

November 2023

NeuroAudiology Newsletter

Editor: Alyssa
Davidson, PhD, AuD
Co-Editors: Frank
Musiek, PhD; Amy
Bradbury, AuD

Research on Auditory and Cognitive Abilities!

AUDIOLOGY TRIVIA

ANSWERS ON LAST PAGE

- 1) Based on pooled data, about what percent of patients with multiple sclerosis yield abnormal results on combined ABR/MLR tests?
a) 0%, b) 25%, c) 40%, d) 70%
- 2) According to Medicare data, what percent of patients seen by audiologists receive tympanograms & acoustic reflexes upon examination?
a) 18%, b) 36%, c) 52%, d) 70%
- 3) Who is given credit for first describing the caloric response?
a) Achan, b) Baloh, c) Barany, d) Barber

Editor of this newsletter: Alyssa Davidson, AuD, PhD (pictured left below), along with collaborator, Pamela Souza, PhD (pictured right below), from Northwestern University has a recently had an important manuscript accepted for publication in Journal of Speech, Language, and Hearing Research.

Title: Relationships between auditory and cognitive abilities: A systematic review

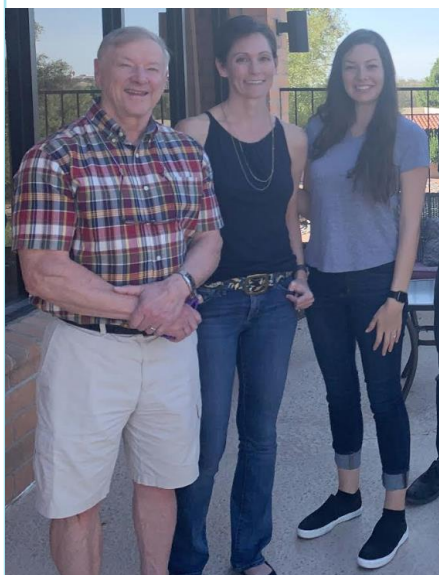
Authors: Alyssa Davidson and Pamela Souza

This article summarizes relationships between central auditory processing and cognitive processing. Both behavioral and electrophysiologic auditory processing measures were included in this review, along with cognitive abilities of working memory, processing speech, executive processes, fluid intelligence, visual perception, and multi-domains. Stay tuned for this publication release!



Expanding Dichotic Listening!

Editors of this newsletter, Alyssa Davidson and Frank Musiek, collaborated with others at the University of Arizona to publish a manuscript on the effects monaural and binaural noise can have on the Dichotic Digits Test (DDT). In fact, first author, Carrie Clancy (pictured below), is a previous member of the NeuroAudiology Lab at the UofA. Results from this study show unique effects of noise on dichotic listening and an approach to eliminate the ceiling effect on the DDT.



Pictured-publication authors: Frank Musiek, Carrie Clancy, Alyssa Davidson

Accepted Manuscript

Submission Date: 2023-03-29
Accepted Date: 2023-09-20
Accepted Manuscript online:

Journal of the American Academy of Audiology

Effects of Adding Monaural and Binaural Noise to a Dichotic Listening Task

Carrie Ann M Clancy, Alyssa Davidson, Mark Borgstrom, Kiana Robinson, Frank Musiek.

Affiliations below.

DOI: 10.1055/a-2181-2398

Please cite this article as: Clancy C M, Davidson A, Borgstrom M et al. Effects of Adding Monaural and Binaural Noise to a Dichotic Listening Task. Journal of the American Academy of Audiology 2023. doi: 10.1055/a-2181-2398

Conflict of Interest: The authors declare that they have no conflict of interest.

Abstract:

Background: The Dichotic Digits Test (DDT) evaluates central auditory nervous system (CANS) dysfunction. The DDT is widely used in audiology clinics worldwide because it is clinically efficient and has good sensitivity and specificity for CANS lesions. However, the DDT shows a strong ceiling effect, which can mitigate its ability to detect subtle CANS dysfunction.

Purpose: This study examines the effects of adding monaural and binaural speech-spectrum noise to the DDT in an effort to make the test more taxing to the CANS and thereby reduce the observed ceiling effect.

Research Design: This was an experimental repeated measures study.

Study Sample: The participants were 20 adults aged 18-50 years with normal, bilaterally symmetric peripheral hearing sensitivity.

Data Collection and Analysis: Each participant was administered one standard DDT test list (no noise added) and DDT test lists with binaural, monaural right, and monaural left noise added. For each of the noise-added conditions, lists were administered at two different signal-to-noise ratios (SNRs), for a grand total of seven DDT test lists per participant, presented in randomized order. Monaural and binaural noise effects on DDT scoring indices (Right and Left Ear Percent Correct Scores, Combined Total Percent Correct Scores, and Dichotic Difference Scores), as well as noise effects on the Right Ear Advantage (REA) for speech, were examined. Mixed model analyses of variance (ANOVAs) were used to examine fixed effects and interactions of Noise Condition and Ear.

Results: Adding noise to the standard DDT systematically reduced Right and Left Ear Percent Correct Scores and Combined Total Percent Correct Scores. Statistically significant differences on all indices were found between monaural and binaural noise-added conditions, suggesting a possible advantage for binaural listening in noise.

Conclusions: These findings suggest that adding noise to tests of dichotic listening increases the difficulty of the task, and that further investigation of dichotic listening patterns in noise could potentially lead to more sensitive clinical evaluations of CANS integrity and function.

Corresponding Author:

AuD Carrie Ann M Clancy, The University of Arizona, Department of Speech, Language, and Hearing Sciences, Tucson, United States, carrieclancy@gmail.com

Affiliations:

Carrie Ann M Clancy, The University of Arizona, Department of Speech, Language, and Hearing Sciences, Tucson, United States

Alyssa Davidson, Walter Reed National Military Medical Center, Bethesda, United States

Mark Borgstrom, The University of Arizona, University Information Technology Services, Tucson, United States

Kiana Robinson, The University of Arizona, University Information Technology Services, Tucson, United States

Frank Musiek, The University of Arizona, Department of Speech, Language, and Hearing Sciences, Tucson, United States

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

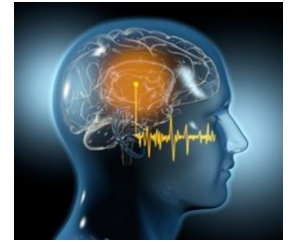


This article is protected by copyright. All rights reserved.

Accepted Manuscript

NeuroAudiology/CAPD Corner

Topic: Phenylketonuria (PKU) and Central Auditory Dysfunction



Phenylketonuria (PKU) is a genetic disorder that can affect the myelination of nerve fibers in a negative manner. If myelination is influenced by this disease, then neurotransmission and neural connectivity in the brain can also be compromised. Though PKU has long been screened for in newborns, awareness of PKU and central auditory system dysfunction has received little attention. Given that PKU compromises neural transmission, audiological procedures such as evoked potentials would seem to be an excellent way of assessing the integrity of the central auditory system in these cases.

The literature does show that those with PKU demonstrate abnormal ABRs with extended central conduction times. Though this early data did open the door to possible central auditory dysfunction, it was a more recent study by Mancini and colleagues that provided critical insight into PKU and central auditory dysfunction.

The Mancini et al. study revealed that over 50% of their PKU population (aged 6 – 15 years) demonstrated extended central conduction times for ABR. Perhaps even more revealing, over 80% showed abnormal middle latency responses (MLR) when comparing inter-hemispheric responses. These are rather compelling statistics. Though more confirmation data is needed, audiologists should strongly consider testing newborns and children for central auditory disorder. The ABR/MLR, which can be simultaneously recorded, are tests that should be considered in screening for auditory dysfunction. However, research should be initiated for expanding audiological testing, including behavioral measures, when feasible, for those with PKU.

Upcoming Musiek Presentation

Frank Musiek will be giving a 2-Hour Master Class at the upcoming American Speech Language and Hearing Association Convention. You do not want to miss this!

A 3-D Tour of the Auditory Brain: It's Functional Neuroanatomy and Clinical Correlates. ASHA Convention, Boston, MA. Nov 17

Efforts to Restore Hearing

Title: Landmark Gene Therapy Clinical Trials Aims to Restore Hearing in Children with Genetic Hearing Loss. October 13, 2023

Source: HHTM News Watch

Addenbrooke's Hospital in Cambridge is part of a landmark global trial that seeks to restore hearing in children with a rare genetic condition. The trial will include approximately 18 children and is dedicated to exploring the potential of gene therapy to restore hearing in children with severe to profound hearing loss due to auditory neuropathy, a condition that disrupts nerve impulses from the inner ear to the brain. The trial will follow these children for a span of 5 years to assess the extent of hearing improvement. Auditory neuropathy, often stemming from mutations in the OTOF gene and usually produces a protein called otoferlin, enabling communication between inner ear cells and the hearing nerve. Professor Manohar Bance, an ear surgeon at Cambridge University Hospitals NHS Foundation Trust, leads the trial, emphasizing that children with OTOF gene mutations are born with profound hearing loss, which often goes unnoticed in standard hearing screenings for newborns. The trial uses gene therapy to deliver a functional copy of the defective OTOF gene, utilizing a modified, non-pathogenic virus. Administered via an injection into the cochlea during surgery, the procedure closely resembles cochlear implant surgery. If the gene therapy doesn't prove effective within six months, families can opt for a cochlear implant. Successful gene therapy could pave the way for treating other genetic hearing conditions, a significant advancement in the field of hearing loss treatments. The trial is sponsored by Regeneron Pharmaceuticals, with support from the National Institute for Health and Care Research (NIHR) and is conducted at Cambridge's Clinical Research Facility.

CAPD Corner Suggested Reading

- Cardona F, Leuzzi V, Antonozzi I, et al. (1991). The development of auditory and visual evoked potentials in early treated phenylketonuric children. *Electroencephalogr Clin Neurophysiol*, 80, 8–15
- Mancini PC, Durrant JD, Starling AL, Iório MC. (2013). Children with phenylketonuria treated early: basic audiological and electrophysiological evaluation. *Ear Hear*, 34(2), 236-44.
- Musiek, F., & Baran, J. (2022) NeuroAudiological Considerations for the ABR Revisited: Back to the Future, *Seminars in Hearing*, 43, 149 – 161.

Current Literature to Review

- De Sousa, K. C., Manchaiah, V., Moore, D. R., Graham, M. A., & Swanepoel, D. W. (2023). Effectiveness of an Over-the-counter self-fitting hearing aid compared with an audiologist-fitted hearing aid: A randomized clinical trial. *JAMA Otolaryngology–Head & Neck Surgery*, 149(6), 522-530.
- Reynard, P., Joly, C. A., Damien, M., Le Normand, M. T., Veuillet, E., & Thai-Van, H. (2023). Age-Related Dichotic Listening Skills in Impaired and Non-Impaired Readers: A Comparative Study. *Journal of Clinical Medicine*, 12(2), 666.
- Westerhausen, R., Fabri, M., & Hausmann, M. (2023). Dichotic-listening performance after complete callosotomy: No relief from left-ear extinction by selective attention. *Neuropsychologia*, 108627.

AUDIOLOGY TRIVIA ANSWERS

- 1) About (D) 70% of MS patients yield abnormal results.
- 2) About (A) 18% of patients receive tympanograms and acoustics reflexes at their evaluation.
- 3) (C) Barany was given credit for first describing the caloric response.