2013
Student
Research
Day

Wednesday April 24
12:45-3:30 pm
Bioinformatics Auditorium (1131)
and Lobby, UNC-CH

Division of Speech and Hearing Sciences, Department of Allied Health Sciences, University of North Carolina at Chapel Hill
Fifth Annual  
Division of Speech and Hearing Sciences  
Student Research Day  

Wednesday April 24, 2013  
12:45 – 3:30 pm  
University of North Carolina – Chapel Hill  
Bioinformatics auditorium and lobby

Welcoming Remarks  
Dr. Jackson Roush  
12:45 – 1:00

Oral Presentations

1. Katie Belardi (2nd year Ph.D. Student)  
   Gesture and vocalization co-occurrences in infants later diagnosed with autism  
   1:00 – 1:20

2. Jennifer Zoski (2nd year Ph.D. Student)  
   Informing Intervention in Early Literacy: A Morphological Analysis of Kindergarten Oral Language  
   1:20 – 1:40

3. Joy Diamond (1st year Ph.D. Student)  
   What’s in a Name? The Predictive Relationship between Name Writing Skills, Alphabet Knowledge, and Phonological Awareness  
   1:40 – 2:00

Poster Session  
2:00 – 3:30

1. Meredith Anderson, Margaret Dillon, Marcia Adunka, Harold Pillsbury, Craig Buchman, and Oliver Adunka  
   Single-Site Objective and Subjective Outcomes of Electric-Acoustic Stimulation (EAS)

2. Amanda Bock, Chanel Blaylock, Megan Latta, Kaylen Hunter  
   Communication and Participation in Self-Contained Special Education Classrooms

3. Andrea Bucker  
   Efficacy of Intra-Oral Bone Conduction Devices: An Evidence-Based Review of the Literature

4. Sau Yu Cheung and Lori Leibold  
   Estimating Speech Perception in the Noisy Classroom: Creation of a Disyllabic Word Identification Measure in the Presence of a Masker Comprised of Two Children Talking

5. Kevin T. Cunningham, Katarina L. Haley and Adam Jacks  
   Sound distortions: A clinical feature of apraxia of speech

6. Alexandra Gery  
   Incidence and Prevalence of Hearing Related Problems in Individuals with Diabetes Mellitus Type 1- an Evidence-Based Review of the Literature
7. Laura Greaver  
   *The Evidence Base for the Application of Various Audiologic Interventions for Unilateral Hearing Loss in Children*

8. Michelle Hicks and Jackson Roush  
   *Newborn Hearing Screening in South America*

9. Hannah Hodson, Emily Buss, and Lori Leibold  
   *The influence of high-frequency audibility on a clinical measure of word-final plural identification*

10. Maria Jaunakais, Shawn Van Steen, Nancy McKenna, and Jackson Roush  
    *Noise in the NICU: Optimizing the Acoustic Environment for Infants in the Special Care Nursery*

11. James Leyva  
    *Cochlear Implants: Comparing Fine Structure Processing to Continuous Interleaved Sampling in Speech Recognition Testing*

12. Sara Mamo and John Grose  
    *Speech-evoked ABR: Periodicity coding of a temporally jittered stimulus*

13. Megan Nosol and Katarina Haley  
    *Stories Worth Sharing: A Writing Workshop for People with Aphasia and Their Loved Ones*

14. Cristen Paige  
    *Chronic Traumatic Encephalopathy, Sports-Related Concussion and the Role of the Speech-Language Pathologist*

15. Anna Styers, Katarina Haley, and Adam Jacks  
    *Development of a Web-Based AAC System for People with Aphasia*

16. Ashley Wellons  
    *Behavioral Audiometry Testing for Children with Autism: A Systematic Literature Review*

17. Megan Wolfe and Lisa Domby  
    *What Am I Supposed To Do with English Language Learners?*

18. Cecil Yeatts III  
    *The Effects of Traumatic Brain Injury on the Central Auditory System: Test Validity and Reliability*
Katie Belardi and Linda Watson  
*Gesture and vocalization co-occurrences in infants later diagnosed with autism*

**Purpose or Research Questions**
The purpose of the study is to examine the relationship between gesture and spoken language development in infants later diagnosed with autism compared to infants with a developmental disability and typical development.

**Background**
One defining feature of autism is poor communication. Research suggests older children with autism and children at-risk for autism have difficulty coordinating oral communication and gestures (de Marchena and Eigsti, 2010, Iverson, 2010); however, there is a dearth of information regarding the development of these skills in infancy. Research supports the view that gesture and speech follow the same developmental trajectory (Bates & Dick, 2002) and serve as markers for predicting language outcomes in typically developing children as well as those with delays and disorders (Watt, Wetherby, & Shumway, 2006). Additionally, the quality of vocalizations, such as more sounds with a non speech-like quality, serves as a red flag for children at severe risk for speech and language disorders (Paul, 2011; Oller et al., 1999). Yet, conclusive signs in different aspects of vocalizations in autism have not been identified (Oller et al., 2010). Based on existing research findings, examining the emergence of gesture and vocalization co-occurrences and quality of vocalizations are important for determining if individuals with autism follow the expected developmental course during this critical period of language learning and communication.

**Methods**
Participants for the study were recruited through several previous studies at The University of North Carolina over the past 15 years. A retrospective video analysis of 55 randomly selected participants at 15-18 months (25 individuals who were eventually diagnosed with autism, 15 eventually diagnosed with other developmental disabilities (DD), and 15 with no history of developmental problems (TD) at age of recruitment) will be performed. Instances of gesture and infant vocalizations were recorded using Observer XT software. A naturalistic listening method was used for identifying infant vocalizations. Vocalizations were coded as precanonical or canonical based on an adapted version of Oller’s (2000) classification system. Gestures were classified following the guidelines presented by Wetherby and Prizant (1993) taxonomy. They were classified as behavioral regulation, social interaction, joint attention, or non-communicative. Interobserver agreement for speech sound and gesture classification was 85% between two speech-language pathologists trained by Dr. Kimbrough Oller.

**Anticipated Results**
It is predicted that infants later diagnosed with autism will use fewer gesture-vocalization co-occurrences and canonical speech forms at 15-18 months of age compared to infants with DD or those with TD.

**Discussion**
With the completion of this study, we will be able to contribute new information regarding the similarities and differences in gesture and vocalization co-occurrences in infants with autism, TD, and DD, which may lead to earlier identification of autism and improved understanding of skills to target in interventions to positively influence later language functioning.
Jennifer Zoski

*Informing Intervention in Early Literacy: A Morphological Analysis of Kindergarten Oral Language*

**Purpose:** The purpose of this study was to analyze the morphological complexity of kindergarten oral language. Specifically, oral language samples from three periods (fall, winter, spring) over one academic year were analyzed for morpheme complexity (MLUm, type, transparency, and errors/omissions) during narrative and conversational language. Frequently occurring morpheme types and specific morphemes were determined.

**Background:** It is well established in the literature that children develop inflectional morphemes in oral language at an earlier age and that derivational morphemes continue to develop through adolescence, and even into early adulthood (see Deacon et al., 2010 for a review). Recent research has examined upper-elementary children’s morphological processing of complex words in relation to type (inflectional vs. derivational) and transparency (i.e., the impact of orthography and/or phonology). Deacon et al.’s (2010) study, for example, found morphological processing of both inflectional and derived words in grades 4, 6, and 8 to be similar. In another study, Clin et al. (2009) sampled 8-13 year-old children’s ability to produce words with differing levels of complexity between stem and derived form. It is clear that older children’s ability to process and produce complex morphological words is dependent on a variety of factors; however, little is known about the morphological complexity of language in younger children, above and beyond the dominance of inflectional morphemes in their language. Given recent evidence pointing to the importance of morphological instruction and intervention in children as young as first grade, it is important to analyze the types of morphemes that younger children are producing in order to more specifically develop intervention targets (e.g., Berninger et al, 2010; Wolter et al., 2009; Bowers et al., 2010).

**Methods:** Kindergarten oral language samples from 6 students were analyzed using SALT software to determine the frequency of morphological transformations in spoken language over the course of one year in conversational and narrative language samples. Language growth was coded and measured with the following four variables: mean length of utterances in morphemes (MLUm), morpheme type (inflection vs. derivation), transparency (transparent vs. opaque), and errors/omissions. Variables were analyzed descriptively and were compared across contexts and time periods.

**Results:** The results suggest that kindergarteners use more inflectional morphemes than derivational morphemes, use more transparent than opaque morphemes, and that most opaque morphemes are inflectional in nature. Errors and omissions occurred only for inflectional morphemes, and omissions were more frequent. All variables demonstrated growth during the kindergarten year, indicating that children are increasing their morphological knowledge during this time; however the extent and timing of growth varied. Regarding language context, MLUm was higher, inflectional morphemes were more common, and both transparent and opaque morphemes were more common for narrative language; there were no notable differences in language context for derivational morphemes or errors/omissions.

**Discussion:** In order to develop effective interventions in morphological awareness for younger elementary school children, it is necessary to first describe the types and complexity levels of morphemes that children already use during this time period. The results inform prevention and intervention of reading disorder by providing an in-depth understanding of the types of morphemes that are difficult for students across language contexts in order to choose developmentally appropriate intervention targets at specific times during the kindergarten year.
Joy Diamond  
*What's in a Name? The Predictive Relationship between Name Writing Skills, Alphabet Knowledge, and Phonological Awareness*

**Research Questions**
The major research questions addressed by this study were: For preschool children, (1) What is the relationship between beginning of the year measures of name writing, uppercase letter knowledge, and phonological awareness skills? (2) Does beginning of the year name writing predict end of the year uppercase letter knowledge and phonological awareness, after controlling for age and PPVT scores? (3) What does beginning of the year phonological awareness knowledge add to the prediction of end of year uppercase letter knowledge above what name-writing scores predict? (4) What does beginning of the year uppercase letter knowledge add to the prediction of end of year phonological awareness skills above what name-writing scores predict?

**Background**
Well-established research has indicated the predictive nature of alphabet knowledge and phonological awareness on later reading skills (Adams, 1990, Foulin, 2005). As a result, children entering school are often assessed on their ability to name letters and their phonological awareness skills. In 2003, Welsh, Sullivan, and Justice investigated what name writing tells us about a child’s emergent literacy skills. The results of this study, which looked at 3546 four-year-old at-risk children enrolled in preschool programs, presented a mixed picture. The researchers found that name writing ability differentiated preschool children’s print and phonological awareness skills. However, regression models in this study indicated that only print-related skills (Alphabet Knowledge, Print Knowledge) and age explained variance in name writing.

**Methods**
The participants in this study were preschool children who participated in the Early Reading First, Time is Now in PreK project, year two. Fall PPVT scores and PALS data were gathered and analyzed. To address question one, a Pearson’s correlation was conducted. For questions two through four, linear regression models were generated and hierarchical regression models were compared using ANOVAs.

**Results**
Beginning of the year name-writing measures contributed significantly to the prediction of end of year upper letter naming ability and phonological awareness scores, in the absence of other measures. Furthermore, beginning of the year phonological awareness measures (in addition to name writing) did not add significantly to the prediction of end of the year letter naming skills, but measures of beginning of the year upper case letter knowledge (in addition to name writing) did contribute significantly to the prediction of end of the year phonological awareness measures.

**Discussion**
This study demonstrated that given no additional measures, beginning of the year name writing can be used to predict end of the year uppercase letter knowledge and phonological awareness skills. Because name-writing assessments are quick and age-appropriate for preschool students, this finding is useful information for classroom teachers. Beginning of the year uppercase letter knowledge did add to the prediction of end of the year phonological awareness above name writing, which indicated that a measure of letter knowledge in addition to name writing gave a more complete picture of the students’ end of year skills.
Meredith Anderson, Margaret Dillon, Marcia Adunka, Harold Pillsbury, Craig Buchman, and Oliver Adunka

Single-Site Objective and Subjective Outcomes of Electric-Acoustic Stimulation (EAS)

Purpose or Research Questions

The purpose of this study was to review the subjective and objective outcomes of Electric-Acoustic Stimulation (EAS) in a unilateral listening condition after 12 months of listening experience.

Background

Cochlear implantation is the principal treatment option for patients with moderate to profound sensorineural hearing loss who have limited benefit from conventional amplification. Recently, patients with greater amounts of low-frequency residual hearing yet poor speech discrimination have elected to undergo cochlear implantation. With preserved residual hearing postoperatively, this patient population may utilize the combination of hearing aid and cochlear implant technologies in an ipsilateral listening condition, known as Electric-Acoustic Stimulation (EAS). EAS is currently under investigation in the United States to study whether patients achieve subjective and objective benefits with ipsilateral combined stimulation as compared to preoperative hearing aid alone or postoperative electric only stimulation.

Methods/Proposed Methods

24 subjects with either complete or partial preservation of postoperative residual hearing were included in this analysis. Audiometric and speech perception testing was completed preoperatively and at 3, 6 and 12 months postoperatively. Unaided air and bone conduction thresholds were measured at each test interval to evaluate stability of hearing over time. Subjects listened with the DUET speech processor, which provides electric and acoustic stimulation in a single unit. Aided speech testing included CNC words in quiet and CUNY sentences in noise (SNR+0). Listening conditions included hearing aid alone, cochlear implant alone (full frequency map), and EAS. Subjects also completed a subjective questionnaire, the Abbreviated Profile of Hearing Aid Benefit (APHAB), at each interval.

Results/Anticipated Results

All subjects showed an improvement on speech perception on both CNC words in quiet and CUNY sentences in noise with EAS as compared to their previous listening condition. Further, the best speech perception was achieved in the EAS listening condition. There were no significant differences between the speech perception performance with EAS between the 3, 6 or 12-month follow-up test intervals. Results on the APHAB suggest that subjects reported improved subjective benefit with EAS compared with the preoperative hearing aid condition on three of the four subscales.

Discussion

Subjects with preserved low-frequency residual hearing experienced improved speech perception from utilizing hearing aid and cochlear implant technologies in an ipsilateral listening condition. Both the objective and subjective results of this study agree with those of previous studies. In conclusion, EAS may be a viable treatment option for patients with severe-to-profound high-frequency thresholds who do not benefit from appropriately fit amplification.
Amanda Bock, Chanel Blaylock, Megan Latta, Kaylen Hunter

*Communication and Participation in Self-Contained Special Education Classrooms*

**Purpose**

The purpose of this study was to describe the ways in which students with severe disabilities communicate and participate during literacy instruction in self-contained special education classrooms. Specifically, we examined the ways students use augmentative and alternative forms of communication (AAC) and how teachers support students’ use of these technologies.

**Background**

Evidence-based practices in general education emphasize teacher-student relationships, peer relationships, social and emotional support, the effective use of language, motivation, active engagement, self-regulation, productivity, and higher-order thinking skills (Johnston, 2004; Pianta, La Paro, & Hamre, 2008). Students with severe disabilities, particularly students who use AAC, rarely have access to these kinds of practices. Instead, students with severe disabilities often receive instruction rooted in a behaviorist view of learning, which emphasizes massed trials, systematic prompting procedures, and expectations for students to provide rote responses at a preset level of mastery. Instruction that focuses on memorization of isolated skills fails to provide students with skills that are generalizable or useful (Erickson, Hanser, Hatch, & Sanders, 2009). One-on-one instruction and passive student participation limit opportunities for students to interact, form relationships, and develop an identity as a learner. Denial of meaningful participation in a learning community leads to a self-fulfilling prophecy of incompetence (Keefe & Copeland, 2011; Kliewer, 2008).

**Methods**

Over the course of the 2010-2011 school year, a team of researchers took biweekly field notes in eight self-contained special education classrooms in North Carolina. Our data analysis team focused on three classrooms with students who use a variety of augmentative and alternative communication technologies. We used qualitative methods to code the data, meeting weekly to compare our perspectives and identify emerging themes. One member of the team was rooted in the field of special education and three were rooted in the field of speech/language pathology. Our varying perspectives provided a rich view of the data.

**Results/Anticipated Results**

The research team has identified several themes emerging from the data: 1) genuine engagement versus “trying to get something done”, 2) genuine communication (a student was given a variety of choices and the teacher responded to any selection) versus scripted communication (the only communication option offered to a student was the correct answer), and 3) teachers offering multiple forms of communication to meet different students’ needs (ASL, voice output, eye gaze, etc.).

**Discussion**

We will be able to identify practices that encourage communication and participation and practices that limit communication and participation.
Andrea Bucker  
*Efficacy of Intra-Oral Bone Conduction Devices: An Evidence-Based Review of the Literature*

**Purpose or Research Question**  
Evidence related to the efficacy of intra-oral bone conduction devices, specifically the SoundBite Hearing System by Sonitus Medical, was evaluated to determine the specific long-term outcomes an intra-oral bone conduction hearing aid device can provide adults with Single Sided Deafness (SSD). Additionally, an evidence-based review of the literature surrounding bone conduction thresholds via excitation of teeth versus the mastoid was included.

**Background**  
The SoundBite Hearing System has three main components: a behind the ear microphone unit (BTE), an in the mouth device (ITM), and a charger for both the BTE and ITM components which allows the system to operate without the use of batteries. Verification for this device utilizes loudness balancing tests and programming with similar features to that of a typical BTE hearing aid. The Sound Bite Hearing System states an improvement over osseointegrated hearing devices in the following areas: avoidance of surgery and associated complications and risks, immediate action opposed to waiting 3 months for osseointegration to take place, optimized microphone location utilizing the pinna and external ear canal, removable and user friendly devices, higher frequency range due to piezoelectric processing components, and discrete BTE and ITM devices. Identifying the efficacy of the SoundBite Hearing System is important because it could potentially provide a viable alternative to treating adults with SSD. Currently there are no literature comparisons of intra-oral bone conduction devices and bone-anchored hearing aids. This poster aims to look at the efficacy of an intra-oral bone conduction device and examine literature comparing bone conduction via posterior dentition versus the mastoid to begin to build a comparison of intra-oral bone conduction devices to bone anchored hearing aids.

**Methods**  
A review of literature regarding intra-oral bone conduction devices was conducted between January 2012 and April 2013. The following search parameters and inclusion/exclusion criteria were set a priori. Six databases were searched (e.g. PubMed, CINAHL [Cumulative Index to Nursing and Allied Health Literature], Embase, Academic Search Premier, Psych Info, Google Scholar). Only full text, peer reviewed options were included. Over 120 results were narrowed to 4 applicable research studies. In January of 2013, 2 additional studies were added which looked at the efficacy of bone conduction via teeth compared to the mastoid bone.

**Results**  
Intra-oral bone conduction devices such as SoundBite Hearing System are effective and safe for up to 6 months of use in adults with unilateral SNHL. The intra-oral bone conduction device overcomes some of the obstacles seen by the osseointegrated devices, but further research is needed.

**Discussion**  
Headway has been made in research into intra-oral bone conduction devices, however significant future research is needed. Some of these areas include, but are not limited to, a longitudinal study over several years to evaluate longer term risks and benefits, long term efficacy of the Sound Bite Hearing System for subjects with conductive hearing loss, and a study looking into the applicability of intra-oral bone conduction devices on children with SSD.
Purpose or Research Questions
The purpose of this project is to create an assessment tool appropriate for the evaluation of children’s speech recognition abilities in the presence of competing speech produced by children or speech produced by adults.

Background
School-aged children are expected to listen and learn in classrooms, yet these rooms are often comprised of several sources of competing background sounds. Children experience more difficulty recognizing speech when noise is present relative to adults, but the child-adult disadvantage is significantly larger when the competing background is speech (e.g., Hall et al., 2002). Although child-adult differences in speech perception appear to be particularly pronounced in the presence of competing speech, the stimuli used in previous studies have typically been produced by adults. The goal of this project is to create a speech-in-noise measure using a competing masker comprised of children’s speech, as it is expected to be a more realistic estimate of children’s functional listening abilities in the classroom.

Methods/Proposed Methods
The method involved three stages. Stage one consisted of the creation and evaluation of the auditory stimuli. Two competing speech maskers were created and were comprised of continuous speech recordings produced by two nine-year-old girls or two adult females. Corresponding speech-shaped noise maskers were created based on both the two-talker maskers. The target speech tokens are 30 disyllabic words spoken by an adult female.

Stage two consisted of the development and verification of the assessment tool. Following Hall et al. (2002), the participant’s task is to identify one of thirty disyllabic words in the presence of one of the four maskers: (1) two-adult-talker; (2) two-child-talker; (3) adult speech-shaped noise; or (4) child speech-shaped noise. Maskers are presented at a fixed level of 60 dB SPL throughout testing. The signal level is adapted using a 2-up, 1-down rule to obtain an estimate corresponding to 70.7% correct identification in the presence of each masker.

Stage three consisted of preliminary data collection from four adults and one child.

Results/Anticipated Results
The acoustic analyses of the stimuli revealed that children’s continuous speech samples were spoken at a slower rate than adults’ samples. Preliminary data indicate no systematic differences in performance in the presence of the two speech-shaped noise maskers. Results in the presence of the two-talker maskers are mixed. Additional data collection is ongoing.

Discussion
As predicted, the child-adult difference in performance was larger in the noise compared to the speech maskers. It was hypothesized that this age effect would be more pronounced when the competing background is comprised of two children talking compared to two adults talking. Preliminary data indicate mixed results with respect to the child-adult differences across the two speech maskers. The creation of these stimuli and assessment tool has the potential for further use as a standardized tool to assess performance in classrooms, and may lead to the development of a clinical assessment tool to evaluate complex listening abilities of school-aged children.
Kevin T. Cunningham, Katarina L. Haley and Adam Jacks

*Sound distortions: A clinical feature of apraxia of speech*

**Purpose**
We sought to determine whether sound distortions corresponded with the presence of abnormal temporal prosody, the other primary speech domain thought to differentiate between apraxia of speech (AOS) and aphasia with phonemic paraphasia (APP). We asked: 1) Do individuals with abnormal temporal prosody produce more frequent distortion errors than individuals with normal prosody? 2) Do individuals with abnormal temporal prosody produce some distortion types that are particularly salient and are such errors more likely to affect particular sound categories?

**Background**
The differential diagnosis between AOS and APP is challenging, due to overlapping speech features and the frequent coexistence with aphasia. One important characteristic to distinguish AOS from APP is the presence of sound distortions. Narrow phonetic transcription by trained listeners is an established method for examining such subphonemic errors.

**Methods**
Participants were 15 persons with speech difficulties acquired after left cerebral hemisphere lesions. Two operationally defined groups, composed of speakers representing likely AOS (N=7) and speakers representing likely APP (N=5), were formed based on temporal prosody metrics. Three additional participants were analyzed separately due to borderline impaired prosody (N=1), co-existing dysarthria (N=1), and minimal sound errors (N=1). Audio recordings of single-word productions were coded via narrow phonetic transcription by four coders, and three dependent variables were derived: 1) distortion frequency, 2) distortion type, and 3) manner of production for distorted segments. We used a t-test between speakers who did (N=7) and did not (N=5) show abnormal prosody. Intra-class correlations (ICC) for distortion frequency and combinations of salient distortion types and affected segment types were calculated.

**Results**
Speakers with abnormal temporal prosody displayed significantly more distortion errors than did speakers with normal prosody (p<.01). However, for one coder, values overlapped somewhat between the two groups, and the magnitude of difference between the groups was not large for the other coders. Errors due to voicing, timing and tongue placement were the primary distortion types among speakers with abnormal prosody. Distortions occurred predominantly on stops, fricatives, and vowels. As measured by the ICC, agreement among coders was satisfactory (0.63; p<.001) for overall frequency of distortions. Within the abnormal prosody group, the strongest agreement was found for distortions affecting stop and fricative voicing (0.63 and 0.57; p<.001) and fricative tongue placement (0.67; p<.001).

**Discussion**
These results support the inclusion of distortions as a clinical feature of AOS. However, as indicated by the distribution overlap between the two groups, the mere presence of distortion errors is likely not a sufficient single criterion to differentiate AOS from APP. Consistent with previous studies, distortions due to voicing, timing, and tongue errors were the most salient types. However, timing errors were less common in this study than in previous work. Future research on perceptual distortion features should focus on voicing errors affecting stop and fricative consonants and on tongue placement errors affecting fricative consonants. If such work with larger sample sizes confirms that these distortion/segment combinations are reliably detected in the speech of persons of AOS, clinicians may benefit from listening for these specific features as a clinical marker of the disorder.
Alexandra Gery  

*Incidence and Prevalence of Hearing Related Problems in Individuals with Diabetes Mellitus Type 1 - an Evidence-Based Review of the Literature*

**Purpose**

The goal of this evidence-based review was to investigate current research to determine whether there is a relationship between diabetes type 1, also called insulin dependent diabetes (IDDM), and pathology of the hearing system. A second goal was to estimate the incidence and prevalence of hearing damage associated with IDDM, based on the review of the literature.

**Background**

Diabetes mellitus (DM) is a growing concern in the United States and in the rest of the world. The Centers for Disease Control and Prevention (CDC) reports that DM affects 25.8 million people in America, and that they expect that number to rise to 30 million people by 2030 (2012). DM is a metabolic disease that results from a relative or absolute insulin deficiency. Besides severe metabolic disturbances, widespread pathologic changes in the human body are common. The hearing mechanism is one example of affected systems, but the exact relationship between DM and hearing impairment remains controversial. Reported incidence ranges between 0-96 percent of the population (Lisowska et al., 2001; Parving et al., 1990; Wolfe et al., 2011).

**Methods**

A review of the literature was conducted in March 2012 using search parameters and inclusion/exclusion criteria set a priori. A total of 4 databases were searched (PubMed, Academic One File, CINAHL, Embase), using key words pertaining to hearing loss and diabetes mellitus type 1, epidemiology, prevalence and incidence. Some exclusionary key words included Wolfram Syndrome and optic atrophy. The search in the 4 databases resulted in over 100 hits, narrowed down to 7 articles that met the inclusion and exclusion criteria. Out of those seven, three articles with different approaches to the main focus were chosen. With guidance from Johnson on levels of evidence, ranking studies according to quality and credibility, the quality of evidence in the three main articles was assessed (2006).

**Results and Discussion**

The prevalence of hearing loss in IDDM ranges from 0-24% across studies focusing on behavioral threshold. Mild bilateral high frequency SNHL is the most common degree of hearing loss. In the cochlear and retro-cochlear dysfunctional studies reviewed, a range of 5.3-100% of subjects showed DM related dysfunction of the hearing system. Parving et al. found no correlation between diabetes and HL across IDDM groups and controls. But 40% in the longer duration of IDDM group and 5% in the short duration of IDDM had ABR abnormalities, indicating that a disease effect exists (1990). Age and duration of disease is significantly correlated with more damage to hearing system. No major difference was observed between prevalence comparing US general public (12.7-20.3%) and study groups (0-24%) (Ferrer et al., 1991; Lin et. al., 2011; Lisowska et al., 2001; Parving et al., 1990). Future directions: more prospective longitudinal studies are needed, including and isolating more precise diagnostic assessment measures. In addition, the relation between good or poor metabolic control needs to be studied to determine if poor control of the disease leads to more damage.
Purpose

The purpose of this literature review was to identify current evidence regarding the efficacy of five interventions commonly recommended for children with UHL: preferential seating, hearing aid, frequency modulated (FM) system, contralateral routing of signal (CROS) hearing aid, and bone anchored hearing aid (BAHA).

Background

Unilateral hearing loss (UHL) includes normal hearing sensitivity in one ear and hearing loss of any severity in the opposite ear. Until the 1980s, the potential adverse effects of UHL were not recognized by many professionals. Recent studies have shown that oral language skills and vocabulary intelligence quotient is poorer for school-aged children with UHL compared to their peers with normal hearing (Briggs, 2011). Furthermore, children with UHL are more likely to fail a grade and be labeled with behavioral problems than children with normal hearing (Bess et al., 1998; Lieu, 2004). Similarly, children with UHL report a poorer quality of life than children with normal hearing (Borton et al., 2010). Despite known adversities children with UHL encounter, professional practices regarding amplification for intervention with UHL are inconsistent.

Methods

A systematic search of the literature was conducted in three electronic databases (PubMed, Google Scholar, and CINAHL) using the following key words: unilateral hearing loss, pediatric, children, and audiologic management. Studies were evaluated for intervention type, outcome measures, and age of participants. Criteria for inclusion in this systematic literature review included: studies published in peer-reviewed journals, publications in English, and studies including children diagnosed with unilateral hearing loss. Results were summarized and evidence related to the efficacy of various types of audiological intervention in children with UHL was compiled.

Results

Thirteen articles were identified that met criteria for inclusion in this review. Articles were summarized and organized into a table. The evidence on preferential seating as an intervention suggests that children with UHL experience some benefit for speech discrimination when seated close to a sound source; however, their performance remains poorer than children who have normal hearing. Evidence regarding benefit for traditional hearing aid use suggests improved self-reported and parent/teacher quality of life as a result of the intervention. Studies on FM systems indicate that such technology is helpful in noisy situations, such as a classroom. No evidence was found to suggest benefit for the use of CROS hearing aids as an intervention for UHL.

Discussion

Recent research has primarily focused on BAHAs as an intervention for UHL. Evidence was found to suggest that the BAHA improves self-reported and parent/teacher-reported quality of life as well as speech recognition in quiet.
Michelle Hicks and Jackson Roush

*Newborn Hearing Screening in South America*

**Purpose**

The purpose of this study was to examine the status of newborn hearing screening and intervention in South America. Ten countries were compared to each other and with the United States.

**Background**

Permanent hearing loss affects around 1-3 newborn infants per 1000 live births. The prevalence increases tenfold for infants with risk factors. Studies have shown that early identification followed by appropriate intervention improves developmental outcomes for children who are deaf or hard of hearing.

**Methods**

Information for this study was gathered from government websites, web pages from professional organizations, and published literature. These resources provided statistics, legislation, recent findings, and information on the status of infant hearing screening and intervention in South America. In addition, personal contact was established via email with professionals in Chile, Brazil, Uruguay, and Peru. Much of the information obtained required translation by the first author from Spanish to English.

**Results**

There are three countries with active legislation related to infant hearing screening (Argentina, Brazil, Chile), three with inactive legislation (Columbia, Uruguay, and Peru), and four with no legislation (Bolivia, Ecuador, Paraguay, and Venezuela). Countries with active legislation primarily target high-risk infants. The three countries with inactive legislation have laws that have not been implemented or are still under development. Some of the countries with no legislation are providing screening and intervention services without a legal mandate.

**Discussion**

Newborn hearing screening in South America has been complicated by economic challenges and lack of qualified service providers. Most of the programs that have been implemented are, understandably, focusing primarily on high-risk newborns. While several pilot programs have been undertaken for universal newborn hearing screening, fully integrated systems that screen all newborns are likely to be years away for most South American countries. Some of the problems, such as delays in diagnosis or loss to follow-up, also exist in the United States, but lack of specialists in audiology and related disciplines throughout South America have made it difficult to develop and implement infant hearing screening programs, even for high risk infants. Still, progress is occurring in several South American countries and further expansion across the continent is likely in the years to come.
Hannah Hodson, Emily Buss, Andrea Hillock-Dunn, and Lori Leibold

*The Influence of High-Frequency Audibility on a Clinical Measure of Word-Final Plural Detection*

**Purpose**
The purpose of this project was to investigate the influence of high frequency audibility on performance for children and adults with normal hearing sensitivity on the University of Western Ontario (UWO) Plurals Test.

**Background**
Due to bandwidth limitations of modern hearing aids, children with severe and steeply sloping hearing losses do not have consistent audibility for sounds above 5 kHz; however, high-frequency speech information is thought to be essential for typical speech and language development (e.g., Stelmachowicz et al. 2001). Nonlinear frequency compression (NLFC) processing is one option for providing high-frequency audibility. With NLFC processing, stimulus components above a start frequency are compressed in bandwidth, with the greater shifts occurring for higher frequencies to best suit an individual’s hearing loss (e.g. McCreery 2011). Given the popularity of NLFC in pediatric hearing aid fittings, efforts have been made to develop valid and reliable assessment tools to measure outcomes associated with the provision of high-frequency audibility via NLFC processing. One measure that has gained traction is the University of Western Ontario (UWO) Plurals Test (Glista & Scollie, 2012). This clinical test aims to measure the ability to detect plural fricative endings /s/ and /z/ in the word-final position (Glista & Scollie, 2012). Stimuli consist of the singular and plural forms of 15 monosyllabic words (e.g., dog/dogs) organized in 30 item lists spoken by a female talker. The test is typically administered using a CD recording in the sound field. When used as an efficacy measure, it is administered with and without NLFC activated.

Conflicting results have been observed by Hillock-Dunn et al. (2012). Specifically, NLFC did not appear to provide benefit for a high-frequency phoneme identification task. Of particular interest, it was reported that children with hearing loss could accurately identify /s/ in a 12-alternative consonant identification task, regardless of whether or not NLFC was activated. This observation suggests that children tested by Hillock-Dunn et al. (2012) relied on information other than high-frequency audibility to correctly identify the phoneme /s/. Given the mixed results reported in the literature for outcomes assessed using the UWO Plurals Test, relatively low-frequency acoustic cues might also have been used by listeners tested in those studies.

**Methods**
Listeners were adults and children with normal hearing sensitivity. A two-alternative forced choice task was used to determine plural detection ability for a set of low-pass filtered conditions (8, 5, 4, 3, 2 kHz). Two 30-word lists were completed for each filtered condition, with list order and filter condition randomized.

**Anticipated Results**
Percent correct scores, plotted as a function of low-pass filtering, will be presented. Preliminary data indicate percent correct scores above chance performance for all five conditions for both groups. An analysis of the specific word errors made by listeners will be discussed.

**Discussion**
The preliminary data are consistent with the idea that listeners have access to information in addition to high-frequency frication noise that allows them to correctly identify word-final pluralization for the UWO Plurals Measure. Future acoustic analyses are needed to determine the specific acoustic information that is retained when low-pass filtering is applied.
Maria Jaunakais, Shawn Van Steen, Nancy McKenna, and Jackson Roush  
*Noise in the NICU: Optimizing the Acoustic Environment for Infants in the Special Care Nursery*

**Purpose**

The purpose of this poster is 1) to review existing guidelines for noise control in the NICU; 2) to provide guidance in obtaining accurate sound level measurements in the NICU; and 3) to offer recommendations for reducing and monitoring NICU sound levels.

**Background**

For decades, neonatologists, nurses, audiologists, parents and others have expressed concern regarding noise levels in the neonatal intensive care unit (NICU). With the earlier detection of hearing loss in neonates came additional interest in the effects of NICU noise on infants’ hearing; however, direct cause and effect relationships have not yet been determined. Other studies examined possible ill effects of excessive noise on growth and development. These concerns led the American Academy of Pediatrics to publish guidelines for NICU noise level limits in 1997. More recently, with increased interest in the development of sensory systems, investigators have examined not only the potentially harmful effects of noise, but also the implications of auditory deprivation, that is, the lack of exposure to sounds normally present in the prenatal acoustic environment.

**Literature Review**

A brief analysis of existing research is incorporated to examine the potential impacts of noise in the NICU on neonatal hearing, rest and growth, and auditory development. While noise-induced hearing loss in neonates has not yet been directly documented, immediate changes in respiration and heart rates, oxygen saturation, sleep state, stress responses, and blood pressure have been well established in the literature. Early studies evaluating the effects of recorded maternal voices demonstrated an overall positive effect on neonates; however, the use of music in the NICU remains controversial. It should be noted that, at this time, researchers have not conclusively evaluated the effect of this unnatural sound scene on the auditory maturation of neonates. Recommendations for permissible noise levels from the American Academy of Pediatrics (1997) and the Committee to Establish Recommended Standards for Newborn ICU Design (2007) are referenced. Guidelines for obtaining sound level measurements in the NICU, including recommended equipment and instrument settings also are discussed with reference to the noise of interest. A sample NICU recording also is provided and potential recording variables are detailed. Improvements in the NICU acoustic environment also are addressed, including changes in architectural-acoustic design and equipment design as well as the potential of educational programs for NICU staff members.

**Discussion**

The purpose of this poster is to make NICU noise information more readily available to staff members in special care nurseries and professionals from other multidisciplinary fields. By exploring noise guidelines, detailing recommended recording options and discussing interventions, our goal is to encourage an improvement in the NICU acoustic environment and call for additional research in related fields.
James Leyva  
*Cochlear Implants: Comparing Fine Structure Processing to Continuous Interleaved Sampling in Speech Recognition Testing*  

**Purpose**  

The principal aim of this research endeavor was to collect and evaluate recent evidence regarding clinical outcomes and performance difference in cochlear implant patients by comparing speech recognition performance between Fine Structure Processing (FSP) and Continuous Inter-leaved Sampling (CIS).

**Background**  

In recent years, cochlear implants have used CIS to encode the envelope component of a speech signal. While this speech processing rationale has remained a stalwart method, there have been recent attempts to implement a new speech coding strategy that would provide Cochlear Implant users more than just the envelope component of a speech signal. This new coding strategy, Fine Structure Processing (FSP), is purported to provide CI users with a better-quality signal by providing additional speech cues. It is suggested that these cues provided by FSP could improve speech discrimination performance.

**Methods**  

To address the aforementioned question, a literature review was performed within three databases (Pubmed, Web of Science and CINAHL). The search was conducted using key terms that were relevant to FSP, CIS and Cochlear Implants. Articles included in the present analysis were those that were published in English, which met the following criteria: The population studied consisted of subjects who were no younger than eighteen years of age. Additionally, the studies chosen were those in which the subjects had a minimum of six months experience using their cochlear implants. While the central question considered here is the difference in speech discrimination ability in FSP processing as compared to CIS, studies that included High Definition CIS (HDCIS) were also included in this analysis. Exclusion criteria for this analysis included: studies that emphasized music appreciation, used a primarily pediatric subject base, and studies that included new CI users (New user is defined here as any subject who has used their CI for less than six months).

**Results**  

The results of this analysis indicate that FSP does not necessarily provide a robust, objective benefit in speech discrimination. While one study indicated that FSP provided benefit in +10 dB SNR conditions, all other tested conditions lacked statistically significant differences. Some data suggested that some patients perceived subjective benefit.

**Discussion**  

The current analysis is inconclusive as to whether one strategy is superior to the other. Other studies have sought to clarify the issue by considering the effects of the number of active channels used in FSP, as well as frequency range comparisons between FSP and CIS. Future areas of research include FSP in music appreciation, and the potential benefits of FSP for tonal languages.
Sara K. Mamo and John H. Grose

*Speech-evoked ABR: Periodicity coding of a temporally jittered stimulus*

**Purpose**

Reduced periodicity coding in the aging auditory system likely contributes to difficulty understanding speech in a noisy environment. In a previous study, we found age-related differences in the neural encoding of a periodic complex sound at the level of the brainstem. The purpose of this study was to test the neural coding of a periodic speech sound in young adults and use a temporally jittered stimulus to model the periodicity deficits previously measured in older adults.

**Background**

Evaluating temporal auditory processing in older adults can be confounded by age-related deficits in other cognitive processes. There is a growing interest in characterizing temporal processing deficits in older adults using speech-evoked auditory brainstem responses (sABR). The sABR provides an objective, peripheral measure of the sensory encoding of sound. Our laboratory has observed age-related changes in temporal envelope coding using the sABR that may be due to reduced neural synchrony. This study tests a simulation of reduced neural synchrony designed to mimic, in normal-hearing young adults, the internal representation of the stimulus in older adults. The simulation involves imposing a random temporal jitter (Miranda and Pichora-Fuller, 2002) on the 170-ms /da/ stimulus used to evoke the sABR. The hypothesis is that perturbations of the stimulus periodicity will mimic neural temporal jitter, as reflected in reduced envelope coding of the speech stimulus.

**Methods**

Ten young adults (age: 20-30) were tested. A synthetic speech token (170-ms /da/) was used to elicit the sABR. A single-channel, mid-line recording was collected while the subject relaxed in a recliner and watched a silent movie. Recorded waveform responses were processed offline, and an FFT was computed for the periodic portion of the response in order to analyze the spectral components.

**Results**

Response analyses focus on component amplitude for the sustained, periodic portion of the stimulus. Results show a systematic amplitude reduction of the spectral components of the response for the jittered /da/ stimulus relative to the unprocessed /da/. In the maximal jitter condition tested, the averaged response from the younger adults qualitatively reflects the averaged response of the older adults (n=9) previously tested with the unprocessed /da/.

**Discussion**

These results suggest that disruptions to temporal periodicity of a complex stimulus can elicit a response pattern in young adults similar to that observed in the sABR spectrum in older adults. Future work will test older adults using the temporally jittered stimulus to determine if the corrupted stimulus further degrades the response of the older adults or if the older adults are limited by internal noise in the neural encoding of periodic sounds.
Megan Nosol and Katarina Haley

*Stories Worth Sharing: A Writing Workshop for People with Aphasia and Their Loved Ones*

**Purpose**

The purpose of this study is to develop a 7-week writing workshop program for people with aphasia and their main communication partners to determine if their writing habits and confidence in their communication abilities changed as a result of the writing workshop.

**Background**

Writing therapy has long been used in psychology and medicine as a way to help patients process emotional and physical hardships after trauma. This writing workshop aims to support self-determination for people with aphasia and their main communication partners by exploring communication techniques through writing and by giving participants opportunities to practice these techniques, together and individually, using writing styles of their choice.

The rehabilitation of someone who has aphasia often focuses on the improvement of speech, not usually on a person's ability to write. However, research suggests that writing can be an effective therapy tool for adapting to a life with aphasia (Hartke, King & Denby, 2007). Writing has been proven to facilitate and balance one's emotional expression, improve cognitive organization during speech tasks, and enhance social communication (e.g. Pennebaker, 2004). Additionally, writing has been shown to have a positive influence on physical health and to be an effective coping method for people undergoing major life changes as a result of illnesses (Shetzer, 2007). Aphasia forces family and friends to learn new ways to compensate for losses in communication. For people with aphasia and their family members and friends, confidence in their abilities to communicate with each other can impact perceived quality of life (Babbitt & Cherney, 2010).

**Methods**

In this pilot study, participants include four people with aphasia and two communication partners. All potential participants with aphasia were screened using the Western Aphasia Battery. All participants were interviewed with questionnaires about their writing habits and communication confidence levels before and after their strokes or brain injuries. Each writing workshop session is approximately three hours in duration. Session topics include collaborative writing, brainstorming, drafting, peer editing, finalizing, sharing writing pieces with the group, and sharing writing pieces with family and friends. A post-study interview/questionnaire will be given to all participants during the final workshop session day. A follow-up questionnaire will be given to people with aphasia and their respective communication partners three months following the writing workshop.

**Anticipated Results**

The writing workshop has completed its second week. Based on observations of the two workshop sessions, engaging workshop activities and individualized writing solutions for each participant have created enjoyable, meaningful writing experiences for participants.

**Discussion**

This pilot study suggests that using the self-determination framework, writing can be used with people who have aphasia and their communication partners to increase communication confidence by providing opportunities to learn about writing strategies and practice them, supporting autonomy by allowing people to choose their writing styles and goals, and promoting relatedness through group sharing of people’s writing.
Cristen Paige  
Chronic Traumatic Encephalopathy, Sports-Related Concussion and the Role of the Speech-Language Pathologist

Purpose  
The purpose of this literature review was to: 1) identify causes, risk factors, and signs and symptoms of sports-related concussion and Chronic Traumatic Encephalopathy (CTE) including CTE stages of progression; 2) define the scope of practice of the speech-language pathologist (SLP) as it relates to mild traumatic brain injury (mTBI); and 3) determine prevention measures, assessment tools and treatment plans for sports-related concussion, as they relate to the SLP.

Background  
CTE is a newly identified neurological disease that affects athletes on the professional, collegiate and high school levels. Current research concludes that the etiology of CTE is due to repetitive closed head injuries, including concussion. Evaluation and treatment of neurological disease/dysfunction, including mTBI, falls within the scope of practice of the SLP. This poster describes the risk factors, signs and symptoms of CTE and sports-related concussion, and offers examples of how SLPs may become involved with prevention, assessment, and intervention for this population.

Methods  
Current literature was reviewed, including research studies as well as professional guidelines (e.g. the American Speech-Language-Hearing Association [ASHA] scope of practice guidelines, the North Carolina High School Athletic Association [NCHSAA] “gradual return to play plan”, and the American Academy of Neurology [AAN] “Sports Concussion Position Statement”). Interviews were conducted with clinicians who evaluate and treat students and athletes with concussion. These sources provided information to achieve the stated purpose of the review and offered insight as to why the role is the SLP is underutilized among the population discussed. Examples of prevention, assessment, and treatment of sports-related concussion from the literature and from existing concussion treatment protocols are included in the presentation.

Conclusions  
This review revealed that CTE is caused by repetitive closed head injuries, and many of the symptoms associated with CTE fall within the SLP’s scope of practice. However, CTE is diagnosed post mortem, and until methods for diagnosing this disease during life are developed, the role of the SLP in CTE is unclear. Nevertheless, SLPs are uniquely qualified to assess and treat patients who have experienced mTBI or sports-related concussion. Specifically, they are trained to administer and evaluate standardized tests, such as the widely used computerized concussion evaluation system ImPACT®, and they possess the skills to translate test results in a way that impacts the patient while recovering. Furthermore, the SLP can provide therapy to those whose concussive symptoms do not resolve within the typical 7-10 days. Finally, education and awareness among parents, teachers, coaches, and athletes are critical components to minimizing the occurrence of sports-related concussion. School-wide awareness campaigns and educational resources have been endorsed by ASHA and AAN as possible prevention tactics. Unfortunately, the literature reviewed and the interviews conducted revealed a lack of involvement of SLPs with athletes, the population most at risk of experiencing concussion. Arguably, it is the responsibility of the SLP, with the support of ASHA, to educate athletic departments about the clinical skills they can provide and advocate for their clinical services.
Development of a Web-Based AAC System for People with Aphasia

Purpose
To determine the feasibility of a pictorially-based needs assessment for developing customized augmentative alternative communication (AAC) systems for people with aphasia and to obtain feedback about a new web-based AAC system run through a portable electronic device.

Background
Beukelman and colleagues have developed methods for assessing and preparing the input of AAC devices for persons with aphasia (Beukelman, Garrett, and Yorkston, 2007). In an aphasia needs assessment, the person’s interests and communication needs are surveyed via verbal questions and checklists. In previous studies about augmentative alternative communication devices, McKelvey and colleagues implemented the technique of using contextually rich pictures and were able to teach people with aphasia to associate a range of meanings with photographs (McKelvey, Deitz, Hux, Weissling, Beukelman, 2007). In another study, McKelvey et al. (2010) showed that people with aphasia have a preference for contextually rich pictures that have personal meaning. In this investigation, we modified the Beukelman needs assessment protocol and administered it with the support of clipart, photographs, and sketches that depict the content of interest. Furthermore, we expanded on McKelvey and colleagues’ concept by using pictures with associated meanings for obtaining content information for an AAC device and then implementing contextually rich pictures into a portable electronic device.

Methods
One female participant with aphasia was given a modified aphasia needs assessment supplemented by the Life Interest and Values cards (L!V; Haley et al., 2010). Card sorting methodology was used to identify initial topics, themes, and goals that the participant wanted to include within the electronic AAC system. The first participant then attended three weeks of 1-2 hour training sessions to learn to navigate the device by means of interviews and supported conversation. Each session helped the researcher customize the system to the needs of the person with aphasia. Once the participant was familiar with the device she was given a post-study interview to give feedback on the system and the device. We have recruited a second participant for this study, who is currently in the content development phase of the study.

Results/Anticipated Results
The pictorially based needs assessment generated useful content information to be incorporated in the communication system. The participant gave feedback on the functionality of the system and used the device to communicate with family members and research during the training and interview sessions. We anticipate that the second study participant will provide us with further knowledge about the functionality of the web-based system.

Discussion
The results indicate that people with aphasia can be active participants in the design and development of an electronic communication system. A streamlined interface, such as the one used in this study, is preferable. Regardless of the technology used, the results of this small study indicate that an intuitive interface, consistent navigation strategies, and personal photographs may be essential features for such a system. For the purpose of this project, the content was customized and modified through manual html coding. To ensure independent use, a transparent user interface would be necessary for uploading photographs and pictures and for modifying the text and audio output.
Research Questions
Using knowledge of traits typically expressed by a child diagnosed with autism, how can audiologists alter their behavioral testing methods to elicit responses that most accurately reflect the child’s true auditory threshold?

Background
Autism is a developmental disorder that affects typical development of social skills including language, pretend play, and interactions with others. Similar to children with hearing loss, autistic children often present with delays in speech and language. An audiologic evaluation is recommended to ensure that the child’s hearing is within normal limits, thereby indicating that their language delays are not attributed to a hearing loss and should be screened for autism. (PubMed 2010). Achieving reliable behavioral threshold estimates can prove challenging with an autistic child and may prevent an autistic child from responding at their true thresholds resulting in an incorrect diagnosis of hearing loss. The speech delays will be attributed to the hearing loss and may obscure the need to screen for autism.

The purpose of this literature review was to examine and evaluate the information currently available to audiologists concerning the characteristics of autistic children to determine if there is a testing strategy or method that results in the highest rate of valid and reliable estimates of the hearing sensitivity in this population.

Methods/Proposed Methods
A systematic search of three databases (PubMed, CINHAL, and Embase) was conducted in March 2012 using the key words “hearing assessment”, “autism”, “play abilities”, and “visual response audiometry”. Initially, only peer-reviewed articles involving audiologic testing of autistic children were included. The inclusion criteria was expanded to include expert opinion articles and studies that examined the mental abilities of autistic children due to limited results from the initial search. Based on the updated inclusion criteria, four articles were selected. Two are peer reviewed research articles and two are expert opinion. These articles were evaluated for methodological quality based on: the sample size, sampling, study design, description of protocol, and the level of evidence as described by Johnson (2006).

Results/Anticipated Results
The impairments associated with autism have the potential to hinder the child’s ability to provide reliable and valid behavioral estimates of hearing sensitivity. Overall, behavioral assessments have been shown to be less accurate than physiologic assessments due to large test-retest variability. However, it is possible to get accurate behavioral thresholds by incorporate the child’s needs and interests in testing. As of now, there is no known single best way to behaviorally test an autistic child.

Discussion
Audiologists must be flexible when testing children who have been diagnosed with autism and be willing to adapt their typical testing methods to accommodate the needs of the child. By involving the child in the testing procedure through the explanation of the tests, incorporating their interests in the visual reinforcements, and understanding their difficulties with imitations, the audiologist can work with the child to get accurate and valid estimates of hearing sensitivity.
Megan Wolfe and Lisa Domby

*What Am I Supposed To Do with English Language Learners?*

**Research Questions**

Do speech-language pathologists and teachers in the public school system have knowledge of the best practices of referral, assessment, and intervention for English Language Learners (ELL), as described in the 2006 memo from the NC Department of Public Instruction, Exceptional Children Division?

**Background**

In 2006, the NC Department of Public Instruction, Exceptional Children Division, distributed a memo regarding Speech-Language Pathologists (SLPs) and English Language Learners (ELLs). The memo clarified recommended assessment and intervention procedures for speech-language services with non-English speakers. UNC Speech and Hearing Sciences graduate student clinicians have reported inconsistencies in how English language learners are evaluated and treated for speech and language disorders. Some reported being told that ELLs need to be in the system for a minimum of 2 years (or even up to 7 years) before proper referral or assessment can occur. Speech-language pathologists would like to provide treatment without crossing ethical lines. It is unclear whether speech-language pathologists in North Carolina public schools are familiar with the best practices outlined in the 2006 memo.

**Methods**

A survey was developed to assess speech-language pathologists' and teachers' knowledge of best practices for referral, assessment, and intervention of English language learners as described in the 2006 memo from the NC Department of Public Instruction, Exceptional Children Division. Participants included 61 speech-language pathologists and 18 teachers, all working for the NC Department of Public Instruction. Surveys were conducted with speech-language pathologists in Durham Public Schools and Chapel Hill-Carrboro City Schools at their monthly meetings. Teacher surveys were administered at a teachers' meeting at Braxton Craven School in Randolph County, NC.

**Anticipated Results**

Results will indicate speech-language pathologists' and teachers' knowledge levels of best practices for referral, assessment, and intervention of ELL students. Results will be quantified using a percentage method to compare results from different populations and will be displayed via pie and bar graphs. Significant differences among SLPs and teachers will be highlighted. For example, in response to the item, “Every student who enters school speaking a language other than English should be referred for assessment by the speech-language pathologist,” 0% of SLPs agreed with the statement, while 50% of teachers agreed.

**Discussion**

Results indicated several significant differences in SLPs' and teachers' knowledge of best practice regarding referral, assessment and intervention for English language learners in NC public schools. More than half of survey respondents indicated they would like continuing education on how to properly refer, treat, and assess English language learners. Results will potentially aid in the development of an updated memo from the NC DPI Exceptional Children Division regarding SLPs and ELLs. Future directions may also include surveying additional teachers, and school psychologists.
Cecil Yeatts III
The Effects of Traumatic Brain Injury on the Central Auditory System: Test Validity and Reliability

Research Questions
The purpose of this systematic literature review was to answer the following two questions: 1) what tests can audiologists use to evaluate the degree of damage sustained to the central auditory system from traumatic brain injury? and 2) How valid and reliable are these tests?

Background
With the advancements in modern health care, the advent of the extreme-sports age, and advancements in modern warfare, people are becoming more prone to sustaining Traumatic Brain Injuries (TBIs), and are more likely to survive them relative to recent history. Most of the research in the area of auditory processing after TBI is involved with the military. More and more soldiers are surviving explosions that would not have survived in the past, however they may sustain TBIs that affect their auditory system. The better understanding an audiologist can have on the effects a TBI has on the auditory system, the more appropriate the treatment and intervention will be for the patient. Not all effects on the auditory system following TBI are peripheral auditory system problems some are central auditory system problems, and are much more difficult to assess. This systematic literature review will look to explore the options for audiologists in assessing TBI.

Methods/Proposed Methods
Using the databases CINAHL, Google Scholar, and PubMed, the search key words “Traumatic Brain Injury” and “Auditory Processing” retrieved an initial 47 papers. After applying inclusion and exclusion criteria, only three articles remained. The inclusion criteria required the paper to have been published within the last ten years, published in English, the patients had to be adults who sustained a traumatic brain injury, the study must have involved the central auditory pathways, and the study must have been focused on auditory function with traumatic brain injury. The exclusionary criteria required that no study involve animal or pharmacological models, case studies, committee reports, or studies of children.

Conclusions
There is no direct correlation between test results and severity of central auditory system dysfunction at this time, but there are some results that may have potential to help future research. ABR Wave V absolute latencies and I–V interpeak latencies increase with severity of TBI. As the severity of TBI increases, the absolute latencies and inter-peak latencies increase. No significant relationship has been found between tympanometric abnormalities and severity of TBI. Behavioral thresholds are not always indicative of the severity of effects on central pathways from TBI, and high frequency Otoacoustic Emissions tend to be poorer as the severity of the TBI increases.

The effects of damage to the central auditory system have not been systematically examined in humans, and there have been no studies comparing the validity and reliability of results of different tests performed on patients with TBI. If possible, a way to follow participants who are likely to incur a TBI during their profession could be tested for baseline results then followed up following a potential TBI. Subjective auditory difficulties need to be studied using a hearing handicap inventory for an elaborate evaluation of auditory processing disorders in these subjects. There simply is not enough research in the area, especially with regard to central auditory processing dysfunction after TBI, and more normative data for ABR testing following TBI is needed.