results in terms speech production behavior. Any scores outside the published norms were then explained in terms of perceptual characteristics of the audio samples, environmental considerations, and limitations of instrumentation. Rather than reading about nasometry, students completed instrumental measurements, analyzed the results, discussed potential measurement errors (e.g., environmental noise), and applied the results to speech physiology.

To meet the course goals, learning activities included traditional classroom lectures, along with the following non-traditional teaching methods: electronic, self-paced, and interactive lectures (e-lectures); weekly asynchronous online group peer reviews; and preparation of an electronic portfolio (e-portfolio) consisting of all laboratory activities as well as each student's own independent outside review of research literature. Theories and models of speech production/perception were taught using traditional classroom lectures without a laboratory (see Appendix A for session number, course topics, and mode of instruction.) However, basic acoustic concepts, respiratory physiology and measurement, phonatory physiology and acoustic correlates and articulatory physiology and acoustic correlates were taught using e-lectures. The course participants met once a week for laboratory activities. Group peer-review activities were accomplished through asynchronous, online means (described below). The e-lectures, weekly group peer reviews, and the e-portfolio are described in detail next.

E-lectures.

Four self-paced, interactive e-lectures were created (using a flash-based presentation software package, *Articulate Studio '09*). These lectures were uploaded to Blackboard CE6 (an Internet-based, password-protected learning management system) for students to access on their own computers or in the university computer lab. The e-lectures were used instead of traditional lectures covering the following topics: Introduction to Acoustics, Function of the Respiratory System for Speech Production, Physiological Bases and Acoustic Correlates of Phonation, and Articulation and Acoustic Output. Each e-lecture consisted of a presentation of course content, links to outside Internet sources, and interactive activities (such as matching games with immediate feedback) allowing student self-assessment of recall of content presented in the lectures. The course instructor authored all of the e-lectures. An example of an abbreviated e-lecture may be viewed by using a Web browser with a flash player plug-in at http://www.patrickwalden.com/pref/player.html >.

For each topic students were instructed to watch and interact with the e-lecture several times over the semester before each topic was covered in class via laboratory activities in order to have been exposed to the course content required for each laboratory activity prior to completing the lab. Class time was not used for lecture, except for theories of speech production and perception and the acoustic bases of speech sensitivity (see Appendix A).

Weekly asynchronous, online group peer reviews (labeled discussions for students).

Use of asynchronous, online discussions has been shown to be an effective learning activity if it includes heavy instructor presence and student participation (Andresen, 2009). Along this line, in-depth face-to-face discussion of course content was replaced with asynchronous group peer reviews within a discussion board in Blackboard CE6. One face-to-face meeting each week was substituted with the peer review activity (therefore, there were 14 face-to-face meetings rather than 28). Students were randomly assigned to a peer review group and were given topics to cover in these groups each week. A complete list of weekly peer review topics can be found in Appendix B.

To receive full course credit for weekly peer reviews, students were required to individually answer the questions posted onto the discussion board by the instructor. Students were then required to reply to each group member's post in order to discuss the information presented by group members (regarding correctness of information posted) as well as to discuss how their group members' description of course concepts helped the individual student see a new angle or view a concept differently. Students were instructed to avoid the use of direct quotes from text or internet sources and to set each explanation into their own words in order to foster another way of understanding content. Lastly, students were required to answer at least one other group member's response to their original posting in order to clarify points or to correct misinterpreted information from the original post. In order to guide the peer review direction as well as to clarify misinterpreted information regarding the peer review topic the course instructor also replied to students individually on the discussion board each week.

E-portfolios.

To show students' learning throughout the speech science course, students were required to create an electronic portfolio of their laboratory activities and independent review of acoustics research literature as a Web page and post this Web page to the Internet. The pages students created were not indexed for search-by-search engines (such as Google) and the instructor did not create any links to the student Web pages outside the course. Students were free to post their material on personal Web pages, if they so chose in order to make their work available to the public outside the course.

The portfolio's content included the description of laboratory activities covering theories of speech production and perception (supplemented with independent review of the acoustics research literature), basic acoustical concepts, measures of vocal frequency and intensity, respiratory volume measurement, vocal quality measurement, nasalance measurement, and the use of spectrograms to describe the acoustic features of vowels and

consonants. Both *description* of speech phenomena as well as *interpretation* of laboratory findings were emphasized in the laboratory activities. Detailed instructions given to students for each of these areas can be found in Appendix C. All acoustical measurements were accomplished in groups with the whole class observing and commenting. These measurements were made using KayPentax's *Computerized Speech Lab Model 4500* (CSL) and the *Nasometer II*. Perceptual measures were also introduced for each of these areas through use of a required text on assessment in speech-language pathology (Shipley & McAfee, 2009).

Online, Anonymous Preferences Survey

An online survey designed to elicit student perceptions of their learning experience as well as their preferences regarding individual course activities was used to collect student data. The survey was created and data collected using Surveygizmo (www.surveygizmo.com), an online survey and questionnaire software application. Student participation in the online survey was voluntary and anonymous.

Students were solicited to participate in the survey two weeks prior to the end of the semester (Appendix D). To discourage student participation in the survey based on student fear of instructor retribution, a research assistant presented the survey to the class, distributed the informed consent document, and answered any questions the students had regarding the survey. Students were provided the Internet address to access the online survey in the informed consent document, through a link provided within Blackboard CE6, as well as in two reminder emails from the course instructor.

The survey elicited perceptions of their learning in the course as well as their preferences for learning through the course activities. Student *preferences* for course learning activities are conceptually distinct from their *perceptions* of their learning from the course. For example, students may perceive that asynchronous, online discussions (labelled "peer reviews" in this article) are effective for learning course content (perception); however, students may prefer not to complete them due to the time required to create posts each week (preference). Therefore, only survey items which corresponded to student preferences for learning activities are reported here. Eleven of the 18 survey items were statements regarding the individual activities in the course and students rated their level of agreement regarding each statement. The Likert-type scale ratings for nine of these 11 close-ended questions included "*Strongly Agree,*" "*Agree,*" "*Neutral,*" "*Disagree,*" and "*Strongly Disagree.*" From 11 close-ended questions two questions elicited students' rating of the course activity which helped their learning to the greatest degree and which activity was the least helpful (multiple choice-type questions). Students were asked in seven additional open-ended questions to comment on the overall course format as well as for the individual activities, as compared to their experiences with traditional, lecture-only formats. General topics covered in the survey included student preferences concerning e-lectures, traditional lecture, course labs, online peer reviews (discussions), e-portfolio, and hypothetical preferences (student would rather have had the activity completing the labs instead of an in-class lecture).

Survey of Familiarity and Comfort with Acoustical Concepts

Students were administered a second survey regarding their familiarity and comfort level with acoustical concepts after taking the course in speech science. This second survey was paper-based consisting of four statements to which students were asked to rate their level of agreement using the terms "*Strongly Agree,*" "*Agree,*" "*Neutral,*" "*Disagree,*" and "*Strongly Disagree.*" Table 1 lists these statements. The survey was handed out after the students' final exam and then students were given the option to fill out the survey and turn in to the instructor, turn in a blank survey, or to not turn in a survey. The survey did not ask the student to provide a name and was handed in separately from the students' completed final exams.

Data Analysis

Results from the online survey were exported into a comma delimited file from the Surveygizmo Website and viewed using spreadsheet software. These results contained both quantitative data and textual data from the open-ended questions (qualitative data). Qualitative data were removed from the spreadsheet and into a word processing document for thematic analysis (described below). Quantitative data derived from the 11 close-ended statements were coded using integers 5 through 1 ["*Strongly Agree,*" (5) "*Agree,*" (4) "*Neutral,*" (3) "*Disagree,*" (2) and "*Strongly Disagree*" (1)]. Data from the paper-based survey were keyed into a separate spreadsheet by hand using the same coding scheme.

Quantitative data regarding students' preferences for course activities were analyzed using descriptive statistic techniques (mean, standard deviation, and percent agreement). Table 1 lists the survey statements and the student participants' level of agreement from the online and paper-based surveys. For qualitative data analysis, each question was read separately by two independent researchers versed in qualitative data analysis and coded for meaning. Codes were then collapsed into themes across study participants. Both independent researchers reached consensus on each emergent theme. Last, disputing or negative evidence which would contradict the resultant themes was sought. According to Bogdan and Biklen (2007) themes should be compared to the original text document in an attempt to locate disputing evidence or negative cases. No disputing evidence for the themes reported in this manuscript was found.

RESULTS

Thirteen of 20 female students (65% return rate) who took the speech science course completed the online, anonymous survey. A sample size of thirteen is considered too small for standard statistical analyses. Therefore, only descriptive statistics were applied and used to determine student preferences for this

Online Survey Statement: Preferred Activities	Mean	SD	Percent Agree	Percent Neutral	Percent Disagree
N=13					
I liked completing the labs instead of in-class lecture.	4.54	0.66	92.3%	7.7%	0%
Overall, I liked the way the course was structured.	4.46	0.66	92.3%	7.7%	0%
I liked completing the online discussions.	3.77	1.01	69.3%	15.4%	15.4%
I would have preferred live, in-person lectures instead of e-lectures.	3.08	1.12	30.8%	30.8%	38.5%
I would have preferred more in-class time instead of online discussions.	3.08	1.32	53.9%	7.7%	38.5%
Overall, I feel a course consisting of in-person, live lecture would have better enhanced my understanding of course content that was presented in e-lectures.	3.00	1.16	38.5%	23.1%	38.5%
I would have preferred a lecture-only course without labs.	1.92	0.76	0%	23.0%	77.0%
Online Survey Statement: Preferred Hypothetical Activities					
N=13					
I would have preferred completing quizzes throughout the course instead of completing an e-portfolio.	1.62	0.87	7.7%	0%	92.3%
I would have preferred completing a paper-based portfolio instead of an e-portfolio.	1.54	0.88	7.7%	0%	92.3%
Paper-based Survey Statements: Student Learning					
N=19					
I feel learning through labs allowed me to learn acoustic principles most easily.	4.36	0.59	94.7%	5.3%	0%
I feel comfortable with basic acoustic principles after taking this course.	4.21	0.78	89.4%	5.3%	5.3%
Before taking this course, I was easily confused by acoustic information.	4.05	0.77	84.2%	10.5%	5.3%
After taking this course, I can read research containing acoustic information without a problem.	3.8	0.95	68.4%	21.1%	10.5%

Note: Mean values represent levels of agreement on a scale of five possible levels. A value of 5 represents "Strongly Agree" whereas a value of 1 represents "Strongly Disagree." Percent agreement was derived by combining 4 and 5 values for "Agree," 3 for "Neutral," and 2 and 1 values for "Disagree."

Table 1.
Mean, Standard Deviation and Percent Agreement for Student Survey Responses

sample of students. Most students (92.3%) reported that they liked the way the course was structured. Most students (92.3%) also reported preferring laboratory activities over lecture. Similarly, students (92.3%) preferred participating in laboratory activities over completion of hypothetical in-class quizzes. Students (92.3%) also reported a preference for the use of electronic portfolios over hypothetical paper-based portfolios. Students, however, disagreed regarding the replacement of face-to-face class time with online discussions ("peer reviews"), with 38.5% preferring the peer reviews, and 53.9% preferring more in-class time. The students were neutral regarding the use of e-lectures to replace in-class lecture (30.8% preferred live lecture, 30.8% were neutral, and 38.5% preferred e-lectures). There was greater variability of response for statements concerning the online discussions as well as the e-lectures, creating a lack of general consensus in one direction. Conclusions based strictly on the survey statements regarding the use of e-lectures and online peer reviews (discussions) cannot be definitively drawn.

The student participants' responses regarding the course activity aiding learning course content to the *greatest* and *least* degrees were somewhat mixed. Five of the 13 students indicated that the online discussions (peer reviews) supported their learning to the *greatest* degree while four of the students chose completion of the e-portfolio. While one student selected the e-lectures, two of the students opted for the laboratory activities. The remaining student did not choose just one indicating that all of the activities helped. Of the activities judged to aid learning to the *least* degree, six students chose the e-lectures, two chose the laboratory activities, two chose the online discussions, and three responded that all course activities were helpful (thus not indicating an activity which aided learning to the least degree).

Qualitative Results

Both investigators came to consensus on all results reported here. Qualitative analysis produced 24 codes which were collapsed into four distinct themes: (1) Face-to-face time, (2) hands-on nature of laboratory activities/course structure, (3) extreme time commitment for peer reviews, and (4) flexibility in accessing course information. Of the 24 codes derived from the qualitative data, nine (from seven students) dealt directly with students' desire for more face-to-face time. For example, one student responded, "I wish we had more face time because then we can ask questions that we think of during class. Even though [instructor] answers emails quickly, it's so much easier to understand something when it is explained in person."

Seven (from six students) of the 24 codes derived from the qualitative data referred to the students' responding positively toward the hands-on nature of the laboratory activities. One student wrote,

> I liked the way the course was structured because it was a very hands-on approach. I think that I was able to understand the material better because of the e-portfolio. The labs allowed me to see the information in a real life setting which made it a lot easier to understand.

Regarding the course structure, one student wrote,

> I also liked how expectations were written on blackboard. I feel that this is the only speech class that I have taken at a undergraduate level that has a rubric and firm guidelines on every expectation such as homework and what each discussion should entail.

Four (from three students) of the 24 codes derived from the qualitative data described the online discussions (peer reviews) as time consuming. One student responded,

> I feel that the online posts were too demanding. Maybe have all the posts done just on one day (post, replies, and reply to a reply). I did not like how I constantly had to check back because sometimes I would forget to post on that day.

Last, four (from three students) of the 24 codes from the qualitative data referenced students' satisfaction with the ability to access course material and participate in the course on their own time. A student responded,

> I liked the e-lectures, labs, and discussions because I was able to learn the content of the chapter during my time. The e-lectures were obtainable when I felt I had time. I also liked how we were able to review the lecture unlike in class lectures.

Results of Paper-based Survey

Nineteen of the 20 female students (95% return rate) completed the paper-based survey after taking their final examination. These statements and the students' response data are found in Table 1. The participants stated that they were easily confused by acoustic information before taking the course (4.05 mean). Students also agreed that after taking the course, they felt comfortable with basic acoustic principles (4.21 mean). The student participants also agreed that the laboratory activities allowed for learning acoustic principles most easily (4.36 mean). Less clear was the students' ability to read research containing acoustic information after participation in the course (3.8 mean; independent review of the acoustics research literature was a requirement for the e-portfolio as described earlier in this manuscript).

DISCUSSION

Based on the results garnered from the online, anonymous survey, and the paper-based survey, two conclusions regarding the student participants' preferences for course activities in an undergraduate speech science course can be drawn. First, the students preferred the use of laboratory activities over more traditional lectures and hypothetical in-class quizzes. Students reported that the laboratory activities allowed them to learn acoustical concepts most easily. This finding was echoed in the paper-based survey as well. The student participants also reported a positive preference toward the hands-on, active nature of laboratory activities; these activities served to aid the

students' comprehension of acoustical concepts and provided a means for students to use the course concepts in a "real world" manner. As one student described it, "I think more speech classes should incorporate speech labs to help students who learn better when performing the task rather than lecture."

It appears that hands-on activities may appeal to students whose learning styles differ from the traditional preference for auditory learning. Lecture formats generally rely heavily on the students' abilities to listen, comprehend, integrate information, and remember what was heard. While some students excel at this approach, others may be better served through a "learning through doing" approach (Cell, 1984; Jarvis, 1987). The hands-on approach taken in this course was previously reported to help the students learn the course concepts (Walden, 2010). Interestingly, the student participants appeared to be aware of their personal learning styles, as evidenced in the preceding student response. Undergraduate student respondents in the fields of chemistry (Minderhout & Loerscher, 2007) and anatomy and physiology (Brown, 2010) have also reported a similar preference for hands-on activities as a means to learn course concepts.

The second conclusion which may be drawn regarding the student participants is that they felt more comfortable with basic acoustic principles after completion of the course. It was clear from the students' responses that they were generally easily confused by acoustical concepts prior to participation in the course. Given the general lack of student exposure to acoustics in prerequisite classes, student confusion with acoustics was expected. The overall design of the course, while not completely helpful to every student, appeared to meet its general goals for the majority of the students by providing the avenue through which the students gained a level of comfort with acoustic principles. This level of comfort was evidenced in the students' completed portfolios which included interpretation of acoustic data.

An important result discovered was that the students' level of agreement regarding their ability to read research which contained acoustic information (required for completion of the e-portfolio) was not as strong as other areas of the paper-based survey. This may be due to the other aspects of research which have little to do with acoustics. For example, evaluation of research requires familiarity with research design, the concepts of validity and reliability, as well as statistical methods. It is difficult to discern from the current research whether students experience barriers to understanding research containing acoustical information due to the actual acoustical information described in the research or if students are generally unfamiliar with the process of evaluating research. General research design considerations were not a topic covered in this course. Further, it cannot be expected that students would become completely comfortable with all aspects of the acoustical characteristics of speech from one undergraduate course. Such an expectation may be inappropriate due to the amount and complexity of the information covered in speech science courses (Finan, 2008). Indeed, students are likely to require a more advanced study of speech acoustics at the graduate level as well as varied experiences applying these concepts in clinical situations in order to gain a high level of familiarity and comfort with the acoustical concepts pertinent to speech production, hearing, and speech perception.

The one area of student preferences for course activities which was less clear was the replacement of face-to-face class time with online group discussions and e-lectures. Some students benefited from these activities through the ability to access course information multiple times and at times more convenient to them. On the other hand, students consistently reported wanting more face-to-face time with the course instructor to ask questions and get the instructor's response without having to wait for email correspondence. Some students also indicated that the online group peer reviews (discussions) were too time consuming. Interestingly, however, five of the 13 student respondents to the online survey indicated feeling the online peer reviews (discussion) aided their learning of course concepts to the *greatest* degree. It appears that while the online peer reviews are an effective means whereby students learn course concepts, the students find this to be time consuming and demanding. In an attempt to make course activities more student-centered in future offerings of this course, students will be supplied e-lectures as well as assigned online peer reviews *as a supplement to* face-to-face discussions of course content. Making both options available to students allows students with differing learning styles to use the instructional method ideal in learning course concepts.

The results of the current research and the conclusions drawn from these outcomes must be interpreted with caution. The current findings may only be directly applicable to the students who participated in the course in the semester the research took place. Yet taken in light of previous research in speech science, chemistry, and anatomy and physiology (Brown, 2010; Minderhout & Loertscher, 2007; Seikel, Drumwright, Whites, & Seikel, 1995; Walden, 2010), it appears that undergraduate students' learning in the physical sciences is indeed enhanced through use of hands-on activities which illustrate course concepts.

The significance of the current research lies within the systematic collection of student preferences data during the conduct of an undergraduate speech science course to guide future course design decisions. The current research may also provide speech science instructors with preliminary data to support the inclusion of hands-on, active learning activities in courses covering speech acoustics. Additionally, instructors may consider the time in which this study was designed and implemented. It is initially time consuming to create laboratory activities which match course topics but once these are created, they can be used in subsequent offerings of the course. Multiple corrections of each student's e-portfolio were also time-

consuming. This may be partially remedied by asking students to work in groups rather than individually when creating e-portfolios.

Certainly, each university's CSD department wants its students to effectively learn acoustic principles and each program has students capable of becoming SLP professionals. Nevertheless, each institution's department differs in focus, knowledge, skills, and the preferences of course instructors. An assumption can be made that course offerings must be tailored to accomplish departmental goals, instructor goals, and student goals. Therefore, case studies at the local (departmental) level are recommended in order to discern how best to approach student learning. The findings of local research are significant in that they may (1) lead to local changes in course instructional practices; (2) guide others' research efforts; (3) as well as begin to develop a database of learning activities specific to the learning of acoustical concepts which are shown to be both effective and accepted by students.

Further, students' recall, integration, and application of speech science concepts may be improved through the use of laboratory activities. Laboratory activities afford students the opportunity to immediately apply concepts discussed in lectures, text readings, and research articles. The students in this and other studies (Brown, 2010; Minderhout & Loertscher, 2007; Seikel, Drumwright, Whites, & Seikel, 1995; Walden, 2010) appear to prefer this type of active learning in addition to its pedagogical advantages for improving student learning.

Future research regarding student preferences for course activities might include the correlation of student preferences and comfort levels with acoustic information with performance on a knowledge-based pre- and post-test. Further, more experimental designs are recommended in which inclusion of students' preferred activities are compared to a control group to measure any significant differences in students' learning of course concepts due to inclusion of these preferred activities. Last, studies investigating levels of student engagement as a result of participation in preferred learning activities compared to more traditional pedagogical approaches would lend evidence to the importance (or lack) of student-centered and more action-based instructional practices in higher education.

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REFERENCES

American Speech-Language-Hearing Association. (2001, October). *Guidelines for Developing Formative Assessment Plans for Implementation of New Standards for the Certificate of Clinical Competence*. Retrieved January 6, 2011 from http://www.asha.org/academic/accreditation/CAA_Formative_Assess.htm.

American Speech-Language-Hearing Association. (2009). Knowledge and Skills Acquisition (KASA) Summary Form for Certification in Speech-Language Pathology.

Anderson, L. W., & Sosniak, L.A. (1994). *Bloom's taxonomy: A forty-year retrospective.* Chicago, IL: The National Society for the Study of Education.

Andresen, M. A. (2009). Asynchronous discussion forums: Success factors, outcomes, assessments, and limitations. *Educational Technology & Society*, *12*(1), 249–257.

Arai, T. (2002, September). An effective method for education in acoustics and speech science: Integrating textbooks, computer simulation and physical models. Paper presented at the meeting of Forum Acusticum, Sevilla, Spain.

Arai, T. (2006). Acoustic demonstrations for education in speech science. *Journal of the Acoustical Society of America, 120*, 3072.

Bogdan, R. C., & Biklen, S. K. (2007). *Qualitative research for education: An introduction to theory and methods* (5th ed.). Boston, MA: Pearson Education.

Brekelmans, M., Sleegers, P., & Fraser, B. (2002). Teaching for active learning. In R. J. Simmons, J. van der Linden, & T. Duffy (Eds.). *New Learning* (pp. 227-242). New York: Kluwer Academic Publishers.

Brown, P. J. (2010). Process-oriented guided-inquiry learning in an introductory anatomy and physiology course with a diverse student population. *Advances in Physiology Education, 34*(3), 150-155.

Cell, E. (1984). *Learning to learn from experience*. Albany, NY: State University of New York Press.

Cole, R. (1999, August). Tools for research and education in speech science. Paper presented at the meeting of the XIVth International Conference of Phonetic Sciences, San Francisco, USA.

Finan, D. S. (2008). Speech science education-roll over Beethoven. *Perspectives in Speech Science and Orofacial Disorders, 18*, 22-30.

Hiemstra, R., & Brockett, R. G. (1994). From behaviorism to humanism: Incorporating self-direction in learning concepts into the instructional design process. In H. B. Long and Associates (Eds.). *New Directions about Self-Directed Learning* (pp. 56-80). Norman, OK: Oklahoma Research Center for Continuing Professional and Higher Education.

Hofstein, A., & Lunetta, V. N. (2004). The laboratory in science education: Foundations for the twenty-first century. *Science Education, 88*(1), 28-54.

Jarvis, P. (1987). *Adult learning in the social context.* New York: Croom Helm.

Lammers, W. J., & Murphy, J. J. (2002). A profile of teaching techniques used in the university classroom: A descriptive profile of a US public university. *Journal of Active Learning in Higher Education, 3*, 54-67.

Merriam, S. B., Caffarella, R. S., & Baumgartner, L.M. (2007). *Learning in adulthood: A comprehensive guide* (3rd ed.*)*. San Francisco, CA: Jossey-Bass.

Minderhout, V., & Loertscher, J. (2007). Lecture-free biochemistry. *Biochemistry and Molecular Biology Education, 35*(3), 172-180.

Sanders, J. V. (2009). Fundamental acoustics education and applications. *Journal of the Acoustical Society of America, 126*, 2253.

Sapienza, C., & Stathopoulos, E. T. (1998). Integrating science into clinical practice. *Perspectives in Speech Science and Orofacial Disorders, 8*, 6-7.

Seikel, J. A., Drumright, D.G., Whites, M. M., & Seikel, P. J. (1995). A "hands-on" approach to speech science. *Computers in Education, 24*, 107-116.

Shipley, K.G., & McAfee, J.G. (2009). *Assessment in Speech-Language Pathology: A Resource Manual* (4th ed.). Clifton Park, NY: Thomson Delmar Learning.

Shuster, L. I. (2001). Utilization of the speech spectrograph in the study of disordered speech and language. *Perspectives on Speech Science and Orofacial Disorders, 11*, 4-5.

Steckol, K. F. (2007, April 17). Learner-centered teaching in higher education: Formative assessment study turns classroom into research lab. *The ASHA Leader*. Retrieved January 6, 2011 from http://www.asha.org/Publications/leader/2007/070417/070417e/.

Walden, P. R. (2010). Student perception of learning speech science concepts in a hybrid environment. *PSHA Journal, 1*(1), 41-50.

Weiler, E. M., Boyce, S., & Steger, J. (2003). Teaching hearing science to undergraduate nonscientists. *Journal of the Acoustical Society of America, 113*, 2221.

Wilcox, K. A. (2004). The role of speech and hearing sciences in a clinical world. *Perspectives on Speech Science and Orofacial Disorders, 14*, 3-5.

Wolf, S. J., & Fraser, B. J. (2008). Learning environment, attitudes and achievement among middle-school science students using inquiry-based laboratory activities. *Research in Science Education, 38*(3), 321-341.

APPENDIX A

Course Units of Instruction, Activities and Mode of Information Delivery

Meeting	Unit of Instruction	Delivery Mode
1	Theories of Speech Production Lecture	Traditional Lecture in class (no e-lecture or lab for this unit of instruction)
2	Theories of Speech Perception Lecture	Traditional Lecture in class (no e-lecture or lab for this unit of instruction)
3	Student Presentations of preferred Theories of Speech Production/Perception	Student-led presentations
4	Pure Tones vs. Complex Tones Lab 1	Laboratory Activity E-lecture on basic acoustics concepts
5	SPL Lab 2	Laboratory Activity E-lecture on basic acoustics concepts
6	Vocal Frequency/Intensity Lab 3	Laboratory Activity E-lecture on basic acoustics concepts
7	Respiration Lab 4	Laboratory Activity E-lecture on respiratory physiology and measurement for speech
8	Voice Quality Lab 5	Laboratory Activity E-lecture on phonatory physiology and measurement of vocal quality (jitter/shimmer)
9	Nasality Lab 6	Laboratory Activity
10	Vowels/consonant Spectrogram lab 7	Laboratory Activity E-lecture on articulatory physiology and use of spectrograms to measure vowel/consonant articulation
11	Speech perception	Traditional Lecture in class (no e-lecture or lab for this unit of instruction)
12	Review Session and Portfolio Problem-solving	Instructor-led, in class discussion of student-initiated review topics and problem-solving for e-portfolio uploads to the internet
13	Student Presentations of post-course preferred Theories of Speech Production/Perception	Student-led presentations
14	Final Examination	

APPENDIX B

Weekly Peer Review Topic for Online Activities

Week 2: Speech Production Theories
Explain the difference between a model and a theory.
Describe two of the issues in speech production that theories attempt to take into account.
Compare and contrast connectionist models and dynamic systems models of speech production.

Week 3: Speech Perception Theories
Present one argument for and one against the specialization of speech perception.
Explain the following terms in relation to theories of speech perception: bottom up, interactive, passive.

Week 4: Student Presentations
Briefly outline your preferred theories of speech production and perception. State why these make the most sense to you. Your discussion group members should either agree (with reasoning) or disagree (with reasoning).

Week 5: Acoustics: Pure Tone/Complex
With regard to sound waves, define and describe the relationship between the following: frequency, amplitude, period. Include information about the commonly used units of measure for all three.
With regard to sound, explain pure tones and complex waves.
Waveforms and spectra both display amplitude on a vertical axis. However, the information that is presented on the horizontal axis of a waveform diagram is totally different from the information presented on the horizontal axis of a spectrum diagram. Explain the difference between the two.

Week 6: Acoustics: SPL
Explain the decibel scale. Include the relationship between the increments of the scale and human hearing perception. Give specific examples of the approximate decibel levels associated with speech and with several environmental sounds.

Week 7: Acoustics: Vocal Frequency/Intensity
With regard to sound, explain constructive and destructive interference.
Explain how the sound that a coin dropped on desk makes, is transmitted and perceived by a human listener. Include a description of the transmission of the sound through air and the pathway and events involved in conversion of the sound to information that is available to the brain of the listener.

Week 7: Acoustics: Vocal Frequency/Intensity Continued
Describe the anatomical reasons why average FO is different for children, adult women, and adult men.

Week 8: Respiration
Define and describe the following: resting expiratory level, tidal volume, residual volume.
Identify and describe the four changes that take place when switching from life to speech breathing.
Explain the relationships between air pressures, airflows, volume, and chest wall shape in respiration.

Week 9: Vocal Quality
Choose three of the following to discuss:
Discuss the role of air pressure in vocal fold opening and closing, as described by the myoelastic-aerodynamic theory.
Describe how vocal pitch and loudness are regulated.
Identify and describe three of the six parameters of normal voice suggested by Zemlin.
Why is the human voice nearly periodic but not completely periodic?
Identify four ways that acoustic measures such as jitter and shimmer are valuable in assessment and treatment of neurological and voice disorders.

Week 10: Nasality
Describe the characteristics of the vocal tract as an acoustic resonator.
Define both hypernasality and hyponasality and describe how speech production would be affected by each. How is each produced in oral speech?

Week 11: Spectrograms

Choose three of the following to discuss:

Why is there an inverse relationship between F1 and tongue height, in the production of vowels?

Describe the acoustic similarities and differences between vowels, diphthongs, and nasals, as seen on a spectrogram.

Identify and explain two ways in which vowel formants can be used to infer articulatory function in normal speakers and those with various types of disorders.

Discuss how spectral analysis of stops and fricatives can reveal underlying patterns of articulatory movement.

Week 12: Speech Perception

Choose three of the following to discuss:

Discuss a theory that seeks to explain why inconsistencies in formant frequencies for vowels do not prevent listeners from distinguishing between vowels.

What is meant by the term segmentation problem in relation to speech perception?

Identify two theories that have been proposed to explain why the lack of consistent formant values for particular vowels is not a problem for speakers.

Describe categorical perception, and explain its role in the recognition and identification of consonants.

Compare the acoustic cues that are important in the perception of stops and consonants.

Explain the role of context in speech perception.

APPENDIX C
E-portfolio Directions

General Directions:
You will be creating an e-portfolio which showcases your activities, thinking, and research throughout this semester. The e-portfolio is made up of three distinct sections: (1) Pre-course statement of your preferred theories of speech production and perception including your reasoning; (2) All 7 of your labs, including interpretation; and (3) Post-course statement of your preferred theories of speech production and perception including your reasoning and the sources (you need 3 additional sources) you used to help you construct your reasoning. Your e-portfolio will be created in a Web page format and will be uploaded to the Internet throughout the semester, culminating in a complete e-portfolio at the end of the semester. What is important to remember is that you have creative freedom regarding how you choose to format your Web page. As long as all the necessary information is present and correct, you will have met the requirements.

I. Pre-course Statement of Theory:
The first section of your Web page will be a statement of which theory of speech production and speech perception makes the most sense to you. You should name and describe each theory you prefer (one for speech production and one for speech perception). Use your text and supplementary readings as sources. Be sure to use APA citation format to cite your sources. Lastly, you will describe your reasoning as to why you prefer a specific theory. You will also present this information in class.

II. Labs:
Lab 1: Pure Tone vs. Complex Tone Lab:
In class, we will create three different sound waves. One will be a sound wave from a tuning fork, one will be a male voice and the other a female voice. We will capture these signals together in class and create the sound wave for each together. You will be provided with both the audio file and the resulting sound wave. Your job, to be done individually, is to compare and contrast the three different waveforms and post the sound wave graphics as well as your interpretation online. You should work together in the creation of the Web page as well as posting your page.

Lab 2: SPL Lab:
In class, we will measure the sound pressure level of various sounds around campus. You will keep a log of what sounds we measure and how loud these sounds are. Your job for your Web page is to report this information (what was measured and how loud it was) and to discuss what it means to be loud. You should concentrate on an explanation of what sound pressure is and why one sound is louder than another. This, like all other labs, will be part of your Web page.

Lab 3: Vocal Frequency/Intensity:
In class, each person will capture his or her voice using the CSL (hardware and software which performs acoustic analysis). Each person will then discuss their voice in terms of frequency and intensity parameters. You will be provided with both the audio file and the graphic file of the sound wave. This is to be uploaded to your Web page.

Lab 4: Respiration Lab:
In class, we are going to build a spirometer. We will then measure each person's lung volumes. For your Web page, you will describe the process we used to build the spirometer and how we measure each lung volume. You will then describe what each lung volume measured is and how this lung volume is/is not involved in speech production. You will also complete, in class, Form 11-3 from the Shipley & McAfee text. All of this is to be uploaded to your Web page including interpretation.

Lab 5: Vocal Quality Lab:
In class, each person will capture his or her voice and we will perform both Jitter and Shimmer analyses on each person's voice. You will be provided with the graphic file resulting from your analyses. Your job is to describe what each analysis is, what it is for, and what your results mean. Also, you will complete an s/z ratio (found in your Shipley & McAfee text on page 395) as well as forms 11-1 & 11-2 from that text. Be sure to read the supplemental reading available in the resources section of Blackboard regarding the use of the s/z ratio for a perspective regarding the use of this measure. All of this is to be uploaded to your Web page including interpretation.

Lab 6: Nasalance Lab:
In class, we will measure nasalance using the Nasometer. Each person will have the opportunity to read a passage and to view his/her resulting nasalance readings. You will be provided with the graphic file from your analysis. Your job is to describe what you see on the graph as well as to define nasality. You will also complete the six resonance assessment procedures found on pages 396-400 of your Shipley

& McAfee text (Assessing Resonance Counting task, Hypernasality task, Assimilation Nasality task, Hyponasality task and Assessing Velopharyngeal Function task). All of this is to be uploaded to your Web page including interpretation.

Lab 7: Vowels/Consonants Spectrogram Lab

In class, each person will produce two vowel sounds and two consonant sounds of their choice. These will be captured and analyzed using the CSL. A spectrogram will be created and each file will be provided to you. Your job is to describe both what a spectrogram is and what you see on your four spectrograms. Also, you will complete Forms 6-1 & 6-2 from your Shipley & McAfee text. All of this will be uploaded to your Web page, including interpretations.

III. Post-course Statement of Theory:

The last section of your Web page will include a statement of which theory of speech production and speech perception makes the most sense to you after being exposed to the course content and activities throughout the semester. You should name and describe each theory you prefer (one for speech production and one for speech perception). Use your text, supplementary readings, and at least 3 outside sources you found and read on your own. Be sure to use APA citation format to cite your sources. Lastly, you will describe your reasoning as to why you prefer a specific theory and how your choice of preferred theory has changed or was strengthened through your participation in the course and your outside readings (basically, compare and contrast with your pre-course statement of theory). You will also present this information in class as well as upload this to your Web page.

APPENDIX D

Online Survey Statements/Questions

Online Survey Statement	*Response Choice*
I would have preferred live, in-person lectures instead of e-lectures.	( ) Strongly Agree; ( ) Agree; ( ) Neutral; ( ) Disagree; ( ) Strongly Disagree
I liked completing the labs instead of in-class lecture.	( ) Strongly Agree; ( ) Agree; ( ) Neutral; ( ) Disagree; ( ) Strongly Disagree
I would have preferred a lecture-only course without labs.	( ) Strongly Agree; ( ) Agree; ( ) Neutral; ( ) Disagree; ( ) Strongly Disagree
I liked completing the online discussions.	( ) Strongly Agree; ( ) Agree; ( ) Neutral; ( ) Disagree; ( ) Strongly Disagree
I would have preferred more in-class time instead of online discussions.	( ) Strongly Agree; ( ) Agree; ( ) Neutral; ( ) Disagree; ( ) Strongly Disagree
I would have preferred completing quizzes throughout the course instead of completing an e-portfolio.	( ) Strongly Agree; ( ) Agree; ( ) Neutral; ( ) Disagree; ( ) Strongly Disagree
I would have preferred completing a paper-based portfolio instead of an e-portfolio.	( ) Strongly Agree; ( ) Agree; ( ) Neutral; ( ) Disagree; ( ) Strongly Disagree
Overall, I liked the way the course was structured.	( ) Strongly Agree; ( ) Agree; ( ) Neutral; ( ) Disagree; ( ) Strongly Disagree
Please explain why you liked or did not like how the course was structured.	
Overall, I feel a course consisting of in-person, live lecture would have better enhanced my understanding of course content that was presented in e-lectures.	( ) Strongly Agree; ( ) Agree; ( ) Neutral; ( ) Disagree; ( ) Strongly Disagree
Which portion of the course enhanced your understanding of course content to the GREATEST degree?	( ) E-lectures; ( ) Labs; ( ) Online Discussions; ( ) E-portfolio; ( ) Other
If other, please explain.	
Which portion of the course enhanced your understanding of course content to the LEAST degree?	( ) E-lectures; ( ) Labs; ( ) Online Discussions; ( ) E-portfolio; ( ) Other
If other, please explain.	
What did you like most about the course?	
Why did you like this the most?	
What did you like least about the course?	
Why did you like this least?	

AUTHOR INFORMATION

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Jo Ann M. Bamdas received her Ph.D. and Educational Specialist degrees in Educational Leadership: Adult and Community Education at Florida Atlantic University. She is a certified College Reading & Learning Association (CRLA) tutor and has Dun & Dunn Learning Styles training certification. Her active interests include international doctoral education (including studies abroad), women's adult learning, diverse socio-cultural narrative experiences, and adult and community learning including lifelong learning. She is a member of the American Educational Research Association and the American Adult & Continuing Education Association.

Krista Buchanan is an undergraduate student in her senior year at Bloomsburg University, majoring in Audiology and Speech-Language Pathology. She is currently a National NSSLHA member. Krista was a member of Bloomsburg's NSSLHA Research Committee from 2009-2010.

Christina M. Earl earned a B.A. with a major in Communicative Disorders and a minor in Psychology at West Chester University. She is presently a M.A. student in Communicative Disorders at WCU. She is a member of NSSLHA, as well as a student member of DSHA (Delaware), her native state. Her current research goal is to critique minimal pairs materials with the hope of formulating new minimal pairs as well as maximal opposition materials that extend beyond the word level.

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JOURNAL
CALL FOR SUBMISSIONS
2012 EDITION
(DEADLINE: 15 JULY 2012)

PURPOSE:
The PSHA JOURNAL is an annual electronic peer-reviewed publication of the Pennsylvania Speech-Language-Hearing Association. The revival of the PSHA Journal complements the aims of PSHA as (a) a means to broaden the nature of the services PSHA provides to PSHA members, (b) an outlet to showcase information about clinical education, clinical practices, and responses to professional issues, particularly as relevant to Pennsylvania, (c) a means to distribute scholarship in its diverse forms and to facilitate access to appropriate publication outlets, and (d) a tool to advance the information that will assist PSHA members in their quest to best address the clinical needs of individuals with communication disorders across professional roles and responsibilities.

SUBMISSIONS:
The PSHA JOURNAL accepts manuscripts for review that reflect diverse scholarly work. Manuscripts that reflect these scholarly orientations are welcome:

Basic Scholarship: *Basic Scholarship* includes those articles that expand our information base with respect to normal and non-normal communication processes, as well as normal and non-normal processes in the communication mechanism. Articles that illustrate this variation of scholarship are data-based studies (with quantitative and/or qualitative data) that, while not necessarily experimental in nature, may seek to confirm or disconfirm specific theoretical assertions.

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Instructional Scholarship: *Instructional Scholarship* includes a diverse assortment of articles that aim to improve our approaches to and materials and methods for instruction. Because our disciplines have clinical practice at their heart, instructional scholarship also includes articles that aim to improve clinical service delivery across work sites, work duties, and clinical populations. Instructional scholarship also includes reports of innovative clinical education and professional development models.

In addition to these variations of scholarship, the PSHA Journal welcomes for review any other content the PSHA Executive Board deems important to advance our disciplines and/or serve our membership.

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Authorship Information: In the cover letter, please include verification that, in the case of multiple authors for a manuscript, the authors

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Manuscripts: Manuscripts should be the original work of the named authors. Plagiarism in any form is automatic ground for non-acceptance of a manuscript. Manuscripts submitted to the PSHA Journal should not be previously published in any form in any other venue.

Manuscript Preparation: Authors should submit manuscripts in electronic form. Authors should use Microsoft Word for the transmission of their manuscripts, APA style for the format of their manuscripts, and 12 point Times New Roman font for the text. At this time, the minimum word count for manuscripts is 2,500 words, and the maximum word count for manuscripts is 10,000 words. Authors who wish to exceed the maximum word count for a manuscript should consult with the Editor before submission. Each manuscript should contain an abstract of 100-150 words. Authors should indicate 3-4 Key Words to describe the primary content of the manuscript. A reference list of all works cited within the text/appendices should be included after the main text. Figures/Tables/Images/Other should be appended to the main text with their approximate locations indicated in the text. Images that are photos should be submitted in jpeg format with a minimum of 600 pixels per square inch. The manuscript should not contain footnotes or endnotes. The file should have editorial tracking utilities disabled. Authors should acknowledge any funding sources for support of their work, as well as any individuals whose contributions enhanced the work.

Manuscript Submission: Authors should submit their manuscripts on or before 15 July 2012 to Cheryl Gunter, Ph.D. CCC-SLP, PSHA Vice-President for Publications/Editor, at cgunter@wcupa.edu. For further information, please contact the Editor at 610.436.2115 or at this e-mail address. Information about the manuscript review process will be available to authors at the time of their manuscript submission.