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Assessing word recognition through head turn preference in infants with chronic otitis media

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Assessing Word Recognition through Head Turn Preference in Infants with Chronic Otitis Media

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Dedication

This dissertation is dedicated to my wonderful, brilliant parents, whose support, encouragement, and endless love have guided me throughout my lifetime. Even after we lost our sweet Todd, you continued to encourage and love me just the same. Your parental guidance and true selflessness leave me awestruck. The love you two have for one another is truly inspiring and what I hope to embody in my own marriage to Donnie. To two of my most cherished blessings, I love you both more than you'll ever know.

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Last but not least, thank you to my two biggest advocates: my husband, Don, and my best friend, Kati. I could not have successfully journeyed through the last four years without you two. Thank you for praying with me, laughing alongside me, and ultimately loving me unconditionally throughout all of the ups and downs. My life is so much brighter because of you two.

There are truly not adequate words to express my gratitude to those listed here and a myriad of others, so a simple ‘thank you’ will have to do for now.

Table of Contents

List of Tables

List of Figures

ABSTRACT

Previous studies across a variety of different languages have shown that eleven-month-olds tested via the head-turn preference paradigm show a preference for familiar words over unfamiliar words, as demonstrated by longer look times. This study examined the effect of chronic otitis media on the preference for familiar over unfamiliar words. Nine eleven-month-old children (mean age 342 days, SD = 9.61) with chronic ear infections, defined as three or more diagnoses before the test date, were tested using wordlists adapted from a study performed by Vihman et al. (2004). Children with a history of chronic otitis media did not show a preference towards either unfamiliar or familiar wordlists ($t(8) = 0.668$, $p = .523$) as did their fellow American peers without chronic otitis media in unpublished data from our lab ($t(11)= 2.915$, $p = .014$). When combined with other language limiting factors such as low socioeconomic status or potential learning disabilities, additional professional support may be warranted. More research is required before specific recommendations can be made; however, this research provides the foundation for further analysis of the effects chronic otitis media has on early language learning.

INTRODUCTION

Otitis Media

Among children, otitis media is one of the most common ear-related disorders. Though treatment approaches have been speculated and debated, acute otitis media and otitis media with effusion remain common causes for medical visits and antibiotic treatment, especially for young children. Acute otitis media (AOM) involves a rapid onset of inflammation of the middle ear, causing symptoms such as otalgia and fever. Otitis media with effusion (OME) occurs when the middle ear space experiences a collection of fluid; no symptoms or indications of acute infection are present in OME. For the purposes of this written work, otitis media (OM) will be used to encapsulate both forms of the middle ear disorder. For a full review of otitis media and its current treatments, see Thomas et al., 2014.

Two-thirds of children have at least one episode of acute otitis media before they reach three years of age (Qureishi et al., 2014). Due to the nature of Eustachian tube development, low immunity to bacteria such as *Streptococcus pneumoniae*, and exposure to bacteria and viruses in daycare and everyday settings, children often develop this disorder more than adults. Other factors that have been associated with otitis media are secondhand smoke exposure, parental level of schooling, ethnicity, family history of otitis media, and chronic upper respiratory tract infections (Koch et al., 2011). Otitis media typically is evidenced audiologically as a fluctuating, mild to moderate conductive hearing loss (Roberts, Rosenfield & Zeisel, 2004).

It has been widely suggested that even mild hearing losses may cause significant language encoding impairments, especially for young children developing language (Roberts, Rosenfield & Zeisel, 2004). Though language acquisition occurs in a rapid fashion during the first two years of life, there is a vast debate across interdisciplinary pediatric fields as to whether OM truly hinders one's ability to develop speech and language or its impact on academic skills long-term (Karunanayake et al., 2016; Roberts, Rosenfield & Zeisel, 2004; Roberts et al., 2004). Several studies have indicated that there is a correlation between OM and language deficit, while many others show no significant speech or language deficit when comparing pre-school and school aged children with and without a history of chronic OM (Roberts et al., 2004). The theory behind this 'catch up' in skills revolves around overlap and redundancy in language functions; these allow children to overcome temporary processing inefficiencies and mirror that of their fellow typically developing peers (Friel-Patti & Finitzo, 1998; Roberts et al., 2004). Thus, there is not sufficient evidence as to whether chronic OM early in life represents a significant risk to speech-language milestones in neurotypical children once they are pre-school aged. It is largely unknown, however, how children with chronic OM are able to develop their language lexicon compared to children who do not experience chronic OM.

For children who grow up in low socioeconomic status (SES) households, having chronic otitis media may doubly impact their early word learning abilities. Low socioeconomic status has been linked to smaller amounts of word labeling, lack of reading with parents, and smaller amounts of infant-directed speech, amongst other factors that lead to smaller lexicons and less complex syntax in this population (Risley &

Hart, 1995; Dollaghan et al., 1999). As previously mentioned, lower parental education level and socioeconomic class have also been linked to an increased rate of OM.

Though neurotypical, middle-SES and high-SES children with chronic ear infections are perhaps able to catch up to their peers, children with coexisting learning disabilities may also be doubly impacted when suffering from chronic OM. Even if they come from a language-rich environment, children with future learning disabilities may not fully process and encode words into their lexicon during early word learning years due to OM, resulting in a potentially larger delay. If a child does not come from a language-rich environment or has coexisting disabilities in conjunction with delayed word learning due to chronic OM, it will take significant work from early intervention specialists, speech language pathologists, and the child's parents to help the child compare to his or her peers and language norms. The field of communication disorders does not know the implications that early word learning has on populations with coexisting issues.

Head-Turn Preference Paradigm

The head turn preference paradigm (HTPP) involves a simple behavioral task to test an infant's preference for either familiar or novel stimuli (see DePaolis, Keren-Portnoy & Vihman, 2016, for a review). The child sits on its caregiver's lap in a dark, three-sided booth as a wordlist is played from a speaker on a randomly designated side of the booth in conjunction with light stimuli. The infant's head turns are blindly coded by the experimenter, and the type of stimuli the infant looks longer towards is deemed the

preferent stimuli. As explained in Hallé & Boysson-Bardies' 1994 article, infants will attend longer to words they recognize over words that they do not recognize. Hallé and Boysson-Bardies were the first to use the HTPP in a novel way to compare familiar and unfamiliar word lists in French infants.

Vihman et al. (2004) followed Hallé & Boysson-Bardies in their experiment with British-English nine-month-olds and eleven-month-olds. Vihman and her colleagues concluded that eleven-month-olds show a group preference for familiar words while nine-month-old infants do not (Vihman et al., 2004). A later study found that ten-month old infants do not show a preference for familiar over unfamiliar words (DePaolis et al., 2016). For the purposes of this study, we will focus on eleven-month-olds.

The HTPP has been successfully used with eleven-month-old infants across a plethora of different languages, including French, Hebrew, Dutch, and British-English (Hallé & Boysson Bardies, 1994; Segal et al., 2015; Swingley, 2009; Vihman et al., 2004). All have shown that eleven-month-old infants show a preference for familiar words over unfamiliar words. This study will be replicating experiment 1b of Vihman's "The Role of Accentual Pattern in Early Lexical Representation," with American-English eleven-month-old infants who have experienced chronic ear infections to determine whether they have a preference for familiar or unfamiliar words.

Rationale

Two major components of an audiologist's scope of practice are identification and intervention. If children can be promptly identified with early word learning problems due to chronic otitis media, this group of children may have a better chance at drawing near to their peers in terms of language development. If having chronic otitis media affects children's ability to reach milestones, the field of audiology needs to be examining what this means in terms of identification and early intervention, especially when other coexisting, language limiting factors are present.

Statement of Purpose

Early word form recognition has not been previously studied in infants with chronic otitis media. The head-turn preference paradigm has been shown to be a useful tool in determining infants' early word representation and preference. The purpose of this study is to investigate word recognition in infants with chronic otitis media and determine whether this population may need more involved intervention. Because previous data from the head-turn preference paradigm has shown that eleven-month-olds across many different languages show preference for familiar words, understanding whether eleven-month-old infants with chronic ear infections also show this distinction could significantly advance our understanding of early word learning.

Hypothesis

We hypothesized that, as a group, the infants with chronic otitis media would not show a preference towards either wordlist as do typically developing eleven-month-olds.

METHODOLOGY

Study procedures were reviewed and approved by the James Madison University Institutional Review Board (Protocol #18-0269). Each participant's guardian gave written informed consent prior to the start of the study (Appendix A). The participants' caregivers also ranked how well their baby knew words included in the study (Appendix B). Subjects' caregivers were compensated $20 in cash for their time. All testing for this study was performed at the James Madison University Infant Toddler Language Laboratory and the James Madison University Audiology Clinic.

Participants

Eleven-month-old infants were recruited from the local Harrisonburg and Rockingham community to participate in this study. The participants were recruited via targeted marketing advertisements sent through the university-wide e-mail service, as well as posters hung at local daycares, Otolaryngology offices, audiology clinics, and various public informational boards (Appendix C). Inclusion criteria in this study included a history of at least three diagnosed bouts of otitis media before the test date and no self-report of current bilateral ear infections; unilateral infections on the day of testing were accepted.

An a priori power analysis using G*Power 3 software (Faul, Erdfelder, Lang & Buchner, 2007) indicated a required sample size of 15 subjects to achieve a power of 80% with a large effect size at an alpha level of 0.05. A total of nine participants (4 females and 5 males, mean age 342 days) were included in the completed research. Of

note, seven of the participants were tested previously to the current study utilizing the same criteria and set-up. The only difference between the previous seven participants and the more recent two participants was the puretone audiometry testing process which is detailed below. The inability to meet the targeted sample size is a reflection of difficulty recruiting participants. Two babies were additionally tested, but were removed from the dataset due to confounding factors.

Stimuli

Vihman et al. (2004) used the head-turn preference paradigm to determine when British-English infants began to show a preference for familiar words over phonetically and phonotactically matched unfamiliar words, as measured by looking time. They chose familiar words/phrases based on young infants' productions of words and phrases according to previous works by Hart (1991) and Vihman & McCune (1994). The familiar words they chose exemplify the early lexical representation of infants and contain words/phrases that babies are likely to recognize, like "thank you" and "sleepy." The other list contains rare words and phrases that infants were not likely to be exposed to, like "a noose" and "manna." Both familiar and rare wordlists were phonetically and phonotactically balanced to eliminate phonetics and phonotactics as reasons for prolonged look times. Of note, only simple recognition of word form is required, whereas understanding of words is not required for this study to be effective (Hallé & Boysson Bardies, 1994; Vihman et al., 2004). The original British-English words from Vihman et al. (2004) are as follows:

Table 1: Words from Vihman et al., 2004

Familiar Words	**Unfamiliar Words**
Apple	Bridle
Baby	Cycle
Button	Fog light
Mummy/Mommy	Maiden
Nappy	Manna
Sleepy	Mortar
Thank you	Thorough
A Ball	A bine
Away	A noose
Balloon	Compare
Fall down	Disturb
Tonight	Taboo

The stimuli utilized in this study were the same as the Vihman et al. (2004) study except for the replacement of the word “nappy” with “cookie.” This is because the word “nappy” is the British English equivalent to the American English word “diaper;” therefore, American babies were unlikely to recognize “nappy” as a familiar word. With the replacement of the word “nappy” with “cookie,” these American English wordlists remain phonetically and phototactically balanced (Vinyard, 2018). The American English wordlists were recorded by a female speaker with a standard American dialect. The sound level pressure was set using a sound level meter to ensure the peak amplitude of the words was at 60 dBA SPL.

The American English variation of the wordlists was previously used in an unpublished study with ten and eleven-month-old babies. In this unpublished data, eleven-month-olds preferred the familiar list, while the ten-month-olds did not show a preference (R. DePaolis, personal communication, April 7, 2021). The eleven-month-old American English data will be utilized for comparison against the eleven-month-old American English participants with otitis media in this study.

The words/short phrases were pseudo-randomized into twelve lists containing twelve words in varying orders. Every child received a different file, which contained a different combination and order of wordlists. Each word appeared in the first or second position of one wordlist. Additionally, each participant file had no more than two familiar or two unfamiliar wordlists in a row. This ensured that every child heard all words at least once and that they had an equivalent number of each type of list. Each list was approximately 25 seconds long and had a 1.5 second gap between each word. When all twelve wordlists are played, the tracks lasted 4 minutes and 56 seconds.

Procedures

The study was conducted inside a black, three-sided booth separated via a wall from the tester side (Figure 1). A two-sided head-turn preference paradigm procedure was utilized, and the wordlists were used as stimuli. Lighting was dimmed utilizing a lamp set to an appropriate level deemed by the visualization of the baby on the video camera while also being dark enough for lights to be clear for the infant. The dimming

level was consistent across all test sessions. Figure 1 provides a visual representation of the experiment set-up.

Figure 1: Block Diagram of Testing Set-Up

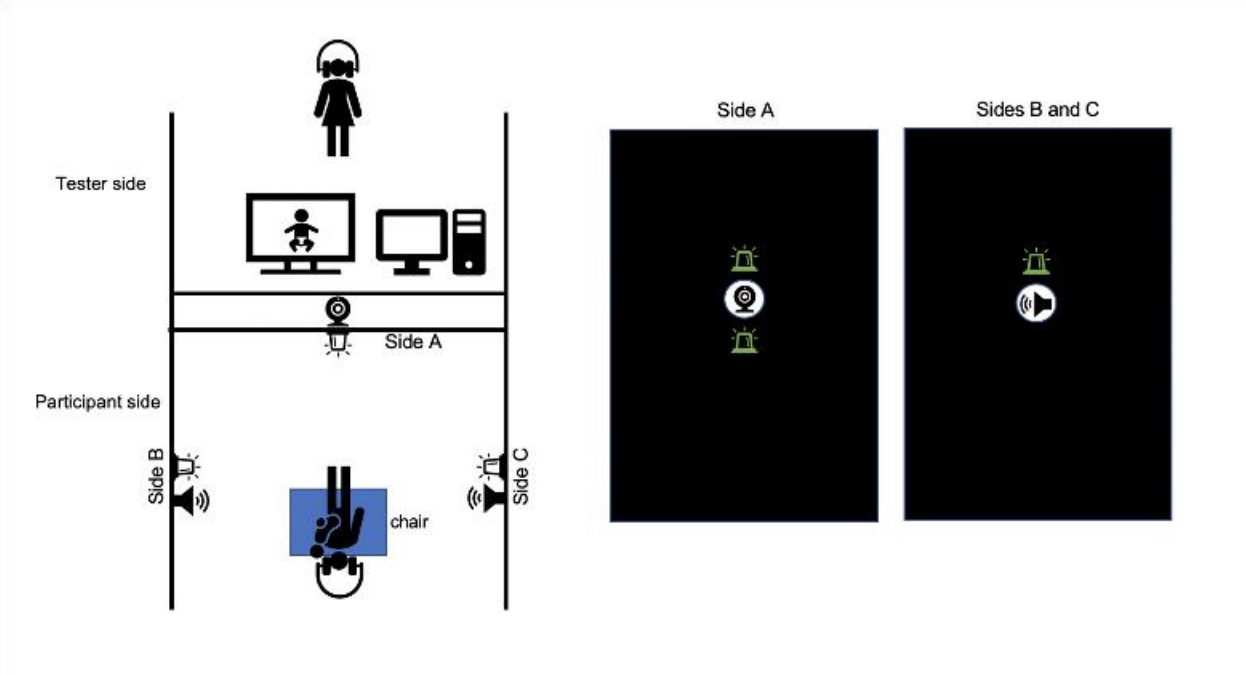

Figure 1. A visual representation of the experimental set up.

Four conditioning trials consisting of two familiar wordlists and two unfamiliar wordlists were played, followed by twelve test trials. The familiarization trials and test trials were performed in the same manner. First, attention-getter lights blinked on Side A of the test booth. Side A was also where the video camera was located, so that the tester could visualize and code the baby's looks from a computer screen on the other side of the booth. After the baby was centered, either a familiar or unfamiliar word list was played from either Side B or Side C, as designated randomly by the computer software. A solid light was also left on in conjunction with the wordlist. When the baby looked towards a particular side, this was coded as a head turn. The tester did not know which type of

wordlist, either familiar or unfamiliar, was being played at any given time. If the baby was no longer looking at a side of the booth and coding was ceased, then the trial was deemed over after three seconds in the training trials, and two seconds in the test trials. This was calculated by the computer to avoid tester inconsistencies. The centering lights were then played again, and the next trial began.

Controls for Bias

Similar to visual reinforcement audiometry, the participant resided on the caregiver's lap while the study was performed. Both the caregiver and the tester on the other side of the booth wore supra-aural headphones with a significant amount of speech masking (babble) noise playing. The level for the caregiver was determined by having three unfamiliar listeners attempt to guess words while sitting in the chair on the test-side of the soundbooth. The masking level was raised until the volunteer listeners were unable to identify which type of word list was being played (50% identification of word list). The speech babble level was raised for the tester side until the tester could not hear the words being played at all through the wall. All speech babble levels were consistent across test sessions.

Additional Testing

A tympanometry screening was also performed with all nine participants, to ensure at least one tympanic membrane was healthy and functioning appropriately on the day of testing. All participants were required to have at least one normal functioning tympanic membrane on the day of testing. Normal variations were defined as Type A,

Type As, Type Ad, or a large volume tympanogram if tympanostomy tubes were present, as determined by parental report and otoscopic evaluation.

The two recent participants included in the data were tested for hearing sensitivity at the James Madison University Audiology Clinic. Testing was performed in the soundbooth via visual reinforcement audiometry (VRA) between the octave frequencies of 500-4000 Hz. These guidelines were chosen according to the American Speech-Language Hearing Association (ASHA) recommended guidelines for hearing screenings. As soundfield testing evaluates both ears while listening together, a response at 20 dB HL or better was deemed within the normal range for at least one ear.

RESULTS

Participants

Eleven babies with chronic otitis media were tested, and nine successfully completed the task; the remaining two were discarded from the dataset due to confounding errors. One baby was excluded due to experimenter error (N=1) and the other was excluded due to excessive fussiness and movement which led to early cessation of the task (N=1). The mean age of babies with chronic otitis media was 342 days (SD = 9.61) and the age range was from 330 to 363 days. Five were males and four were females. Of note, seven of these infants were tested previously as part of the pilot study.

Twelve infants without chronic otitis media were also tested previously with the same American English wordlists. All twelve babies successfully completed the task; no data was discarded as there were no confounding errors. The mean age of babies without chronic otitis media was 336 days (SD = 3.70) and the age range was from 328 to 342 days.

Looking Time Analysis

The average look times for both familiar and unfamiliar wordlists were evaluated for each group. Babies with chronic otitis media looked an average of 8.31 seconds (SD = 3.14) to familiar words and 7.57 seconds (SD = 3.32) to unfamiliar words. In comparison, babies without chronic otitis media looked an average of 5.13 seconds (SD = 2.31) to familiar words and 3.76 seconds (SD = 1.29) to unfamiliar words. Figure 2 demonstrates the differences in look times for each group of babies respectively.

Figure 2: Average Looking Times for OM and Non-OM Infants

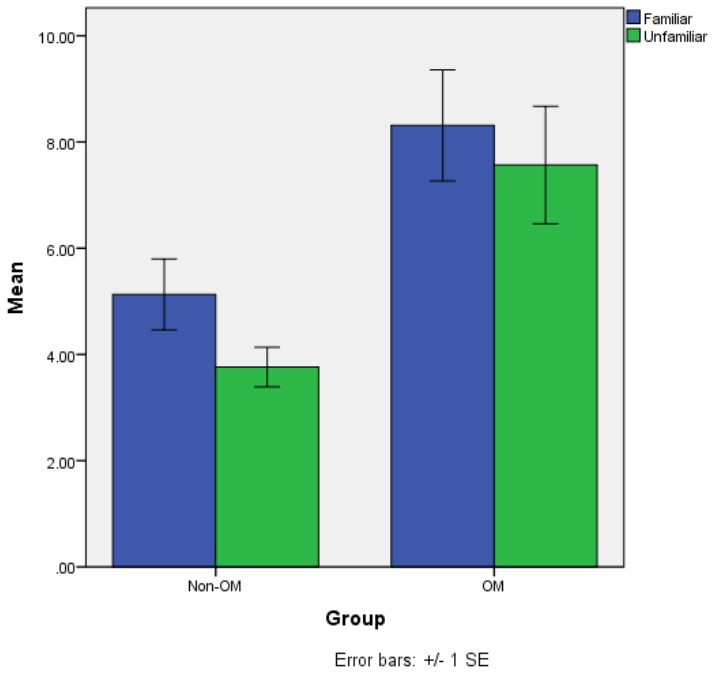

Figure 2. Average looking times for infants with chronic otitis media and without chronic otitis media with standard error bars.

A paired sample means two-tailed t-test was also performed with both groups of babies. The infants with chronic otitis media showed no significant group effect between wordlists, $t(8) = 0.668$, $p = .523$. The infants without chronic otitis media showed a significant group effect between wordlists $t(11)= 2.915$, $p = .014$, with familiar lists receiving longer look times than unfamiliar lists. Individual looking time data can be reviewed for babies with chronic otitis media and without chronic otitis media in Figure 3 and Figure 4, respectively.

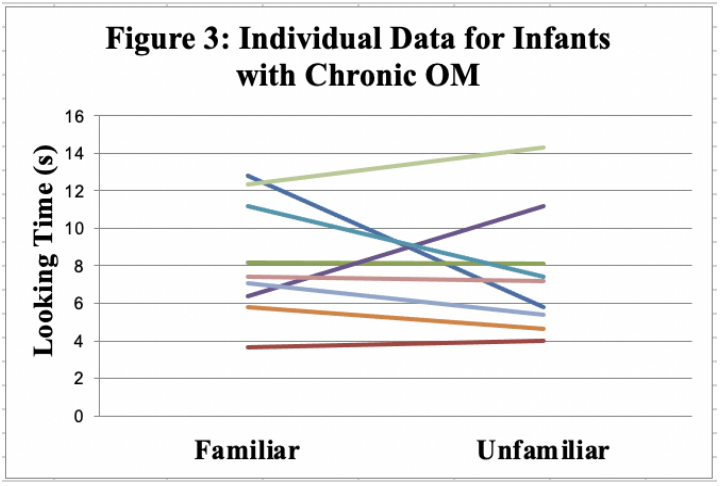

Figure 3. Graph of familiar and unfamiliar look times for infants with a history of chronic otitis media. Four babies showed a preference for familiar words, three showed a preference for unfamiliar words, and two showed no preference.

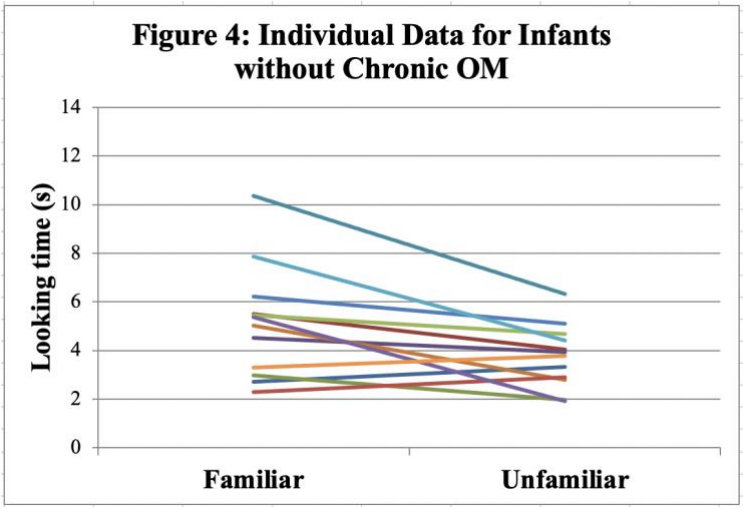

Figure 4. Graph of familiar and unfamiliar look times for infants without a history of chronic otitis media. Nine babies showed a preference for familiar words, three showed a preference towards unfamiliar words, and zero showed no preference.

Audiometric Data

Both participants not tested in the pilot study demonstrated responses in the normal hearing range for at least two frequencies and for speech stimuli when presented in the soundfield. Ear-specific testing was not performed with infants due to the lack of a second tester and due to time constraints. All nine babies with chronic OM had at least one normal tympanogram on the day of testing. Hearing screenings and tympanograms were not performed with the children without chronic OM, as this was not part of the IRB protocol.

DISCUSSION

The findings of this study indicate that American-English infants with chronic otitis media do not show a preference for unfamiliar or familiar wordlists, suggesting a delay in word form recognition compared to American English eleven-month-olds without chronic otitis media. Both groups of infants presented above were the same age and from the same geographical area, providing evidence that the history of chronic OM is the reason for their lack of preference. It is unclear why the children with a history of chronic OM looked longer towards both unfamiliar and familiar words than did children without a history of chronic OM.

Because otitis media is known to cause a mild to moderate fluctuating conductive hearing loss, this is likely the cause of the delay in word form recognition in this group. Naturally, there are varying severities of ear infections which coincide with differing degrees of hearing loss. If an infant has a mild to moderate conductive hearing loss during key learning opportunities, incidental word learning may not be occurring as frequently or efficiently. For instance, speech-language pathologists often encourage parents to interact with their infants during bath time, as there are many opportunities for identifying and repeating new words during these one-on-one interactions. Thus, a child with a temporary conductive hearing loss due to chronic ear infections could be missing out on hundreds of words during an hour of bath time (K. Statzer, personal communication, March 11, 2021).

"Chronic" otitis media for this study was defined as at least three diagnosed bouts of otitis media prior to the date of the study. The OM could either be categorized as acute otitis media or otitis media with effusion. Common amongst Otolaryngology care standards, OME is often treated with 4-6 weeks of 'watchful waiting' so that antibiotic resistance can be avoided; additionally, antibiotics are largely ineffective against the uninfected fluid of OME. This means that three bouts of OME could have up to four and a half months of reduced access to speech and language. Since infants in the Shenandoah Valley are exposed to an average of over 1500 words per hour in a typical day (DePaolis, McQuilkin, & Seal, 2016), this could lead to over a hundred thousand early words that are processed with reduced access to robust speech cues.

Though four and a half total months experiencing otitis media may be an extreme example, it is important to reflect on the language impacts that even a small amount of reduced speech-language access may have on a young child. OME is also more difficult to clinically diagnose due to the absence of acute infection signs (fever, otalgia, red tympanic membrane, etc.), and therefore may be overlooked more frequently by primary care physicians. Regardless, reduced access to speech and language is likely the reason that the data suggests a lack of preference between familiar and rare words in this population.

While the data thus far is a compelling argument for otitis media being a major issue in this group of children's early word learning abilities, studies have shown varying outcomes in how chronic ear infections during childhood affects language development

as a whole. While some children have lasting negative impacts on language development, others fully catch up to their peers. However, when chronic otitis media and other factors such as learning disabilities or a language-poor environment are combined, it is unclear as to whether these children are able to catch up to their peers. If a child has delayed word learning due to chronic OM and also does not come from a language-rich environment or has coexisting learning disabilities, the impact of delayed early word learning is significantly more pronounced.

Preliminary Implications

Audiologists are often one of the first few professionals to evaluate children with chronic otitis media. When a child sees an Otolaryngologist for medical treatment of chronic otitis media, he or she is often also scheduled for a hearing evaluation. Prior to tympanostomy tube placement, audiologists are typically given the task to determine whether the chronic ear infections are impacting a child's ability to hear. Closer monitoring of hearing status may be warranted with this population, especially during early months of life. Though behavioral testing proves to be challenging prior to six months of age, tympanometry is a useful way to monitor middle ear status of these children with chronic OM until they become behaviorally testable.

At these early appointments, it may be useful to determine whether coinciding issues are present and whether they warrant an early speech-language pathology referral. Early outside referrals may provide great benefit for children with chronic otitis media, as speech-language pathologists encourage parental involvement and child-directed speech

to facilitate early language development. Speech therapists often work with parents and their children to reach goals such as increasing lexicon size and improving complex syntax formation. A referral to early intervention services such as speech-language pathology may be especially helpful for this population of young children when coexisting issues are present so that the disparity in language development can be preemptively treated.

In addition to early referrals, pursuing an interdisciplinary team approach could also focus on evaluating and treating an individual child's specific needs when coinciding factors are present. A team of caregiver(s), pediatrician, otolaryngologist, audiologist, speech-language pathologist, and other early intervention specialists could discuss what types of customized intervention might be warranted to preventatively assist a child in 'catching up.' For instance, the team might discuss whether a child may benefit from bilateral tympanostomy tube placement prior to clinic standards, whether he or she needs individual vs. group therapy services, or if a child needs hearing aids when hearing loss is likely more permanent. Additionally, interdisciplinary approaches can lead to education of other disciplines; this could further educate pediatricians in the diagnosis of otitis media and provide standards of care for referrals. Taking into consideration familial history of learning disabilities, socioeconomic status, speech-language milestones, and audiometric status as an interdisciplinary team would be helpful to preventatively care for these children so that they have the best opportunity to reach developmental milestones alongside their peers.

Limitations and Future Research Steps

Based on the power analysis performed prior to the start of this study, the target sample size was unable to be reached. This is largely due to difficulties with local recruitment in the Harrisonburg/Rockingham local community. Optimally, this study would be performed again with a larger sample size and eventually expanded across a broader geographic region of children to generalize findings outside of the Harrisonburg/Rockingham community. Audiometric testing should be implemented with all future participants to rule out bilateral hearing loss on the day of testing as a cause of the lack of wordlist preference.

Additionally, providing caregivers with a functional language assessment prior to the start of the study may be helpful in determining how children with chronic otitis media perform outside of the laboratory setting. Collecting information related to socioeconomic status, familial history of learning disabilities, and other pertinent factors relating to speech-language milestones could also render useful if long-term follow-up is initiated in future studies with this population. It would be beneficial to track these children long-term to monitor both audiometric status and speech-language milestones until at least school age. Tracking the aforementioned audiometric results, SES, and learning disability history and/or diagnosis could provide functionally useful data as to how these children with coexisting factors in addition to OM progress throughout early childhood. All factors could then be combined into a regression model to see which correlative factors are most predictive of their language delay and whether they are able to catch up to their peers. Thus, this would help the communication disorders profession

better serve this population and create new standards of care for babies with chronic otitis media.

CONCLUSION

1. Eleven-month-olds with a history of chronic otitis media do not show a preference between familiar and unfamiliar words, as do their peers without a history of chronic otitis media. This suggests a delay in word form recognition in this population.
2. More research is needed to complete the study in entirety and to determine what delayed word form recognition means functionally for children, both with and without coexisting factors such as low-SES or learning disabilities. Findings from future research will dictate whether children with chronic otitis media who also have coinciding factors need additional interdisciplinary support.

Appendix A: Informed Consent and Parent Questionnaire

Identification of Investigators & Purpose of Study

Your child is being asked to participate in a research study conducted by Allison Anderson and Amy Antigha from James Madison University under the advisement of Dr. Rory DePaolis. This study is designed to establish the effect of repeated middle ear infections on infants' early word learning skills.

Research Procedures

Should you agree to allow your child to participate in this research study, you will be asked to sign this consent form once all of your questions have been answered to your satisfaction. You will also be asked to visit the James Madison University Infant and Toddler Language Laboratory. While your infant is seated on your lap, different types of speech will be presented through loudspeakers and your child's response to this speech will be observed and videotaped, with your permission. The presentation level of the speech will be about that of normal conversational speech. You will be asked to wear headphones playing noise and to use insert earplugs to mask the speech your infant is hearing so that your response does not affect your infant's response.

At the conclusion of the test, we will check your child's ears using an otoscope. This has likely been done before to your child; an otoscope is the tool physicians use to look into patients' ears. This will provide a visual inspection of the ear canal and eardrum to ensure there are no structural abnormalities, excess earwax, or foreign bodies. There is no risk or harm to your child, but it may cause your child to cry because a viewing device is being placed into his or her ear.

We will next check your child's ears using a tympanometer. This test places a small plug in your child's ear and uses a puff of air to check how the eardrum is working. The test will determine if your child has fluid in her/his ear, or, if your child has had PE tubes placed, if the tubes are working properly. There is no risk of harm to your child, but it may cause your child to cry due to the strange sensation, as the test feels much like the change in pressure as you drive over Afton Mountain.

Lastly, we will determine an approximate hearing threshold for your child to ensure that he or she has no more than a mild hearing loss at the time of testing. This will give you an estimate as to how your child is hearing on the day of testing. The threshold will be obtained either using a speech reception threshold or a speech detection/awareness threshold dependent on your child's cooperation. A speech reception threshold test is conducted by the clinician saying phrases such as, "touch your nose" or "find mommy" as the level of sound decreases gradually. The speech detection/awareness threshold is similar in that your infant does not repeat words but rather lets the clinician know in some way that he or she heard the sound/voice.

This study also consists of a questionnaire that will be administered to individual participants in the Speech Laboratory at James Madison University. You will be asked to

provide answers to a series of questions related to the general health and language of your child.

Time Required

Participation in this study will require approximately one hour of you and your infant's time.

Risks

The investigator does not perceive more than minimal risks (that is, no more risk than that encountered in everyday life) from you or your infant's involvement in this study.

Benefits

Potential benefits from participation in this study include learning more about the way that early ear infections affect infants' ability to learn and remember their first words. Your child will also receive a full audiometric evaluation.

Incentives

You will be paid $20 cash for your participation.

Confidentiality

The results of this research will be presented at conferences and in the classroom. The results of this project will be coded in such a way that the respondent's identity will not be attached to the final form of this study. The researcher retains the right to use and publish non-identifiable data. All data will be stored in a secure location accessible only to the researcher. Upon completion of the study, the data will be archived on non-networked digital media and stored in a secure, locked laboratory. The data will be retained for further research for three years. After three years, the data will entirely be destroyed.

There is one exception to confidentiality we need to make you aware of. In certain research studies, it is our ethical responsibility to report situations of child abuse, child neglect, or any life-threatening situation to appropriate authorities. However, we are not seeking this type of information in our study nor will you be asked questions about these issues.

Participation & Withdrawal

Your infant's participation is entirely voluntary. You may withdraw your infant from the study at any time. Should you choose to participate, you can withdraw at any time without consequences of any kind. You will be paid the twenty-five dollars for participation even if you withdraw during the study.

Questions About the Study

If you have questions or concerns during the time of your infant's participation in this study, or after its completion or you would like to receive a copy of the final aggregate results of this study, please contact:

Dr. Rory DePaolis
Communication Sciences and Disorders
James Madison University
depaolra@jmu.edu
(540) 568-3869

Allison Anderson
Audiology (AuD) Graduate Student
James Madison University
ander5ae@dukes.jmu.edu

Questions About Your Rights as a Research Subject

Dr. David Cockley
Chair, Institutional Review Board
James Madison University
(540) 568-2834
cocklede@jmu.edu

CONSENT TO USE VIDEO RECORDINGS FOR PRESENTATIONS AND TEACHING

Title of Study: Assessing Word Recognition Through Head Turn Preference In Infants With Chronic Otitis Media

We would like to ask your permission to use clips from video-recorded sessions for presentations or as teaching material. Please let us know if you agree to us making such use of the video. Please do not feel pressured to agree if you do not feel comfortable with the video being used in such a way.

Please tick your preference below:

☐ I give consent for use of my infant's video in classrooms and conferences. _____ (parent's initials) This is not necessary to participate in the study.

_____	_____	_____
Name of Parent	Date	Signature
_____	_____	_____
Researcher	Date	Signature

Giving of Consent

I have read this consent form and I understand what is being requested of my infant as a participant in this study. I freely consent for my infant to participate. I have been given satisfactory answers to my questions. The investigator provided me with a copy of this form. I certify that I am at least 18 years of age.

☐ I give consent to be videotaped during my participation for data logging purposes.

____ (parent's initials)

☐ I give consent for my infant to be videotaped during my participation for data logging purposes.

____ (parent's initials)

☐ I give consent for the video recorded in this study to be used in the future for research purposes.

____ (parent's initials)

Name of Child (Printed): _____

Name of Parent/Guardian (Printed): _____

Name of Parent/Guardian (Signed): _____ Date: _____

Name of Researcher (Signed): _____ Date: _____

Questionnaire for Parents of Infants with Chronic Ear Infections

Child's Name_____

Birth Date_____ Birthplace: _____

1. What language(s) do you speak with your child?

2. Was (s)he born full term and without complications?

3. Is your child in general good health?

4. How many ear infections has your child had in the past 6 months? When was the last one?

5. How many ear infections (approximately) has your child had since he/she was born?

6. What types of treatment(s) were used for the ear infections?

7. Did your child pass her/his newborn hearing screen (done at birth)?

8. Has your child had any additional hearing tests? If so, what were the results (if you know), and when was the most recent test?

9. Is your child babbling? When did (s)he start?

10. Does your child already recognize a few words? What words are they, how do you know the child understands these words?

11. Does your child say/sign any words that you can recognize?

12. What is your highest educational level?

- ☐ Did not graduate high school
- ☐ High School Degree (or equivalent, i.e. GED)
- ☐ Some college (not completed)
- ☐ Associate Degree
- ☐ Bachelor's Degree
- ☐ Graduate Degree

13. What is your spouse/partner's highest educational level?

- ☐ Did not graduate high school
- ☐ High School Degree (or equivalent, i.e. GED)
- ☐ Some college (not completed)
- ☐ Associate Degree
- ☐ Bachelor's Degree
- ☐ Graduate Degree

Appendix B: Ranking of Known Words

Child's Name_____

Circle how well you think your baby recognizes these words/phrases. They may or may not have attached meaning to them yet, this just asks if they recognize the word if they hear it. **1 indicates they don't recognize the word at all, and 5 indicates that they always recognize the word.**

	1 (Never Recognizes)	**2**	**3**	**4**	**5** (Always Recognizes)
Away	1	2	3	4	5
Apple	1	2	3	4	5
Baby	1	2	3	4	5
Button	1	2	3	4	5
Mommy	1	2	3	4	5
Sleepy	1	2	3	4	5
Thank you	1	2	3	4	5
Diaper	1	2	3	4	5
A Ball	1	2	3	4	5
Balloon	1	2	3	4	5
Fall Down	1	2	3	4	5
Tonight	1	2	3	4	5

Appendix C: Recruitment Flyer

CONTRIBUTE TO A STUDY ON HOW BABIES LEARN LANGUAGE

YOUR BABY NEVER LEAVES YOUR LAP

STUDIES TAKE ABOUT 1 HOUR MAX

ONLY REQUIRES ONE VISIT TO JMU

FULL HEARING TEST FOR YOUR CHILD FOR FREE

RECEIVE $20 FOR YOUR TIME

HEY PARENTS!

Is your baby 11 months old or younger?
Has he or she had multiple ear infections?
JMU's Infant and Toddler Language Lab needs your help!

If you have an infant 11 months of age or younger, please contact our laboratory to contribute to a study on how babies learn language! We are especially interested in babies who are 11 months old or within a few weeks of it.

ALLISON ANDERSON
Audiology Graduate Student

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(703) 989-5790 (cell)

Department of Communication Sciences and Disorders

Chronic Ear Infections Study
Contact: Allison Anderson
Ander5ae@dukes.jmu.edu
(703) 989-5790 (cell)

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