**Speech Understanding: Dissecting Strategies Used in Speech Recognition vs. Speech Quality Judgement**

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Despite trends in hearing technology, there is little understanding of how listeners judge quality of speech. The lack of understanding of these perceptual mechanisms prevents development of efficient approaches to improving speech quality technologies. The proposed research addresses this knowledge gap and is among the first studies to elucidate the differences in listening strategies between speech understanding and speech quality judgments. It is well established that the frequencies in speech contributing to speech understanding varies—certain frequencies are more essential than others. The relative importance of different frequencies, known as spectral weights, represents listeners’ strategies when performing speech recognition tasks (i.e., repeating back the presented speech). We hypothesize the spectral weightings of listeners judging speech quality compared to speech understanding will differ—our preliminary results have proved our hypothesis true as frequencies are proving to contribute disparately for understanding versus recognition. Previous research demonstrates clarity of pitch being a key contributor to perceived speech quality, while speech understanding may be maintained when voice pitch is heavily distorted. Therefore, the frequencies carrying information in pitch may become more important in speech quality judgment. As research continues, I will test this hypothesis by analyzing the differences in the participants’ spectral weightings of a speech recognition task and a speech quality judgment task. To discern the spectral weighting, a correlational analysis is done for each of the two tasks using averages in the responses. This correlational analysis averages data from the participants’ responses to find how each frequency band of interest contributed to understanding versus recognition. This project provides one of the first estimates on the contribution of frequencies in perceptual judgments of speech quality, which is valuable for future hearing technology aiming to improve perceived speech quality in that it pinpoints the frequency regions requiring attention in audiological research to come.

**Examining the Culturally Sensitive Assessment of Social Communication in Toddlers As Perceived by Caregivers**

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Inequities in healthcare have led to disparities for many populations, including autistic individuals. One structural factor associated with health inequities for autistic individuals are the tools used to screen for autism, which do not work equitably within minority populations. There is, therefore, a great need for culturally sensitive screening tools. My study assesses the cultural sensitivity of “My Toddler’s Social Communication” (MTSC), a tool developed by UW’s ReadiLab to screen toddlers at autism risk. Unlike existing screening tools, MTSC employs photographs of toddlers engaging in social communication behaviors, along with brief behavioral descriptions. I used a sequential explanatory mixed-methods design to investigate whether caregivers of toddlers find MTSC to be feasible for use with culturally and linguistically diverse (CLD) families; and find the photos and behaviors culturally relevant. For the first phase, 10 caregivers of toddlers completed MTSC and answered questions regarding its acceptability and feasibility for CLD families. For the second phase, I interviewed 15 CLD caregivers. I then analyzed survey data using descriptive statistics and the interviews using thematic analysis. Survey results showed that 80% of caregivers found the photos representative of a broad range of cultures. However, only 30% of respondents agreed that MTSC was easy to complete for caregivers from diverse backgrounds. Thematic analysis revealed five themes: visual representation deficits, cultural relevance differences, accessibility to non-native English speakers, and accuracy chal-
A Visual Approach to Learning Grammatical Gender in German
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In many languages, nouns have what is called "grammatical gender," which is a seemingly arbitrary gender that is assigned to each noun. A common example would be Spanish, where nouns with the article la are feminine and those with el are masculine. In German, these noun genders are notoriously difficult to learn. This is, in part, due to the fact that German has three grammatical genders (masculine, feminine, and neuter) compared to the more common two (masculine and feminine). In addition, there are often no markers at the ends of nouns to indicate whether the noun is masculine, feminine, or neuter, which means learners cannot tell the gender of the word simply by looking at it. For example, in Spanish, feminine nouns often end with -a and masculine nouns with -o, which make the gender relatively easy to identify. This is not the case in German. Learners must, for the most part, learn noun genders through rote memorization. In this study, I test three different methods of helping native English speakers acquire the grammatical gender of nouns in German. I investigate whether learners can effectively acquire the gender and meaning of twelve German nouns with three mnemonic devices: color association, images, and videos with gendered actors. Participants are split into four groups, one control and one for each mnemonic device, where they are exposed to the nouns. The short-term effects of these visual aids are then revealed through two post-tests following the session. Based on previous research, I believe that the video condition will be the most effective at helping learners acquire noun gender. Given that memorization of grammatical gender is crucial to effectively learning a language, it is worth exploring innovative ways of helping students acquire this feature, especially for speakers whose first language does not have gendered nouns.

Sibs and Bibs - Older Siblings and Infant Vocabulary Development
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Early childhood language capability is closely tied to future success. Thus, it is vital to research how best to support the language acquisition process of young children. Extant literature emphasizes the role of children’s parents but largely ignores the impact of other family members such as siblings. The primary goal of my research is to address this absence by investigating the effects of older sibling presence upon the language development outcomes of infants. I use a longi-
tudinal dataset of audio recordings taken by Language Environment Analysis (LENA) software. This software uses a small device worn by a child over an entire day to record their naturalistic linguistic environment for up to 16 hours. I focus on two main indicators of language input quality: parentese and conversational turns (CTs), both of which have been shown to promote language acquisition. Commonly referred to as “baby talk,” parentese is the acoustically exaggerated speech style typically used while addressing infants. CTs are alternations between speakers in one-on-one conversation, and often include nonverbal aspects of communication upon which infants rely for learning. My present findings demonstrate that infants with older siblings experience lower levels of these variables compared to infants without older siblings. However, the differences between language outcomes of the two groups were not as pronounced as expected based on this difference. Thus, with the help of fellow undergraduate coders, I am now coding and transcribing segments of LENA recordings of infants with older siblings that have the highest amount of speech from other children. I hope to uncover sibling input variables that may help infants with siblings to “catch up” to those without siblings regarding language outcomes. My results will inform those involved in early childhood development regarding how to facilitate the language acquisition process of young children with older siblings most effectively.

Rhythm Improves Communication in a Noisy World
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Noisy environments pose difficulty for efficiency of communication and understanding of conversation. However, some individuals are able to hear better in these environments than others, with age and hearing ability controlled. A contributing factor may be the natural rhythm of speech. All of speech contains rhythm, we speak at different paces with words timed at certain paces. When this rhythm is altered, it is shown to reduce speech understanding. This study investigates whether people are the same in terms of how much they rely on speech rhythm to decipher speech in background noise. The purpose of this study is to use these results to create more effective and customizable hearing aids catered to each individual’s hearing differences. We looked at two promising factors in this study that may predict increased ability to use the natural rhythms of speech in order to better understand it: working memory and non-speech rhythmic abilities. We created remote tasks on an online platform, Gorilla, to measure these factors in normal hearing individuals. More specifically, these tasks included a working memory task, Reading Span; a rhythmic abilities task, Beat-Based Advantage; and a rhythmic speech in noise task. We used step-wise linear regression to analyze whether these two factors impact one’s reliance on rhythm in speech. The findings of this study support that better working memory skills and better rhythmic abilities improve speech understanding in noisy environments, as these participants utilized speech rhythm to do so. We can use this knowledge on future research with participants with hearing loss. We still live in a “one-size fits all” model for hearing aids. However, by understanding the factors that improve speech comprehension in noise, we can create individually-tailored hearing aids that adapt to people’s abilities and thus improve communication in all types of environments.

The Functional Implications of the Mental Timeline: The Effects of Spatiotemporal Priming on Temporal Memory Binding in Children
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Episodic memory is a crucial element of the human condition. It allows us to remember what happened, where it happened, when it happened, and then piece these components together to form comprehensive memories. However, the ability to remember when an event happened lags years behind the ability to remember what happened and where it took place. At the root of this phenomenon is the concept that temporal reasoning ability takes a more gradual path to maturation as well. In several cultures, the challenge of reasoning with time is alleviated using a spatiotemporal model called the mental timeline—a representation of time based on a left-to-right linear frame. With the proposed research I aim to prime 32 6-year-old children with a left-to-right spatiotemporal model, and 32 additional 6-year-old children with a nonlinear model of events before examining each of their spatial and temporal memory binding abilities. The first phase of this study—in which children are primed to think about time in a spatial format—entails a short animation of a character visiting nine places around the world. Icons corresponding to each event are then placed either in order from left to right, or in a nonlinear format. After completing the priming task, children participate in an unrelated memory game to assess the effects of spatiotemporal priming on their temporal memory abilities. They watch three animations, each consisting of a character completing nine activities in nine different locations. After each animation, they answer three corresponding location-related and order-related questions each. I expect children primed with a left-to-right model to outperform children in the nonlinear priming group on temporal-order probing questions. We hope that the anticipated results can be used in academic settings to strengthen memory abilities in young children and shift the nature of how we communicate with children about time.