

Undergraduate Research Symposium May 17, 2013 Mary Gates Hall

Online Proceedings

POSTER SESSION 2

Commons West, Easel 14

12:45 PM to 2:15 PM

Does Triadic Eye Gaze Predict Phonemic Learning in Infants?

Lindsay Rebecca (Lindsay) Wilson, Senior, Speech and Hearing Sci (Com Disorders), Early Childhood and Family Studies

Mentor: Sarah Roseberry, Institute for Learning & Brain Sciences

Triadic eye gaze, a form of coordinated attention, is defined as an infants' eye gaze shifts between another person, and an outside object or person. The current study examined whether 9-month-olds' triadic eye gaze influences language learning; we specifically asked whether infants who engage in more episodes of triadic eye gaze show increased phoneme learning in a foreign language. The current project was conducted as part of a larger research endeavor, the Interactive Exposure study, which examined infant language learning in the context of peer social interactions. In the Interactive Exposure study, infants were exposed to a foreign language, Mandarin Chinese, through individual and peer language exposure sessions. In 12 sessions over four weeks the infants watched video clips of Mandarin Chinese. Infants activated the 20-second video clips by touching the screen. Infants in individual exposure sessions were in the room with only the touchscreen and their caregiver whereas peer exposure sessions consisted of two infants and two caregivers. Following exposure, infants' discrimination of the Mandarin Chinese phonemes was tested via Conditioned Head Turn procedure and an ERP task. Fifteen 9-month-old participants from the peer language exposure sessions were selected for the current analysis of triadic eye gaze patterns. Using ELAN coding software, infants' eye gaze was coded for looks to their own caregiver, other caregiver, other infant, and screen. Next, episodes of triadic eye gaze were identified for eye gaze patterns that consisted of looks between the other infant, caregiver, other caregiver and screen (e.g., other infant – TV – other infant). Although coding and analysis are currently underway, we predict that infants who engage in more episodes of triadic eye gaze will show increased phoneme learning. If our prediction is accurate, this finding will indicate that language learning requires complex social interactions, such as triadic patterns of attention.

SESSION 20

SENSORY INPUT IN MUSIC, SPEECH, AND THE VESTIBULO-MOTOR SYSTEM

Session Moderator: Ludo Max, Speech & Hearing Sciences
288 MGH

3:45 PM to 5:15 PM

* Note: Titles in order of presentation.

Speech Adaptation to Formant-Shifted Auditory Feedback in Stuttering Versus Non-Stuttering Children

Wai Ying (Cathy) Cho, Senior, Speech and Hearing Sci (Com Disorders)

Mentor: Ludo Max, Speech & Hearing Sciences

Stuttering is hypothesized to be a disorder resulting from underlying sensorimotor deficits. Here we investigate whether children who stutter (3-9 years of age) differ from their non-stuttering peers in the integration of auditory feedback in the planning of speech movements. Studies with nonstuttering speakers have shown compensatory adaptation when the formant frequencies in the auditory feedback signal are shifted up or down with an effects processor. Our laboratory has found a lack of such sensorimotor adaptation to formant-shifted feedback in adult stuttering subjects. We have also found reduced adaptation in stuttering children's arm movements when performed with altered visual feedback. In the present study, we investigate speech adaptation in response to formant-shifted feedback in stuttering vs. non-stuttering children. Subjects spoke monosyllabic consonant-vowel-consonant words in baseline (unaltered feedback), perturbed (formants in the feedback signal shifted 2.5 semitones up), and after-effects (unaltered feedback) phases of two conditions. In an "abrupt" condition, the formant perturbation was introduced suddenly at full strength. In an "incremental" condition, the formant perturbation was gradually ramped up over several minutes. Subjects heard the auditory feedback in real-time through insert earphones. Data collection and analysis are ongoing at the present time. Our hypothesis is that children who stutter will show reduced adaptation as compared with children who do not stutter. Findings from this work may have important implications for typical speech development as well as developmental speech motor disorders

such as stuttering.

POSTER SESSION 4

Commons West, Easel 19

4:15 PM to 5:45 PM

Measuring Sociodemographic Risk in Families of Children with Autism: Impact on Intervention Outcomes

*Shirin (Shirin Zargar) Zargar, Non-Matriculated,
Mentor: Annette Estes*

Research has demonstrated that early intervention for young children with autism has a significant positive impact on child progress. However, little is known about the effectiveness of early autism intervention and language acquisition for children with different levels of sociodemographic risk factors (SDR). We examined the effect of these risk factors on the efficacy of the Early Start Denver Model (ESDM) intervention. We aimed to develop a scale of SDR factors and examine the relationship of this scale to child and family factors in order to investigate the validity of this measure. We hypothesized that families with a greater number of risk factors will have children with significantly lower communication abilities. We created the SDR scale from existing variables in a multisite, randomized, controlled trial of early intervention using the ESDM. These data are from a subset of 74 families, when the child with autism was 12-24 months old. Items are from the Life Experiences Survey, CHARGE family characteristics questionnaire, and enrollment interviews. For each factor endorsed by the parent, a point was given, for a possible score of 16 points. Item-level analysis of SDR revealed the following: child not living with both parents 10.8%, mother with high school degree or less 16.2%, father with high school degree or less 10.8%, unemployed father 6.8%, family income below \$50,000, 23%, one/both parents born outside the US 21.6% resided in US for < 10 years, 17.6%, parents with primary language other than English, 25.7%, sibling with a disability, 29.7% (mean = 2.47, SD = 1.753, median = 2, mode = 2). The results suggest that the SDR scale may be a useful tool to investigate variability in response to intervention and parent learning. These family risk factors may have implications for individualization of intervention.

POSTER SESSION 4

Commons East, Easel 66

4:15 PM to 5:45 PM

Infant Detection of Amplitude-Modulated Vowels

Philip Alquiza (Philip) Sanchez, Senior, Speech and Hearing Sci (Com Disorders)

Mentor: Lynne Werner, Speech & Hearing Sciences

Previous research on infant auditory development has shown that infants are poor in discriminating between vowels in a

background of fluctuating noise. In those studies, however, the voice speaking the vowel has always been a male voice. The question is whether infants would perform better if the voice were female. Female vowels (/i/ or /a/) are presented in a 4-Hz amplitude modulated noise. The vowel is played at 75 dB SPL and the noise is played at 60 dB SPL to the right ear. The observer-based approach is used to study 7- to -9-month-old infants' ability to tell that a repeated vowel changed from /a/ to /i/ or from /i/ to /a/. Preliminary results indicated that compared to previous studies conducted using male vowels, infants did not show a difference in vowel discrimination based on gender. Similar performance was obtained regardless of whether male or female vowels were used. One explanation for these results is the infants are inefficient in segregating auditory streams to focus on target acoustic information. This may suggest that infants have immature listening strategies as opposed auditory processing immaturity. Future directions of the studies need to focus on auditory stream segregation and its developmental trajectory using natural, complex sounds.

POSTER SESSION 4

Commons East, Easel 63

4:15 PM to 5:45 PM

Investigating the Effects of Overt and Covert Visual Attention on Auditory Binaural Cue Sensitivity

Christa Nicole (Christa) Dodson, Senior, Speech and Hearing Sci (Com Disorders)

Mentor: Adrian KC Lee, Speech & Hearing Sciences

Mentor: Ross Maddox, Institute for Learning & Brain Sciences

Our research study investigates if covert visual attention (knowing something visual will appear in your periphery) affects sensitivity to binaural cues (sound localization with both ears). The peripheral visual system has an area called the fovea that is used when sharp attention to detail is required, and this study hopes to see if there is a similar "fovea" in the auditory system. While a subject's eyes are tracked, they are asked to fixate on a dot displayed on a screen. Once they are fixated, a sound occurs that appears to move a small distance either from right to left or from left to right. In half of the trials, a diamond also appears on the screen and it is informative of where the sound will occur. The subject is then asked to identify which way the sound moved. I ran the subjects, did statistical analysis on the data, and will be compiling that data into a meaningful result. In a previous study, an overt informative visual primer significantly increased binaural sensitivity, and we believe that a covert visual primer will help similarly. This suggests that the two modalities work together to contribute to a unified map of our environment. The short term goal of this research is to understand how the gaze control system modulates auditory attention. The twenty-year

goal of the lab is to help create hearing aids and cochlear implants that can imitate a functioning hearing system's ability to follow an auditory signal, eliminating a difficulty that pervades hearing devices today called the "cocktail party problem" which arises when attempting to understand speech in a noisy environment. Whether covert visual attention has a significant effect on hearing is as yet unknown, but it may have a valuable long-term impact on the lives of those living with hearing loss.

POSTER SESSION 4

Commons East, Easel 65

4:15 PM to 5:45 PM

Sensorimotor Adaptation in Persons Who Stutter: Generalization and Interference

Adam Wilber (Adam) Redmond, Fifth Year, Speech & Hearing Sciences

Mentor: Ludo Max, Speech & Hearing Sciences

Stuttering is a high-prevalence speech disorder that often develops into a chronic, life-long problem with severe social implications. The ultimate causes are unknown, but recent studies have revealed structural and functional neural deficits that impact sensorimotor functioning, the interaction between motor control and sensory feedback. Our laboratory has shown that stuttering adults differ from nonstuttering adults in their ability to adapt to conditions with novel sensorimotor mappings. We suggest that individuals who stutter may have difficulties with the learning of stored neural representations of the mapping between motor commands and sensory consequences. We investigate whether stuttering individuals' difficulties in sensorimotor adaptation tasks are associated with (a) increased interference by competing sensorimotor mappings and/or (b) an impaired ability to generalize learned sensorimotor mappings to unpracticed movements. We used a design that allows an examination of anterograde interference (learning task B interferes with the subsequent learning of task C), retrograde interference (learning task C interferes when re-tested on task B), and generalization (adaptation transfers to an unpracticed task). In this design, groups of stuttering adults and nonstuttering adults produced monosyllabic words in different conditions of formant-shifted auditory feedback and a non-shifted control condition. Additionally, in each condition, all subjects produced 4 different words without altered auditory feedback but in the presence of masking noise. All productions were recorded for offline acoustic analyses. We will present descriptive and inferential statistical data comparing stuttering and nonstuttering subjects with regard to retrograde interference, anterograde interference, and generalization in this speech sensorimotor adaptation task. We will present these findings in light of previous suggestions that individuals who stutter may have difficulty with the learning, updating, or activation of internal

models used in the planning and execution of speech movements. The results will motivate improvements and adjustments in our current model of the sensorimotor mechanisms underlying stuttering.

POSTER SESSION 4

Commons West, Easel 18

4:15 PM to 5:45 PM

The Relationship Between Joint Attention and Communication in Autism Spectrum Disorder

Kelleen Dunley, Senior, Speech and Hearing Sci (Com Disorders)

Mentor: Annette Estes, Psychiatry & Behavioral Sciences

Autism Spectrum Disorder (ASD) is defined as impairment in three areas of development: social skills, communication, and repetitive behavior. In typically developing children, there is a significant relationship between the development of communication and the use of joint attention (JA). Impairments in JA could also be related to some of the core features of ASD. This thesis will use data collected at the University of Washington as part of the larger, multisite Infant Brain Imaging Study (IBIS) Autism Center of Excellence (HD055741). The IBIS investigates brain and behavioral development in infants with older siblings with ASD, who are at high risk for ASD and related disabilities. This thesis project investigates the relationship between JA and early communication in high-risk infants. Our hypothesis is that high-risk infants with deficits in JA will also demonstrate more delayed language development than infants without these deficits. We have studied approximately 55 12-month-old high-risk infants and approximately 35 low-risk infants with a typically developing sibling. Language ability was assessed with the MacArthur Communicative Development Inventories (CDI) and joint attention was assessed with the Communication and Symbolic Behavior Scales (CSBS). Correlations between scores from 12-month-old high-risk and low-risk infants on the CDI and CSBS were then reported. This research will have implications on our understanding of the relationship between joint attention and language development as it applies to social interaction and learning in children with ASD. This thesis will expand on earlier research that has shown that joint attention plays a pivotal role in social interaction and language learning.