2019 Student Research Day

Friday April 26
1:00-5:00 pm
Bioinformatics
Auditorium and
Lobby, UNC-CH

Division of Speech and
Hearing Sciences,
Department of Allied Health
Sciences, University of
North Carolina at Chapel
Hill

Eleventh Annual
Division of Speech and Hearing Sciences
Student Research Day

Friday April 26, 2019
1:00 – 5:00pm
University of North Carolina – Chapel Hill
Bioinformatics Auditorium and Lobby

Welcoming Remarks

    Dr. Sharon Williams   1:00 – 1:10

Oral Presentations: 1st year Ph.D. Students

1. Liz Jaramillo   1:10 – 1:25
   Developing an Authentic Measure of Spanish Language Grammar and Narrative Language Development in Guatemala

2. Julia Yi   1:25 – 1:40
   The Language and Literacy Profiles of Students at an Adult Literacy Center

3. Kevin Cunningham   1:40 – 1:55
   New frontiers in discourse analysis: The rise of automation

4. Stacey Goebel Kane   1:55 – 2:10
   Estimating Spectral Ripple Resolution in Children and Adults

Oral Presentations: 2nd year Ph.D. Students

1. Meg Dillon   2:10 – 2:30
   Individualizing Electric Frequency Filter Assignments for Cochlear Implant and Electric-Acoustic Stimulation Devices: Normal-Hearing Simulations

2. Ranita Anderson   2:30 – 2:50
   Is there a relationship between early parent concerns and a later developmental disorder diagnosis?

3. Sofia Benson-Goldberg   2:50 – 3:10
   Visual Attention to Print: A pilot investigation with a child with CDKL5

Poster Session 1 (9 posters)   3:10 – 3:50

1. Catherine Lamont & Caroline Seaton
   Symptoms Related to Feeding Disorders in Children with Autism Spectrum Disorders

2. Laura Perrotta & Rachel Glendenning
   Surface Electromyography versus Electrical Stimulation in Post-Stroke Dysphagia Treatment

3. Megan Bartoshuk, Stephanie Berry, & Ashley McMillen
   Audiologic Management and Outcomes of Children with Auditory Neuropathy Spectrum Disorder (ANSD)

4. Meredith D. Braza, Stephanie Berry, & Nicole Corbin
   Speech Perception in Spatially Separated Speech: Effect of Talker Orientation

5. Maggie Anthony, Atiana Mcbride-Tobiere, & Helen Wrenn
   The Effectiveness of Neuromuscular Electrical Stimulation in Adults with Head and Neck Cancer with Dysphagia: A Systematic Review

6. Danielle Hamlin
   Outcomes Following Special Olympics Healthy Hearing Screenings

7. Sarah Cloud, Danna Verastegui, & Meaghan Whalen
   Non-pharmacological Interventions and Neonatal Abstinence Syndrome (NAS) Outcomes

8. Julia Skinner & Joel Lydic
   The Speech-Language Pathologist's Role in Concussion Management: A Systematic Review

9. Michaela Johnson, Andie Brandt, & Meg Dondero
   Assessment and Treatment Practices for Clients with Bilingual Aphasia: A Systematic Review

Poster Session 2 (10 posters) 3:50 – 4:30

1. Christine South
   Increasing positive predictive value for likelihood of autism in infants at-risk using Dynamic systems model

2. Dana Connor, Leah Gibson, & Jenna Hall
   Impact of Cognitive Training on Dementia Prevention

3. Madeleine Barclay, Samantha Scharf, & Crystal Smaldone
   Cochlear Implantation in Children with Single-Sided Deafness: A Systematic Review

4. Margaret Richter & Anne Marie Misey
   A Systematic Review of the Duration of Cochlear Implant Device Use and its Impact on Speech Perception in Adults

5. Lorraine Smith
   Drawing to Communicate: Assessing Component Skills

6. Will Brinson, Heather Cook, & Rebecca Wellons
   A systematic review of diagnostic test accuracy for identifying developmental language disorder in bilingual children

7. Chelsea Carter & Camille Herring
   Impact of School-Based, Linguistically Relevant Literacy Interventions for Spanish-English Bilingual Students

8. Jill Frink, Dana Sampson, & Annie Sager
   Peer-Mediated Intervention in High School Students with Autism Spectrum Disorder

9. Rachel Wasserman & Katherine McNeilly
   Efficacy of Tinnitus Retraining Therapy (TRT) in Adults with Bothersome Tinnitus

10. Caroline Baker, Keyton Glover, Arushi Mahajan
    Frequency of Errors in Apraxic Versus Non-Apraxic Speakers

Liz Jaramillo   Mentor: Linda Watson
Developing an Authentic Measure of Spanish Language Grammar and Narrative Language Development in Guatemala

Purpose
The purpose of this project is to further develop the *Brillo Assessment of Expressive Language and Personal Narratives,* a measure of grammatical morphemes and narrative skills for children in Guatemala. This tool will inform instruction and intervention, ultimately allowing the school to track and report on child language outcomes. This project will explore the sociocultural validity of the tool and community perspectives on language and narrative development. The need for this tool and the inception of the project emerged, and continues to be guided, through a professional collaboration between Lisa Domby at the University of North Carolina-Chapel Hill and Lic. Leticia Lopez, a Guatemalan speech therapist and director of Brillo de Sol (a non-governmental primary school serving children with special needs).

Background
The majority of research that impacts health and educational outcomes for children with developmental disabilities is conducted in high-income countries, despite the fact that the majority of the world's children live in lower- and middle-income countries (Durkin et al., 2015; Erskine, 2016; Wallace et al., 2012). It is inappropriate to use diagnostic measures that are normed for higher social-economic status communities, or predominantly western-based culture, in communities that do not share these characteristics. Using appropriate assessments with diverse communities can produce reliable epidemiological data for characterizing child disability globally. Authentic assessment methods improve awareness of local needs and our ability to serve these populations. Engaging the community that we serve in the development of assessment measures increases our confidence that the measure is appropriate to that community.

Proposed Methods
Qualitative methods will be used to assess the cultural appropriateness of the tool, including semi-structured key informant interviews and small-group focus groups. After administering the revised tool to a sample of typical and atypical children in Guatemala, we will review individual items and responses for content and construct validity. Additionally, we will consider preliminary evidence that the tool discriminates between children identified with and without language delays. To do so, we will conduct a qualitative analysis using Cronbach's Alpha. Previously, we have reviewed the wording in this tool so that it is linguistically appropriate specifically for Guatemala. As items are fine-tuned or changed for validity, we may revisit wording to maintain the use of Guatemalan Spanish.

Anticipated Results
While this project is iterative, the aim is to produce an assessment which matches the needs of speech therapists and educators in Guatemala. In addition to producing a new iteration of the tool with stronger psychometric properties, we will refine its administration procedures, scoring and instructions for use in its intended context. The tool will ultimately increase the local school's ability to measure, intervene, track and report child language and narrative outcomes.

Discussion
This project will further our understanding of the complex process of cultural and linguistic adaptation of a child language assessment. Importantly, we will characterize the goals and perceptions of local educators as we collaborate in this process. Additionally, we will engage in a broader dialogue on cultural influences of narrative production and assessment.

Julia Yi   Mentor: Karen Erickson
The Language and Literacy Profiles of Students at an Adult Literacy Center

Purpose
The purpose of this study is to determine the language and/or literacy profiles of adults participating in a community adult literacy center using existing intake and assessment data. Potential research questions might include: (a) What are the language and literacy profiles of adults enrolled in an adult literacy program? (b) What are the self-reported special education and disability histories of students enrolled at an adult literacy center? (c) Is there a relationship between self-reported special education and disability histories and the intake language and literacy profiles of adults enrolled in an adult literacy program? (d) What is the impact of the adult literacy program on participants? (e) Is there a relationship between self-reported special education and disability histories and impact of the adult literacy program on participants?

Background:
Literacy is an essential skill with a lifelong effect on employability, earnings, and health[1]. Conversely, illiteracy is correlated with unemployment, poor health, and incarceration[1-3]. Though there are an estimated 30 million adults with below basic literacy in the US[4], there is a paucity of research on both the language and literacy profiles of these adults and the relationship between these profiles and the relative success of literacy interventions.

Proposed Methods
Data will be acquired from the Local Adult Literacy Center (LALC). Adults enrolling in the LALC are tested with at least one of four assessments upon intake and after completing benchmarks: (a) *Test of Adult Basic Education* (assesses silent reading comprehension of passages), (b) *Comprehensive Adult Student Assessment Systems* (measures reading, listening, math, writing, and speaking), (c) *Wilson Assessment of Decoding and Encoding* (measures alphabetics and word and sentence-level decoding/ encoding), and (d) *Student Achievement in Reading* (measures vocabulary and reading fluency). Adults also provide demographic information including a self-report of an identified disability in school. The number of cases available has not yet been determined. Depending on the completeness and scope of available data, descriptive statistics and appropriate (non)parametric analyses will be conducted.

Anticipated Results
It is predicted th:at students enrolled at the LALC will have below-average language and literacy skills, a disproportionate number of adults with self-reported disabilities, and differences in language and literacy profiles across adults with and without self-reported disabilities.

Discussion
The results have the potential to help inform research for language and/ or literacy interventions for adults enrolled in adult literacy programs.

Kevin T Cunningham   Mentor: Katarina Haley
New Frontiers in Discourse Analysis: The Rise of Automation

Purpose
Difficulties with discourse are common in the setting of stroke and dementia. Current methods to these skills are limited to time-consuming manual coding. As a result, potentially critical information is not evaluated by clinicians. We propose a fully automated analysis method to provide practitioners with a simple discourse evaluation metric, the Word Information Measure (WIM). This metric based on information theory obtains a severity rating based on a transcript. We ask whether automated discourse generation (autoWIM) is comparable to the manual transcript generation (manWIM).

Research question: Is autoWIM reliable compared to manWIM?

Background
Current methods to assess discourse are prohibitively time-consuming, requiring manual transcription and coding that can require two hours. We have demonstrated sensitivity and specificity of WIM based on manual transcription in a large study of 404 speakers. We found that WIM, calculated using only a single storytelling task, demonstrated a diagnostic accuracy of 81% in discriminating individuals with aphasia from neurotypical controls.

Proposed Methods
We will enroll 54 neurotypical adults and record their performance on typical discourse elicitation tasks. We will transcribe these recordings from neurotypical participants and available recordings from 110 stroke survivors. manWIM will be calculated based on these transcripts using the qdap package in R. A software developer will create an interface to upload the recordings to a machine learning speech-to-text platform to generate a transcript, which will be used to calculate autoWIM. The intra-class correlation (ICC) for manWIM and autoWIM will be calculated.

Anticipated Results
We anticipate an ICC of greater than 0.60 indicating adequate agreement of manWIM and autoWIM. If this value is not obtained, we will recalibrate the machine-learning platform as needed.

Discussion
Once reliability is demonstrated, we intend to investigate improving the diagnostic accuracy of autoWIM by manipulating the type of discourse elicitation task. Current tasks are relatively simplistic, for example describing a children's story, and our hypothesis is that diagnostic accuracy can be improved by including tasks that demand more complex discourse skills.

Stacey L. Goebel Kane   Mentor: Emily Buss
Estimating Spectral Ripple Resolution in Children and Adults

Purpose
This study evaluated the effects of static versus dynamic cues on spectral resolution estimates when using various forced-choice test procedures.

Background
Spectral modulation detection is one method used to characterize spectral resolution abilities. In this task listeners detect spectral modulation as a change in the stimulus *across* intervals. Alternatively, the spectral-temporally-modulated-ripple test (SMRT; Aronoff & Landsberger, 2013) estimates spectral resolution using dynamic stimuli for which the detection cue is a change in pitch *within* a single interval. For both tasks – spectral modulation detection and the SMRT – performance drops with increasing density of spectral ripples (ripples per octave, RPOs), and RPO at threshold reflects spectral resolution.Developmental effects in pitch perception are larger when the task requires a comparison across intervals (e.g., pure-tone frequency discrimination) than detection of a change within an interval (e.g., FM detection; Buss, Taylor, & Leibold, 2014). A greater child-adult difference for frequency discrimination than FM detection could be due to the larger burden on auditory memory associated with comparing cues across intervals in contrast to listening for cue changes within a listening interval. Similarly, a two-alternative forced-choice task (2AFC) may be more challenging for children than a three-alternative forced-choice task (3AFC), due to the memory burden associated with remembering the perceptual qualities of the target sound across multiple listening intervals and trials.The current implementation of the SMRT uses a 2AFC format. This study compared estimates of spectral resolution for spectral modulation detection and the SMRT using different forced-choice procedures (2AFC, cued-2AFC, and 3AFC) with children and young adults.

Methods
Participants were fifteen typically-developing children (5-12 years) and ten young adults (19-35 years) with normal hearing (≤20 dB HL 250 – 8000 Hz) and without history of middle ear disease. All participants completed three frequency resolution estimates using SMRT stimuli (see Aronoff and Landsberger, 2013, 2018) and spectral modulation detection with frequency bandwidth equal to the SMRT. Estimates were collected at 80 dB SPL in the left ear with adaptive 2AFC, cued-2AFC, and 3AFC procedures, adjusting for d'

Anticipated Results
As anticipated, performance improved as a function of age for all test conditions. The strongest effects of age were observed for spectral-temporally modulated cued-2AFC and 2AFC conditions and the spectrally modulated cued 2AFC condition. Median ripple density thresholds appear similar across all test paradigms. In adult data, there was a modest advantage for the cued 2AFC condition. In the 2AFC condition, listening with a dynamic stimulus did not significantly improve performance for children or adults. Finally, a strong relationship between thresholds for spectral-temporally modulated and spectrally modulated stimuli was observed for the cued-2AFC and 2AFC test paradigms, but not for the 3AFC paradigm.

Discussion
Results do not suggest substantial threshold differences based on stimulus type (static or dynamic) or test paradigm (2AFC, cued-2AFC, or 3AFC). These results will guide future development of a test battery including spectral resolution estimates in children with sensorineural hearing loss and auditory neuropathy.

Margaret Dillon   Mentor: Emily Buss
Individualizing Electric Frequency Filter Assignments for Cochlear Implant and Electric-Acoustic Stimulation Devices: Normal-Hearing Simulations

Purpose: To compare the speech perception in noise when listening to a default versus place-based map in simulated cochlear implant (CI) and electric-acoustic stimulation (EAS) devices.

Background: Cochlear implant and EAS device users demonstrate variable rates of speech perception acclimatization within the initial months of device use. Performance variability may be due in large part to a frequency-to-place mismatch created by the default mapping procedures of the electric frequency filter assignments. For patients listening with the CI-alone, the default mapping procedure distributes the speech spectrum logarithmically across the active electrodes. For patients listening with EAS, the default mapping procedure identifies the frequency at which unaided acoustic hearing exceeds a criterion level (e.g., 65 dB HL) and presents that low-frequency information on the most apical electrode; the remaining mid- to high-frequency information is distributed logarithmically across the remaining active electrodes. While default mapping procedures ensure full representation of the speech signal, they do not consider the natural tonotopic place of stimulation. Electrode array angular insertion depth (AID) varies across patients, and is dependent upon the cochlear anatomy, electrode array design, and surgical approach. Therefore, the default procedures can create a discrepancy between the place of stimulation and the natural tonotopic organization of the cochlea, known as a frequency-to-place mismatch. The magnitude of the frequency-to-place mismatch may influence speech perception variability during the initial months of device use.

Methods: We investigated the effectiveness of a place-based mapping procedure that incorporates the AID of individual electrodes into the device's filter assignments. Imaging algorithms use the postoperative CT scan to calculate the AID, which is used to estimate the cochlear place frequency based on the spiral ganglion function. With the place-based procedure, the frequency filter assignments of individual electrodes are adjusted to match the cochlear place frequency. As a first step to evaluating the efficacy if this approach we tested normal-hearing subjects who were randomized to listen to a simulation of a CI-alone or EAS device that was mapped with either the default or place-based procedure. Subjects were asked to recognize AzBio sentences presented in multi-talker babble at increasing signal-to-noise ratios. A noise vocoder simulated the electric component of a CI-alone and EAS device, and low-pass filtered speech simulated the acoustic component of an EAS device. The simulation parameters were based on the AID of individual electrodes for an actual Flex24 electrode array recipient. There were two conditions for this simulation: 1) low-frequency hearing preservation and use of an EAS device, or 2) low-frequency hearing loss and use of a CI-alone device.

Results: Subjects demonstrated better speech perception and less performance variability when listening with a place-based map as opposed to the default map in both conditions (with and without simulated hearing preservation).

Discussion: The results indicate that matching the electric frequency filters to the cochlear place frequency may improve the initial speech perception with CI and EAS devices and reduce the acclimatization required for asymptotic performance. Critical evaluation of the variables that may contribute to early speech perception performance is needed to support optimal outcomes in CI and EAS device users.

Ranita Anderson   Mentor: Linda Watson
Exploring considerations and barriers for early intervention services for children at-risk for ASD

Research Questions
- Do differences exist in the quantity/types of services received by at-risk infants/toddlers later diagnosed with ASD versus those with non-ASD outcomes?
- Do race and/or socioeconomic status predict early intervention (EI) access?
- Does developmental status or ASD symptom severity predict EI access?
- What are factors described by parents that influence pursuit of services and/or create barriers for pursuing or accessing services?

Background
Although EI can support better outcomes for children with ASD, children are often not diagnosed with ASD until they age out of birth to three services. This often means the EI services a child may receive do not target specific ASD behaviors with the recommended intensity. Additionally, existing literature does not address how, why, and who pursues or accesses EI services after a positive ASD screening. We do know that many factors play a role in accessing services for older children with ASD and other diagnoses, including demographic (e.g., SES, race), as well as factors such as the severity of the child's challenges. Barriers to obtaining EI services, such as waiting times and awareness of services, also have been noted.

Methods
Using a mixed methods approach, we analyzed extant data from the Early Development Project (EDP), an intervention trial enrolling 12- to 15-month-olds with a positive ASD screen. Group differences in EI services for children later diagnosed with ASD versus those with non-ASD outcomes were examined via t-tests. Predictors of total EI services accessed were examined through both simple and multiple linear regression. The qualitative portion of the study used directed content analysis, with Andersen's Behavioral Model of Service Use as the foundational framework to analyze interview summaries during and after participation in EDP for themes related to service use, including barriers and parental decision-making related to service pursuit.

Results
In preliminary analyses, expressive language scores predicted the total minutes of services a child received while in EDP. For every one-point decrease in expressive language scores, approximately 28.88 additional minutes of services were acquired. No other significant demographic or developmental predictors were identified. Children later diagnosed with ASD received more minutes of service than those with non-ASD outcomes, including OT, service coordination, developmental services and "other" services. Qualitive analysis showed themes around reasons not to pursue services included a "wait and see" perspective, noting growth in skills, financial/insurance barriers and differences in opinions about the child's need.

Discussion
Findings about variables that predict pursuit of services reinforce the idea that parents' first primary concern of reduced expressive language will often lead to differences in service. Qualitative analysis supports these findings as families who noted improvements in expressive language indicated reduced interest in pursuing services. While language was the only predictor, families did not access more SLP services based on a future ASD diagnosis. This may be impacted by a systematic challenge in receiving these services.

Sofia Benson-Goldberg   Mentor: Karen Erickson
Visual Attention to Print: A Pilot Investigation with a Child with CDKL5

Purpose
This study examines the patterns of visual attention to print that occur during shared reading for young children with CDKL5. Specifically, it aims to: 1) *Identify the patterns of visual attention to a digital picture-book for children with CDKL5 when their parents engage with them in storybook reading interactions*; 2) *Explore the impact of print referencing strategies on children's visual attention to print.*

Background: Emergent literacy is broadly defined as the reading and writing skills that precede conventional literacy (Teale & Sulzby, 1986), including understandings of the functions and conventions of print (Senechal, LeFevre, Smith-Chant, & Colton, 2001). Shared reading is a research-based intervention that supports the emergent literacy skills of students with and without disabilities (NELP, 2008). Print referencing is a strategy used during shared reading to increase a child's understanding of concepts and conventions of print (Justice & Ezell, 2004). Historically, children with developmental disabilities have had substantially different experience with and access to literacy when compared with their typically developing peers (Koppenhaver, Coleman, Kalman & Yoder, 1991; Light & Smith, 1993). Physical, sensory and/or cognitive impairments lead to reduced opportunity to develop and integrate emergent literacy skills as a result of reduced access to materials for reading, writing and communicating. Children with CDKL5 have a combination of motor, cognitive, sensory and communication impairments that significantly impact their ability to interact and learn. The current study aimed to leverage advancements in eye-tracking technologies in order to measure visual attention to print before and after a parent-mediated print referencing intervention.

Methods: A preliminary, descriptive study has been completed with one parent-child dyad in their home. The intention was to recruit three children, aged 36 to 96 months with CDKL5 and their parents; however, recruitment has been challenging with two families starting and then discontinuing their participation and three families initially expressing interest and then withdrawing before they could begin due to health-related or other family issues. For the single dyad who has completed the protocol, eye-gaze technology, digital children's books, and a computer configured with software for observing and recording interactions were shipped to the family's home for the duration of the study. During baseline, the family read six electronic books selected from a bookshelf created for this study. At the conclusion of baseline, the mother was taught a print referencing approach described by Justice et al. (2008). This parent-focused intervention was mediated over Skype. After learning the print-referencing approach, the mother then read six additional electronic books while applying the strategy. Dependent variables informed by Justice and Lankford (2002) were computed from the collected recordings.

Results: One family successfully completed the study protocol. Results demonstrate that the eye-trackers were capable of capturing the participant's eye gaze during both phases of the study. Furthermore, visual analysis of the data demonstrates changes in visual attention to print after the parent introduced the print referencing strategy.

Discussion: While the current study demonstrates that advancements in eye-tracking technology provided a new modality for assessing response to intervention for a child with severe physical, cognitive, and sensory-motor disabilities, it also illuminated several barriers that continue to exist in regards to recruiting and retaining children with fragile and complex medical states into intervention research.

Catherine Lamont, Caroline Seaton   Mentors: Steinbrenner & Page
Symptoms Related to Feeding Disorders in Children with Autism Spectrum Disorders

Research Question
What are the symptoms related to feeding disorders in children with Autism Spectrum Disorder (ASD)?

Background
Feeding difficulties have been observed in children with ASD since the disorder's earliest descriptions. Ledford and Gast (2006) reported in their review that between 46–89% of children with ASD present with a feeding difficulty of some description. This study aimed to review current research about feeding disorders in children with ASD in order to (1) determine common symptoms of feeding disorders in this population and (2) determine if there is a pattern of symptom presentation for these children. Previous systematic reviews have been completed on this topic, such as Marshall et al. (2014). However, none have been found synthesizing data from the past five years.

Methods
To complete this systematic review, researchers searched key terms of ASD, feeding, and related terms and synonyms in databases CINAHL, PsycInfo, ERIC, and PubMed for published articles between January 2014 and January 2019. Inclusion criteria for selecting papers were case-controlled studies, children with a diagnosis of ASD, children ages birth to 18 years, and articles written in English. Exclusion criteria included intervention studies, case studies, systematic reviews, eating disorder papers, gastroenterology papers, and articles reporting only caregiver outcomes. Two researchers reviewed papers for inclusion through title/abstract review and later full text review. Reliability checks and blinding were utilized at each step. Quality appraisals were performed on papers after the full text review. After final papers were selected, researchers extracted data and synthesized to draw conclusions about research question from current literature.

Results
Systematic review is currently in process. The initial search yielded 360 articles. The researchers eliminated 300 articles in the title/abstract review (96% reliability) and 51 articles in the full-text review (87% reliability). This left 9 articles included for data extraction. Data related to symptoms has been found in three main categories: sensory processing, problematic mealtime behaviors, and selective or restrictive eating. This data spans multiple case-controlled studies to compare to children with ASD to typically developing children (TDC). Extracted data related to methodology and results will be reported.

Discussion
Multiple studies included in this review found a link between sensory processing and feeding disorders in children with ASD. This information can be clinically relevant when creating intervention plans for this population. For instance, a sensory intervention may be indicated for children with ASD who are experiencing feeding difficulties. Further, of the 9 studies included, 12 different assessment tools were used in measuring either sensory processing or feeding symptomatology. This wide variety suggests a need for more comprehensive assessment tools that may be accessed by healthcare providers. Overall, this systematic review revealed the need for future research in sensory interventions for children with ASD and feeding difficulties, as well as the need for the creation of a comprehensive, widespread feeding assessment tool.

Laura Perrotta, Rachel Glendenning   Mentors: Steinbrenner & Page
Surface Electromyography versus Electrical Stimulation in Post-Stroke Dysphagia Treatment

Purpose
In stroke patients, how does surface electromyography compare to electrical stimulation strategies in dysphagia treatment outcomes?

Background
Dysphagia is a prevalent post-stroke complication that is thought to affect 45-65% of patients Lee et. al, 2018). There are several traditional therapies that are being used to treat dysphagia, such as effortful swallow and the Mendelsohn maneuver (Permsirivanich et. al, 2009). Electrical stimulation, otherwise known as neuromuscular electrical stimulation, uses an electric current to stimulate nerves and hopefully produce muscle contraction (Li et. al, 2018). Surface electromyography, a technique in which stimulates the muscles used for swallowing in addition to outputting a graph representation, can be used as a biofeedback technique to help teach patients swallowing techniques (Azola et. al, 2015). This systematic review was conducted to evaluate the effectiveness of electrical stimulation versus surface electromyography in the treatment of dysphagia in post-stroke patients.

Methods
Researchers completed two separate searches for the different treatment techniques on PubMed, ComDisDome, and CINAHL for articles published after 2009. Search terms included the kind of treatment (sEMG or e-stim), "dysphagia" and its synonyms, as well as "stroke" and its synonyms. The inclusion criteria were use of experimental or pre/posttest designs and adults 19 years or older presenting with dysphagia after a stroke. Exclusion criteria were articles not written in English and non-peer reviewed articles. Qualitative assessments were done using the LEGEND evaluation tool from Cincinnati Children's. This systematic review was conducted based on PRISMA guidelines.

Results
One article analyzed the effect of sEMG on swallowing function, while five articles analyzed the effect of e-stim on swallowing function. The sEMG article had a pre/post-test design, and all five of the e-stim articles were randomized control studies. The sEMG study yielded statistically significant results that supported sEMG as a biofeedback technique. All five of the e-stim studies yielded significant results related to dysphagia treatment.

Discussion
Overall, there is preliminary evidence to suggest that electrical stimulation and surface electromyography combined with traditional therapy techniques (Mendelsohn Maneuver, etc.) are more effective than traditional therapy alone. E-stim alone had similar degrees of effectiveness as traditional swallow therapies alone. There was a lack of research involving surface electromyography as a biofeedback technique in dysphagia treatment. More research needs to be done focusing on biofeedback techniques in conjunction with traditional swallowing therapies. E-stim and sEMG prove promising for the future of dysphagia treatment.

Megan Bartoshuk, Stephanie Berry, Ashley McMillen   Mentors: Steinbenner & Page
Audiologic Management and Outcomes of Children with Auditory Neuropathy Spectrum Disorder (ANSD)

Purpose: What are the current recommended audiologic management strategies and related outcomes for children diagnosis with Auditory Neuropathy Spectrum Disorder (ANSD)?

Background: Auditory Neuropathy Spectrum Disorder (ANSD) is clinically characterized by abnormal Auditory Brainstem Response (ABR) wave morphology and normal outer hair cell function with present cochlear microphonic and/or otoacoustic emissions (OAEs) (Starr et al, 1996). This combination of features makes electrophysiologic prediction of functional hearing and outcomes of amplification difficult to predict (Berlin et al, 2010). Hearing ranges from normal to profound loss in one or both ears, and with equally variable speech performance that is often disproportionately poor relative to the degree of hearing loss (Rance et al, 1999). There is no current international standard of management for this population. Clinical interventions vary between no intervention, hearing aids, and cochlear implants. The purpose of this systematic review is to evaluate the current literature for management strategies for ANSD internationally and their associated outcomes.

Methods: A systematic search was performed using PubMed and CINAHL to gather studies that investigated the audiologic management and outcomes of children with auditory neuropathy spectrum disorder. Inclusion criteria were participants with ANSD who were 18 years old and younger, expert opinions, clinical practice guidelines, conference presentations, qualitative and quantitative research. Exclusion criteria consisted of literature reviews, animal studies, case studies with less than five participants, studies with participants older than eighteen years old, participants with multiple disabilities, non-English articles, and diagnostic-only articles.

Results: Initially, 198 articles were identified to fit criteria. The title and abstract screening resulted in the exclusion of 82 articles and an inter-rater reliability of 90.7% on 20% of the articles. The full text assessment resulted in the exclusion of an additional 104 articles and an inter-rater reliability of 90% on 20% of the articles. Ultimately, 12 studies were included for quality appraisal and the authors had an inter-rater reliability of 100% on 20% of the articles. Of the 12 studies, six were rated as good quality and included in data extraction while five were poorer quality and discussed in more limited detail. Six articles evaluated interventions for ANSD: two with cochlear implants, one with hearing aids and three with a combination of cochlear implants and hearing aids. Results of cochlear implantation across studies revealed statistically significant benefit from implantation on measures of speech perception and receptive language questionnaires, in many cases showing no difference from children with traditional sensorineural hearing loss. Outcomes with hearing aids revealed more variable results. Most articles noted improvement in speech production and perception, while one noted poorer performance in the presence of background noise when compared to children with sensorineural hearing loss and hearing aids. One article showed contralateral hearing aid use was beneficial for children with ANSD and unilateral cochlear implantation.

Discussion: Current clinical practices continue to include a variety of interventions. The current research shows benefit from both cochlear implants and hearing aids. It is clear that some intervention compared to no intervention is beneficial; however, the preferred protocol of intervention is not standard across all children. Children with ANSD can have positive outcomes through varied interventions and recommendations for management should be patient-dependent. Future research should focus on patient characteristics that indicate specific management guidelines.

Meredith D. Braza, Stephanie Berry, Nicole Corbin   Mentor: Emily Buss
Speech Perception in Spatially Separated Speech: Effect of Talker Orientation

Purpose
The purpose of this study was to determine if masker talker orientation (60° versus 0° azimuth) has an effect on spatial release from masking in children and adults with normal hearing.

Background
Spatial release from masking (SRM) refers to the improved ability to recognize target speech when target and masker stimuli are spatially separated on the horizontal plane. Laboratory assessment of SRM often involves measurement of speech recognition in two spatial conditions: one in which target and interfering speech originate from directly in front of the listener, and another in which target speech originates from the front of the listener while interfering speech originates from one or both sides of the listener. The vast majority of research investigating SRM has been conducted with target and masker speech stimuli recorded from a microphone placed directly in front of the talker (0° azimuth). As a result, most data on SRM in listeners with normal hearing (NH) simulate a listening situation involving competing talkers that directly face the listener. In the real world, masking speech is produced by talkers with a range of head orientations; the extended high-frequency content of the masker speech at the listener's ears will vary accordingly. This study investigated whether the facing orientation of competing talkers has an effect on SRM.

Methods
Fourteen adults and seven children completed masked speech recognition task in three spatial conditions and two masker talker orientation conditions. All participants had NH, as determined by type A tympanograms and pure-tone air-conduction thresholds of $\leq$ 20 dB HL at 250-8,000 Hz, bilaterally. Extended high-frequency hearing was also tested from 11.5 to 16 kHz but did not serve as exclusionary criteria. Target speech consisted of sentences recorded from a microphone placed at 0° azimuth. Masker speech consisted of concatenated words recorded from a microphone placed at either 0° or 60° azimuth. In each condition, target speech was always presented directly in front of the listener (at 0° azimuth) while masker speech was played from the same location as the target speech or from one or both sides of the listener (+52° or ±52° azimuth). Speech recognition thresholds (SRTs) corresponded to the signal-to-noise ratio (SNR) at which 50%-correct sentence recognition was achieved in each condition.

Results
SRTs were better for the 60° relative to 0° masker orientation condition in both adults and children, with the greatest effects observed in the co-located target-masker condition. SRM was smaller for the 60° relative to the 0° masker orientation condition. Overall, children performed more poorly than adults in the masked speech recognition task.

Discussion
Results suggest that target speech is easier for both children and adults to recognize when background talkers are facing the listener at 60° relative to 0° azimuth. The masker has less extended high-frequency content in the 60° relative to 0° masker facing orientation. Listeners are sensitive to this difference, particularly when both the target and masker are co-located. The reduced SRM observed in the 60° masker orientation condition is likely explained by the improvement in performance observed in the co-located condition. Studies using masker speech recorded at 0° may overestimate the SRM in realistic cocktail party conditions.

Maggie Anthony, Atiana Mcbride-Tobiere, Helen Wrenn   Mentors: Steinbrenner & Page
The Effectiveness of Neuromuscular Electrical Stimulation in Adults with Head and Neck Cancer with Dysphagia: A Systematic Review

Purpose

The purpose of this systematic review is to answer the following questions: How effective is the addition of neuromuscular electrical stimulation (NMES) to traditional dysphagia treatment in improving the swallowing function of adults with head and neck cancer (HNC) with dysphagia compared to traditional treatment alone?

Background

NMES is a commonly used intervention method in the treatment of dysphagia. However, much of the research focuses on larger patient populations, such as individuals who are post-stroke. Dysphagia is also a common disorder associated with the treatment of HNC due to cancer interventions such as chemotherapy, radiation and/or surgery disrupting normal swallowing functions. In this systematic review, the authors sought to explore the current research on the use of NMES in comparison to and/or in combination with traditional swallowing interventions for individuals with dysphagia related to the treatment of HNC.

Methods

The authors conducted a systematic review of journal articles published from 2004-2018 available in PubMed, CINAHL, and The Cochrane Library. Relevant search terms were selected, including cancer, dysphagia, deglutition, swallowing, NMES, stimulation, and neuromuscular electrical stimulation. The inclusion criteria were use of NMES, participants with HNC that had received or were currently receiving chemotherapy, radiation and/or surgical treatments, and participants that were 18 years old or older (adults). The exclusion criteria included prior history of dysphagia before beginning cancer interventions, presence of other forms of cancer, articles not available in English, and use of intervention methods other than traditional dysphagia interventions to improve or compensate for diminished swallowing abilities.

Results

Search results initially yielded 60 articles for title-abstract review, which led to a full-text review of 7 articles. Five articles were then subjected to a quality appraisal process utilizing the Cincinnati Children's LEGEND Evidence Appraisal tools. Four of the five articles were determined to be of high quality while one was deemed to be of lesser quality, though these decisions were made leniently based on the relative lack of research and small patient population available for this research question. Inter-rater reliability was 96-100% in each appraisal stage. Data were extracted from all five articles. The five articles varied greatly in terms of study design, number of participants, length of study, types of HNC represented, and measurements/determinations of swallowing outcomes. For outcomes, some articles determined effectiveness of NMES based on quality of life measures, others used specific dysphagia scales such as the Functional Dysphagia Scale, and some made determinations based on improvement of one or several aspects of swallowing functions.

Discussion

Overall, the information gained from these articles offers preliminary evidence that the use of NMES in the treatment of dysphagia in patients with HNC can improve some aspects of swallowing function and is well tolerated across the patient population. However, the limited number of studies and the widely varying methodology employed means caution should be used in considering the effectiveness of NMES for the HNC population. This systematic review highlights the need for future research in order to address the many limitations of the studies included in this review in order to truly understand the efficacy of including NMES in the treatment of dysphagia in patients with HNC.

Danielle Hamlin   Mentor: Jack Roush
Outcomes Following Special Olympics Healthy Hearing Screenings

Purpose
he aims of the present report are to assess 1) the referral rate for Healthy Hearing screenings at Special Olympics events in North Carolina, 2) the rate of follow-up for athletes receiving a referral, 3) diagnoses or treatment obtained of those who followed-up, and 4) the barriers preventing athletes from following up.

Background
Nearly 40% of children with hearing loss have one or more disabilities in addition to hearing loss. These include intellectual and developmental disabilities, cerebral palsy, autism spectrum disorder, and blindness, all of which have higher rates of prevalence in children with hearing loss when compared to the general population. It is well documented in the literature that people with I/DD have less access to healthcare, resulting in higher rates of undetected and unmanaged health problems. Recognizing these issues, the Special Olympics Healthy Hearing program (SOHH) was implemented in 1999 in an effort to identify previously undiagnosed hearing loss. In the year 2014 alone, 18,398 hearing screenings were performed globally, resulting in 4,710 referrals. Unfortunately, data are not actively collected on how many of these referrals lead to diagnosis and treatment for hearing loss. Obtaining information on referral outcomes following Healthy Hearing screenings is needed to determine if their hearing screening program is accomplishing their intended goal.

Methods
A one page survey was developed and mailed to Special Olympic athletes or their legal guardians (if applicable) who received a Healthy Hearing referral from the Fall 2017 and Summer 2018 Special Olympic Games. Screening data was obtained from these events through the Special Olympics International Research Headquarters. Athlete mailing addresses were then obtained from the NC Special Olympics Office via their Games Management System (GMS). Those not in GMS were excluded. A return envelope was provided with postage. Upon receipt, data was entered into Excel for analysis.

Results
A total of 113 surveys were mailed to athletes or their legal guardians with 19 responses received, resulting in a survey response rate of 16.8%. 68% of participants indicated they pursued some kind of follow up. Cerumen removal was the top treatment obtained (N=10). Mild hearing loss was diagnosed in 3 athletes. No recommendations for hearing aids were made. Reasons for not following-up included lack of insurance, lack of physician referral, lack of parental support, haven't had time, and athletes/caregivers unsure of where to go for follow-up.

Discussion
The most striking finding of this research was the low survey response (16.8%). This was a disappointing result and limits our ability to accurately answer the proposed research questions. Reasons for this potentially include a wordy recruitment letter and consent form preceding the survey, a multi-step survey that might have been difficult to follow, wrong address or change of address, effort required in mailing back a survey package, and limited follow-up from the researcher. One of the interesting findings was that more follow up occurred for cerumen removal than for failed pure tone screenings. This suggests that physicians may be easier to access than audiologists, and should inform future directions in terms of creating easier ways for individuals to obtain audiologic care.

Sarah Cloud, Danna Verastegui, Meaghan Whalen   Mentors: Steinbrenner & Page
Non-pharmacological Interventions and Neonatal Abstinence Syndrome (NAS) Outcomes

Research Question
Does a hybrid non-pharmacological/pharmacological intervention in neonates with Neonatal Abstinence Syndrome (NAS) differentially impact outcomes when compared to traditional pharmacological-only intervention strategies in hospital settings?

Background
Neonatal Abstinence Syndrome (NAS) has become increasingly prevalent in newborns across the United States, and research about clinical prevention and intervention methods continues to develop (Tsai & Doan, 2016). Symptoms of NAS include "irritability, hypertonia, tremors, feeding intolerance, emesis, watery stools, seizures, and respiratory distress" (Tsai & Doan, 2016, p. 522). These infants are more likely to present with low birth weights and feeding difficulties that require intensive medical care, including speech-language pathology intervention (Tsai & Doan, 2016).

Methods
The research team conducted a systematic review of current research pertaining to the effects of non-pharmacological interventions in neonates with NAS, beginning with a search of three databases: PubMed, CINAHL Plus, and Academic Search Premier. Key search terms were neonatal abstinence syndrome and intervention and associated terms. Additionally, the search terms included a number of specific non-pharmacological interventions. Researchers double-reviewed 20% of articles and maintained interrater reliability of at least 90% with blinding implemented across each stage of the review process (i.e., screening, quality review, data extraction). Inclusion criteria included research articles from peer reviewed academic journals on a population of infants, birth to one month, with NAS from mothers with only opioid abuse. Exclusion criteria included non-English articles, case studies, literature reviews, systematic reviews, questionnaires, interviews, and articles published prior to 01/01/2008.

Results
The search strategy yielded 113 results and reduced to 109 results after deduplication. After title and abstract reviews, 44 articles were selected and further reduced to 13 articles after full-text review. Quality review, using *Cincinnati Children's LEGEND Appraisal Forms,* resulted in accepting 10 articles as good quality and 3 articles being excluded due to lesser quality. The review focused on three outcomes: NAS score reduction, length of stay (LOS) reduction, and pharmacological treatment reduction. Results of the review show that the effect of non-pharmacological approaches, to NAS intervention for these three outcomes are statistically significant when compared to pharmacological only approaches.

Discussion
his review has the potential to inform researchers and clinicians seeking a gold standard of care for infants with Neonatal Abstinence Syndrome. It found several overarching themes in benefits of non-pharmacological care for infants with NAS. Overall, the majority of studies found statistically significant benefits of rooming-in, breastfeeding, and mother education programs on length of hospital stay, need for pharmacological management, and management of NAS symptoms. The current epidemic of opioid addiction necessitates more research, particularly randomized control studies with larger sample sizes, to solidify evidence-based practices heavily focused on breastfeeding, mother education, and rooming-in practices, and other non-pharmacological approaches to objectively quantify their effect on NAS.

Julia Skinner, Joel Lydic   Mentors: Steinbrenner & Page
The Speech-Language Pathologist's Role in Concussion Management: A Systematic Review

Purpose
The purpose of this systematic review is to identify and describe the speech-language pathologist's (SLP) role in assessment and management of mild traumatic brain injury. Our research question is: Based on current research, and guidelines, what is the SLP's role in assessing and managing mild TBI?

Background
The most common traumatic brain injuries (TBI) are concussions, also referred to as mild TBI (mTBI). These occur across all age groups and from various causes, from car accidents to sports to military combat. In the past decade, awareness and research for mTBI has risen. SLPs now play a vital role in providing assessments and intervention in mTBI patients in various settings. However, the role they play and the assessments and interventions they provide may vary greatly depending on the setting, age group, and cause of injury, and current research on the specific roles of SLPs in this population is limited.

Methods
Two databases, CINAHL and PubMed, were searched for published English-language articles that discussed the role of SLPs in concussion assessment/management from January 2005 through December 2018. Articles that discussed the SLP's involvement in assessment, treatment or management of mTBI in human participants were included in the review.

Results
The initial search resulted in 202 total articles. The researchers eliminated 186 articles in the screening phase. Sixteen articles were reviewed for quality and data extraction. Out of the 16 articles reviewed, there were 6 case studies, 3 descriptive studies, 2 survey studies, 2 guidelines, 1 case review, 1 retrospective study, and 1 diagnostic study. 50% of studies recommended an interdisciplinary team approach to the assessment and management of mTBI. The other half of the articles recommended that SLPs take an individualized, person-centered approach to treating mTBI. One survey revealed that mTBI patients' biggest concerns are irritability and word-finding difficulties even when their cognitive testing was within normal limits. Duff & Stuck (2015) surveyed SLPs across the U.S. and found that the majority of SLPs are not confident in treating mTBIs.

Discussion
According to current literature, the role of the SLP in mTBI management seems to vary across age groups and settings. Surveys show that even though mTBI patient pass cognitive and language assessments, one of their biggest concerns is word-finding and name recall, indicating that these patients could still benefit from speech services despite their typical scores. Many articles encourage an interdisciplinary approach to managing mTBI symptoms, usually including physicians, occupational therapists, physical therapists, SLPs and athletic trainers. Blyth et al. (2012) found that cognitive deficits are not reliably identified in acute settings using current available assessments, so this is an area that should be further explored. Surveys show that many SLPs are not confident in treating mTBI patients and around half of the SLPs surveyed had inaccurate responses to mTBI questions. This indicates that more education and training regarding mTBIs is needed for SLPs in order to increase knowledge of mTBI symptoms, improve assessments and interventions, as well as increase SLPs' confidence when working with this condition. More research is necessary, as diagnostic and prospective research are extremely limited.

Michaela Johnson, Andie Brandt, Meg Dondero   Mentors: Steinbrenner & Page
Assessment and Treatment Practices for Clients with Bilingual Aphasia: A Systematic Review

Research Questions: 'What are the current practices for assessment and intervention for adults with aphasia who are bilingual?' and 'What are the impacts of interventions?'

Background*:* Approximately 47 million people in the United States speak a language other than English at home. This number will likely rise in the future, as minority populations gradually increase. Unfortunately, minority populations tend to have a higher incidence rate of stroke than their white counterparts, impacting swallowing, speaking, and cognition. Nearly 88% of 400 SLP respondents to a survey regarding bilingualism in the healthcare field stated that they currently work with bilingual patients in a hospital or rehabilitation setting. Aphasia was the most encountered diagnosis with 46% of the respondents indicating they have worked with someone who has bilingual aphasia (Centeno, 2009).

Methods: We searched 5 online databases for articles: PubMed, Global Health, Cochrane Library, PsychInfo, and CINAHL Plus with Full Text. We used the following search terms: aphasia, bilingual, treatment, and assessment and related terms or synonyms. The inclusion criteria were: (a) adults over 18 years old that had any type of aphasia (Broca's, Wernicke's, etc.) and any severity of aphasia (mild to severe) who self-professed that they spoke any two or more languages (b) peer-reviewed original research articles. The exclusion criteria were: (a) people with Primary Progressive Aphasia (PPA), (b) people with dementia, (c) monolingual people, (d) people with previous (pre-stroke) intellectual disability or communication disorder (e) peer-reviewed articles not in English, (f) systematic reviews, (g) book chapters, and (h) case studies.

Results: The initial search yielded 402 articles. We then each independently screened the title and abstract of articles and double screened 84 of those articles with 96% reliability. We excluded 275 articles, and subsequently, completed full text reviews on the remaining 126 articles individually with 94% reliability on the 30 articles we double reviewed. Five articles met the inclusion criteria (Croft et al, 2011; Junque et al 1989; Kiran & Roberts, 2010; Kiran et al 2013; Roger & Code, 2011). Notably, 30 case studies were excluded in the final step due to their varying levels of evidence, ungeneralizable nature, and varying methods or procedures. For the quality review, we found all five of the articles to be of good quality. Final data extraction is in progress, with a focus on how current treatment types, languages, and other factors affect the generalization of treatment within the language of therapy and across to the other language(s) spoken by that person.

Discussion: The studies suggested that age of acquisition of their second language, current language environment, previous language proficiency, as well as several other personal factors can have a potential impact upon recovery of both languages. While almost all of the studies found that there was improvement within the targets used for the intervention, generalization and cross-generalization were more varied; however, trends will be discussed across the articles. With only 4 large-scale studies found on this topic, more research is needed on a larger scale with consistency across specific variables such as language proficiency or age of acquisition. We also included a study concerning the use of translators in the assessment of bilingual aphasia, concluding that the content validity of the assessment can be severely affected through the interpretation of the test. Further information regarding the assessment process for bilingual people with aphasia should be explored in the future as only one study fit our inclusion criteria.

Christine South   Mentor: Linda Watson
Increasing positive predictive value for likelihood of autism in infants at-risk using Dynamic systems model

Purpose

The Dynamic Systems Theory postulates that developmental domains are linked in a child's early development and therefore that the acquisition of increasingly complex skills in one area facilitates the development of other skills. Following this idea, the research team is using this model to gain insight into which factors, if any, could be combined to increase positive predictive value for likelihood of autism spectrum disorder diagnosis in a sample comprised of infants who are already flagged to be at risk.

Background

Longitudinal research of prodromal infants suggests that early features for ASD include atypicality of eye contact and coordination of gaze, early temperament differences, and language delays (Zwaigenbaum et. al, 2005). Given this evidence, a model including the domains of language and motor development, along with self-regulation may increase the predictive accuracy of later diagnosis.

Proposed Methods.

Data for this study were drawn from a sample of 53 infants at EL-ASD based on scores at 12 months of age on an ASD screening tool, the *First Year Inventory (*Watson et. al, 2017)*.* These infants participated in a battery of developmental tests at two time points, 14 months and 22 months; outcomes at 22 months were measured using the *Autism Diagnostic Observation Schedule* (ADOS). Variables representing motor, eye gaze, social communication, and temperament constructs were selected from the data sample. Variables will be used in a logistic regression to see their strength in predicting outcomes as measured by calculated severity scores on the ADOS. The analytic approach will be refined for the final analysis. For example, variables hypothesized to represent the same construct will be aggregated if they meet the apriori criterion of r = .40 or higher; aggregation will increase measurement stability and reduce the number of variables in the model.

Anticipated Results

In preliminary analyses, a linear regression using the above variables measured at 14 months as predictors and the ADOS calculated severity scores at 22 months as the dependent variable provided an R-value of .379 with R-squared of .143; thus, the full set of variables above accounted for 14.3% of the variance in ADOS calibrated severity scores at 22 months. Examining the coefficients for individual variables, early gestures and engagement scores were significantly negatively related to later ADOS severity scores. No other independent variables were significantly associated with the calculated severity scores in this preliminary model.

Discussion

Given this finding, this model does not yet yield any evidence for a role for early motor skills or negative affect in predicting diagnostic outcomes. From this preliminary analysis, it seems that the key predictors may lie in the early social-communication domain. The potential contribution of full results will be clarification of possible early predictors of ASD that could distinguish infants flagged at risk from infants with a similar profile who will go on to have different developmental delays.

Dana Connor, Leah Gibson, Jenna Hall   Mentors: Steinbrenner & Page
Impact of Cognitive Training on Dementia Prevention

Research Question: In adults with mild cognitive impairment (MCI), how does cognitive training affect the likelihood of developing dementia?

Background: With an ever-growing elderly population, the number of people with dementia is expected to triple by 2050 (Dementia, 2017). Dementia prevention is an increasingly critical issue that needs to be addressed. Mild cognitive impairment is considered an intermediate, subclinical stage between normal cognition and dementia. The most common subtype, amnestic MCI (a-MCI), is thought to be a strong predictor of future dementia (Tangalos and Petersen, 2018). It has been reported that individuals with a-MCI progress to dementia at a rate of 12-15% per year compared to 1-2% for healthy adults (Kinsella et al., 2009). A number of studies have implemented cognitive therapies for adults with MCI, but few have analyzed the long-term results of such therapies regarding cognitive decline. This prompted the authors to systematically review studies of cognitive intervention in adults with MCI and evaluate whether intervention leads to outcomes that prevent further cognitive decline into dementia.

Methods: The authors searched PubMed, PsycInfo, and CINAHL databases for peer-reviewed articles using the following terms: ("mild cognitive impairment" OR "MCI" OR "pre-dementia") AND ("cognitive training"). Main inclusion criteria were RCTs, longitudinal studies, or case studies from the last ten years that studied the impact of cognitive training on adults with MCI. Main exclusion criteria included video game or computer-based cognitive training, adults with comorbidities that impair cognition, and studies that did not follow-up beyond the immediate end of intervention to re-assess cognitive changes. After the initial search, title/abstract reviews were conducted, followed by full-text reviews of the remaining articles to determine eligibility for final review. Quality appraisals were completed using Cincinnati Children's LEGEND tools. Inter-rater reliability was 90% or higher for each step of the review process.

Results: The initial search and deduplication process yielded 263 articles. Title and abstract screening resulted in 104 articles for full-text review. A total of seven articles, including six RCTs and one CCT, met all criteria and were determined eligible for inclusion. Six were evaluated as good quality and one was judged to be a lesser quality study. Data was extracted from each of the seven articles to evaluate dementia prevention. Cognitive training improved cognitive performance for ranging periods of time (4-28 months) following intervention in six of seven studies. Longer interventions reaped more significant results, and earlier intervention pointed to longer-lasting cognitive improvements.

Discussion: The reviewed studies looked at multi-component interventions. Until further research looks at the efficacy of specific intervention techniques, multi-component cognitive intervention is recommended. Although there were significant outcomes, it should be noted that many of the outcome measures yielded non-significant results. Only one study reported effect size. Replications of the studies with larger sample sizes are needed to obtain stronger evidence. A limitation of this review was the exclusion of computer-based cognitive interventions, but the authors were specifically interested in interventions more directly related to services that speech-language pathologists provide. While these studies did not determine if dementia can be prevented through cognitive intervention, they did show that early and longer-term intervention for mildly impaired individuals may capitalize on remaining cognitive reserve to improve cognition over time and/or delay progression to dementia.

Madeleine Barclay, Samantha Scharf, Crystal Smaldone   Mentors: Steinbrenner & Page
Cochlear Implantation in Children with Single-Sided Deafness: A Systematic Review

Research Question: In children with single-sided deafness (SSD), how do outcomes in those with cochlear implants compare to children with SSD receiving conventional interventions or no intervention and children with normal hearing?

Background: Research suggests that children with unilateral hearing loss (UHL) and single-sided deafness (SSD) exhibit deficits in spatial hearing and consequently have poorer speech comprehension in noise and localization abilities in comparison to their normal hearing peers. These children are more likely to repeat grades in school and experience poorer quality of life outcomes (Lieu et al., 2010). Current treatment options for UHL in children with aidable hearing include conventional hearing aids, bone-anchored hearing aids (BAHA), contralateral-routing-of-the- -signal (CROS) hearing aids, FM-systems, and no intervention. For children with profound UHL, there is no current option that will provide sufficient amplification to the impaired ear. Candidacy criteria for cochlear implantation in SSD does not yet include children, but benefit with this intervention has been demonstrated in adults and in preliminary research in children.

Methods: The PubMed, CINAHL, and Scopus databases were queried using predefined search terms (e.g., child, single-sided deafness, cochlear implant) for articles published between January 2000 and January 2019. Subjects included children aged 0-18 years with severe to profound unilateral sensorineural hearing loss and aidable hearing in the contralateral ear who received a cochlear implant on the poorer side. Studies included were controlled or longitudinal single-subject prospective and retrospective designs. Articles were screened by title and abstract, and full-text reviews were conducted based on specific inclusion and exclusion criteria. Quality appraisals were completed using Cincinnati Children's LEGEND tools. At least 20% of articles were double-reviewed with at least 90% interrater reliability achieved at each stage.

Results: The search generated 604 records initially and 514 remained after deduplication. Forty-eight articles passed the title and abstract screening with interrater reliability of 90%. Fourteen articles passed the full-text review with interrater reliability of 90%. Of the 14 studies included in the review, 6 were rated as good quality and 8 were rated as lesser quality with 100% interrater reliability. The researchers focused data extraction on 9 out of the 14 articles that used similar outcome measures in order to maximize clinical implications. Overall, findings suggest improvement with cochlear implantation for speech comprehension in noise, localization abilities, and subjective benefit.

Discussion: Our findings indicate that large, controlled studies are lacking regarding outcomes with cochlear implantation in children with SSD. Sample size appears to be a consistent limitation of current research. Although the majority of the studies reported some degree of improvement in speech in noise and localization tasks following cochlear implantation, study results and methodologies are heterogeneous and studies are not sufficiently large to demonstrate clinical significance. Future studies should include larger samples sizes and controlled study designs to provide statistical power and limit variability. Because a positive benefit was seen in many of the studies in this systematic review, expanded candidacy criteria for this population should be addressed in future research studies. Overall, the research question addressed in this systematic review could not be answered due to the lack of high-quality, controlled studies in this area of research.

Margaret Richter & Anne Marie Misey   Mentors: Steinbrenner & Page
A Systematic Review of the Duration of Cochlear Implant Device Use and its Impact on Speech Perception in Adults

Purpose: This systematic review aims to look at the current research assessing the outcomes of the duration of cochlear implant device use and its impact on speech perception in adults.

Background: Adults with moderate-to-profound sensorineural hearing loss who obtain little benefit from other forms of amplification are candidates for cochlear implants (Dillon et al., 2013). Adult cochlear implant (CI) recipients have a wide range of outcomes which may result from inherent factors affecting variability (Blamey et al., 2013). Factors affecting cochlear implantation outcomes may include: age at implantation, age at onset of deafness, length of device use, and others. As more factors are studied we may gain insight as to what criterion will strongly impact a CI candidate's outcomes. (Oh et al., 2009). To measure improvements and outcomes of CI recipients', a variety of speech perception testing is used at routine intervals. Understanding the various interactions of patient factors and outcomes is crucial to predicting success with a CI, as well as, improve our abilities to provide appropriate counseling and set realistic expectations for patients. This systematic review aims to assess current research regarding the specific patient factor of length of time a person has used a CI and how it impacts their speech perception abilities.

Methods: A literature search was conducted in two databases to identify how the duration of CI device use impacts speech perception abilities in adults. The inclusion criteria were use of cochlear implants, adult participants, measurement of speech perception or speech understanding, and documentation of duration of cochlear implant use. The exclusion criteria were implantation under age 19 years, case studies, and bimodal cochlear implant studies. For each step above, at least 20% of articles were checked for inter-rater reliability and each reviewer was blinded to reduce internal bias.

Results: The initial search resulted in the identification of 370 articles. 328 articles were excluded during the title/abstract review, 28 were excluded during full-text review, and 4 were excluded due to low quality, resulting in 10 final articles. The inter-rater reliability was calculated for each step of the systematic review process and was 90% or above in all stages. Data extraction was completed for the remaining articles that fit the inclusion and exclusion criteria used in this review. The resulting articles had a variety of speech perception measures and intervals tested, limiting our interpretations.

Discussion: The current research on the impact of duration of device use on speech perception in CI users suggest improved performance with device use overtime. Further, research found that patients are reaching their plateau, or best performance, between 12 and 24 months of listening experience. The research examined also demonstrated that older and younger adults could achieve significant benefit from a CI; however, one article suggested that older adults may take longer to reach their plateau. This research is impactful for counseling patients on appropriate timeline for speech perception abilities and realistic expectations. Future directions of research on this topic may include further investigating differences in length of time to reach plateau between older and younger adults, as well as, looking at the impact of daily device use on speech perception abilities.

Lorraine Smith   Mentor: Katarina Haley
Drawing to Communicate: Assessing Component Skills

Purpose or Research Questions
This presentation provides an overview of an assessment tool being developed for people with aphasia to evaluate their ability to use drawing as a means to communicate.

Background
For people with aphasia, especially severe aphasia, life activities and interactions that involve speaking can seem daunting. Working solely on speaking and ignoring other possible modalities could lead to isolation and degradation in confidence. As clinicians, our ethical obligation is to give people with aphasia access to a variety of communication strategies. Drawing to communicate offers an affordable, flexible, and powerful communication modality that could be implemented quickly and make a meaningful difference in a person with aphasia's overall life participation.

Methods/Proposed Methods
Six tasks were developed to assess the skill of drawing to communicate. Through a series of conversational and expository narratives, the clinician takes an active communicative role in the assessment and considers not only drawing but also gestures and verbal utterances. The assessment accommodates auditory comprehension impairments via drawn instructions and clinician models. Research articles regarding the use of drawing to communicate in the clinical field were reviewed to guide development of the assessment. Currently the assessment is in the pilot phase of research and has been tested on mostly neurologically typical adults.

Results/Anticipated Results
Results from the assessment are given through an overall communicative effectiveness rating and a series of ten rating scales regarding component skills. the overall communicative effectiveness score ranges from 0-5 and is composed primarily of progressive levels of accuracy degree of related information, and interactive effort. The component skills are presented in scales from 1 to 7 including initiation, idea conveyed, form, detail, sequence, flexibility, speed, gestures, verbal utterances, and cohesiveness.

Discussion
It is our assumption that drawing to communicate is not intuitive to most people and requires some degree of new learning and guidance, even in the absence of brain injury. Effective communication requires not just drawing skill, but a balance of efficiency, sequential idea representation, comprehension of communication partners understanding, and flexibility. Systematic analysis of component skills allows clinicians to identify available strategies and others that need to be taught in therapy. Ultimately, results also inform whether drawing is the right modality to enhance the person's ability to communicate successfully in everyday interactions.

Will Brinson, Heather Cook, Rebecca Wellons   Mentors: Steinbrenner & Page
A systematic review of diagnostic test accuracy for identifying developmental language disorder in bilingual children.

Research Question
What conclusions can be drawn from recent diagnostic tests of accuracy (DTAs) regarding currently-available and experimental measures for the identification of Developmental Language Disorder (DLD) in school-age bilingual children?

Background
In 2011, 21% of children in the United States spoke a language other than English at home (U.S. Census). There is a growing need for assessments that are sensitive to DLD (also known as specific language impairment, SLI) and specific enough to exclude typically-developing bilingual, school-age children. Dollaghan & Horner (2011) conducted a meta-analysis of assessments that were available prior to July 2009. An updated review of current research will help clinicians make evidence-based decisions in their work with this population.

Methods
Four research databases were used in this review: PubMed, CINAHL, ERIC, and PsychInfo. The inclusion criteria were: DTAs including bilingual (with one language as English) typically-developing children and bilingual children with DLD, at least one index test and one reference test, and ages 3-18. The exclusion criteria were: studies that did not separate monolingual participant data from that of bilingual children, articles published in languages other than English, treatment studies, and studies from the previous meta-analysis. The studies were screened in two rounds (title/abstract and full-text), evaluated for quality, and data was extracted. The two types of studies, case control and cross-sectional, were evaluated with LEGEND tools from the James M. Anderson Center for Health Systems Excellence. At least 20% of the articles were double-reviewed for reliability at each stage, with reviewers blind to each other's decisions. Inter-rater reliability was greater than 80%.

Results
A total of 1,278 articles were identified in the initial search--850 articles remained after duplicates were removed. During the title/abstract screen, 749 articles were excluded. The full-text screen of the remaining 101 resulted in the exclusion of 79 articles. When the remaining 22 articles were reviewed for quality and the data was extracted, 1 good quality cross sectional study (3 lesser) and 8 good quality case control studies (10 lesser) were identified.

Discussion
An additional 22 DTAs have been conducted since the 2011 Dollaghan & Horner meta-analysis. These studies include more linguistic diversity, cross-sectional studies, and some higher-quality studies. However, potential bias does still appear in the diagnostic tools and study designs. Despite the variety of measures available at different levels of sensitivity and specificity, there still appears to be insufficient evidence to support a "gold standard" tool for diagnosis of DLD in bilingual children. Quality appraisals indicate there is room for improvement in future research regarding blinding, sample size, and consistency of reference test administration.

Chelsea Carter & Camille Herring   Mentors: Steinbrenner & Page
Impact of School-Based, Linguistically Relevant Literacy Interventions for Spanish-English Bilingual Students

Research Question
In Spanish-English bilingual children ages 3-8, how do school-based, linguistically relevant literacy interventions affect literacy-related outcomes?

Background
In the fall of 2015, the National Center for Education Statistics reported 9.5% or 4.8 million students were English Language Learners (ELLs) ("The Condition of Education," 2018). ELLs often face challenges in school when accessing an English only curriculum. Researchers in education believe that early literacy instruction can mitigate academic disparities (Baker et al., 2012); however, there needs to be more research on whether the instruction should be provided in the child's native language or in English (p. 738). The purpose of this systematic review was to investigate the impact of linguistically relevant literacy interventions for bilingual children.

Methods
The authors searched peer-reviewed articles in English from the following databases: ERIC and Educational Full Text. The inclusion criteria included Spanish-English bilingual students ages 3-8 whose native language is Spanish participating in a linguistically relevant, school-based intervention that included at least one of the following areas: phonemic awareness, phonological processing, reading fluency, or letter knowledge. The exclusion criteria included children whose native language is not Spanish, interventions provided only in English, and home or community-based interventions.

Results
The initial search generated 107 articles, with 98 unique articles after de-duplication. The authors independently reviewed 98 articles during the title/abstract stage of the study and eliminated 80 articles. Then, the authors reviewed the remaining 18 articles for the full-text stage. Ultimately, six articles were included and appraised for quality. During the title/abstract stage, 50 articles were double reviewed. During the full text and quality appraisal stages, all the articles were double reviewed. The authors appraised the articles using the *Cincinnati Children's LEGEND* appraisal tools. Out of the six final articles, four were deemed good quality. The authors extracted data from those four articles.

Discussion
The results suggest that interventions based on cross-linguistic transfer, which is the ability to transfer what one knows from one language to another language, may not be effective in lower elementary students (Baker et al., 2017). Additionally, other studies providing paired (bilingual) literacy intervention did not show much statistical or clinical significance in Spanish or English literacy outcomes when compared to students receiving English only interventions. These results highlight the need for further research to prove the actual impact of school-based, linguistically relevant intervention for bilingual students in the United States. Future research could also identify preferred methods for these interventions.

Jill Frink, Dana Sampson, Annie Sager   Mentors: Steinbrenner & Page
Peer-Mediated Intervention in High School Students with Autism Spectrum Disorder

Research Question:
In high school students with autism spectrum disorder, how does peer-mediated intervention affect social communication and educational engagement?

Background:
In the initial research stage, the authors found that there is a relatively large amount of research on the use of peer-mediated intervention (PMI) with preschool and school-aged children with Autism Spectrum Disorder (Zhang & Wheeler, 2011). However, the impact of PMI for high school students with ASD has been less explored. Therefore, this systematic review seeks to compile and analyze the existing research on using PMI with adolescents with ASD.

Methods/Proposed Methods:
The authors used the following four databases for the initial search: CINAHL, PubMed, ERIC, and PsycInfo. The search terms used were ASD, peer-mediated intervention, school-aged students and related terms and synonyms. The authors used the following inclusion criteria: high school students in grades 9-12, students with a diagnosis of ASD, articles addressing academic and/or social outcomes, and studies published between 2009-2019. The title/abstracts and full texts were reviewed with over 90% reliability on 20% of the total articles. The Quality Indicator Checklist and the Legend Quality Appraisal Tool were used to evaluate the articles. The authors extracted information addressing peer-mediation type and social and academic outcomes.

Results/Anticipated Results:
The initial search yielded 324 total articles. After title/abstract reviews and full-text reviews, six articles remained. Five studies were multiple baseline single-case design and one study was a randomized control trial. Quality appraisals determined that five studies were good quality while one was of lesser quality. The authors found that studies varied in peer-mediated intervention structure, intervention settings, and peer-training methods. Despite these differences, results indicated that a variety of social interactions amongst students with ASD increased from baseline.

Discussion:
There was a common theme of PMI increasing performance and being socially valid and replicable in high school settings. The authors found that all studies required an adult facilitator of varying involvement, but the more structure and activity support that was given to the peers, the less adult involvement was needed. There is preliminary evidence suggesting that PMI is an effective strategy for increasing certain social outcomes but additional research is needed to draw more robust conclusions for this population. The authors recommend additional research studies that increase structure of intervention to facilitate peer interaction and lengthening time of intervention in order to promote generalization.

Rachel Wasserman and Katherine McNeilly   Mentors: Steinbrenner & Page
Efficacy of Tinnitus Retraining Therapy (TRT) in Adults with Bothersome Tinnitus

Research Question

For adults with bothersome tinnitus, how does Tinnitus Retraining Therapy (TRT) affect perception of tinnitus relief?

Background

Tinnitus is the perception of sound in the absence of an external stimulus. Hearing ringing, roaring, or rushing in the ears or head is a common phenomenon in adults, affecting about 25% of the global population. For most people, tinnitus can be easily ignored. However, 1-7% of adults in the United States are living with bothersome, and potentially debilitating tinnitus that causes a disruption of daily life impacting their mood, sleep, and mental health (Bauer et al, 2017). There are many different types of treatment options for people with tinnitus. Some treatment options include the use of sound maskers, Cognitive Behavioral Therapy (CBT), Acceptance and Commitment Therapy (ACT), Progressive Tinnitus Management (PTM), and Tinnitus Retraining Therapy (TRT). TRT focuses on both conscious and subconscious connections to attempt to reduce the perception of tinnitus. The treatment consists of intensive counseling and the addition of sound therapy. The aim of this systematic review is to assess patient's perceived benefits from TRT.

Methods

A literature search was conducted using Pubmed and CINAHL databases. Relevant inclusion criteria included English only journals, studies focusing on the adult population, and TRT as the primary intervention. Exclusion criteria included pediatric studies, studies using experimental tinnitus treatment that is unavailable outside of controlled clinical trials, and non-peer reviewed articles. All articles were double reviewed throughout the article selection and inclusion/exclusion process with 90% reliability. Twenty percent of articles were double reviewed through quality appraisal and data extraction with 100% reliability.

Results

The initial search resulted in 47 articles across the two databases. After completing a title/abstract review of these articles, 20 were selected to move on for a full text review. Ten of the 20 articles were then included for a quality appraisal and data extraction. Of the 10 articles, 5 were randomized or controlled clinical trials and 5 were longitudinal or prospective studies. Eight of the articles were of good quality. Overall, the studies suggest that TRT can be a successful treatment option for patients with bothersome tinnitus. Patients who underwent TRT saw improvement in their perception of tinnitus as measured by the Tinnitus Handicap Index (THI) and the Visual Analog Scale (VAS).

Discussion

The current research suggests that TRT is a viable treatment option for adults with bothersome tinnitus. The combination of counseling and sound therapy is able to reduce tinnitus disturbance of the patient, reduce their perceived handicap from tinnitus, and improve the patient's ability to work, sleep, and relax. TRT also has been shown to have long-term benefits after treatment has ended. More research should be conducted to explore other aspect of TRT, including stimuli used for sound therapy and length of treatment.

Caroline Baker, Keyton Glover, Arushi Mahajan   Mentor: Katarina Haley
Frequency of Errors in Apraxic Versus Non-Apraxic Speakers

Purpose

To determine if phonemic errors are more common in the a) onset vs. coda position and b) consonant vs. vowel position of monosyllabic words for stroke survivors with and without apraxia of speech.

Background

Much of the research that has been done in the past and that is cited in current research regarding phonetic errors in monosyllabic words was performed on small sample sizes with varying methodologies. To identify distinctive speech patterns in apraxic speakers, past studies have compared consonant and vowel errors. Conclusions differ on whether word-initial or word-final errors are more prominent: while many of the studies found more word-initial errors than word-final errors, others found no error frequency difference between the two consonant positions. Studies have often reported greater error frequency for consonants than for vowels, though there is also evidence revealing no difference between vowel and consonant errors in apraxic speakers.

Methods

The authors of this study took an introductory class on phonetic transcription and were trained in Klattese, a phonetic alphabet using standard English keyboard symbols. Each broadly transcribed 30 speaker data sets of 50 monosyllabic words, for a total of 90 analyzed speech samples. Authors edited a template with the standard broad phonetic transcription of each possible target word for each speaker's productions, ignoring presumed dialectal variations. Authors were aware of the target words during the transcription, but unaware of the speakers' apraxia of speech diagnosis. During analysis, authors ignored productions that contained more than one nucleus, as they were no longer monosyllabic. Each production was compared to the standard transcription and any change in the onset, nucleus, and coda was labeled as erroneous. Each position could only be given one error per word.

Results

The data shows that there were more errors in the onset than the coda in apraxic speakers, but no clear difference between the frequency of these errors in non-apraxic speakers. There was greater frequency of errors in consonants than vowels in both apraxic and non-apraxic speakers, but the difference was more distinct in those with apraxia.

Discussion

The results indicate that apraxic speech is often marked by more consonant errors than vowel errors and more errors in the onset than coda. These observations may result from the method of transcription used and could be influenced by listeners subjectively placing more importance on word-initial sounds than word final sounds and not observing vowel errors when the target word is known.