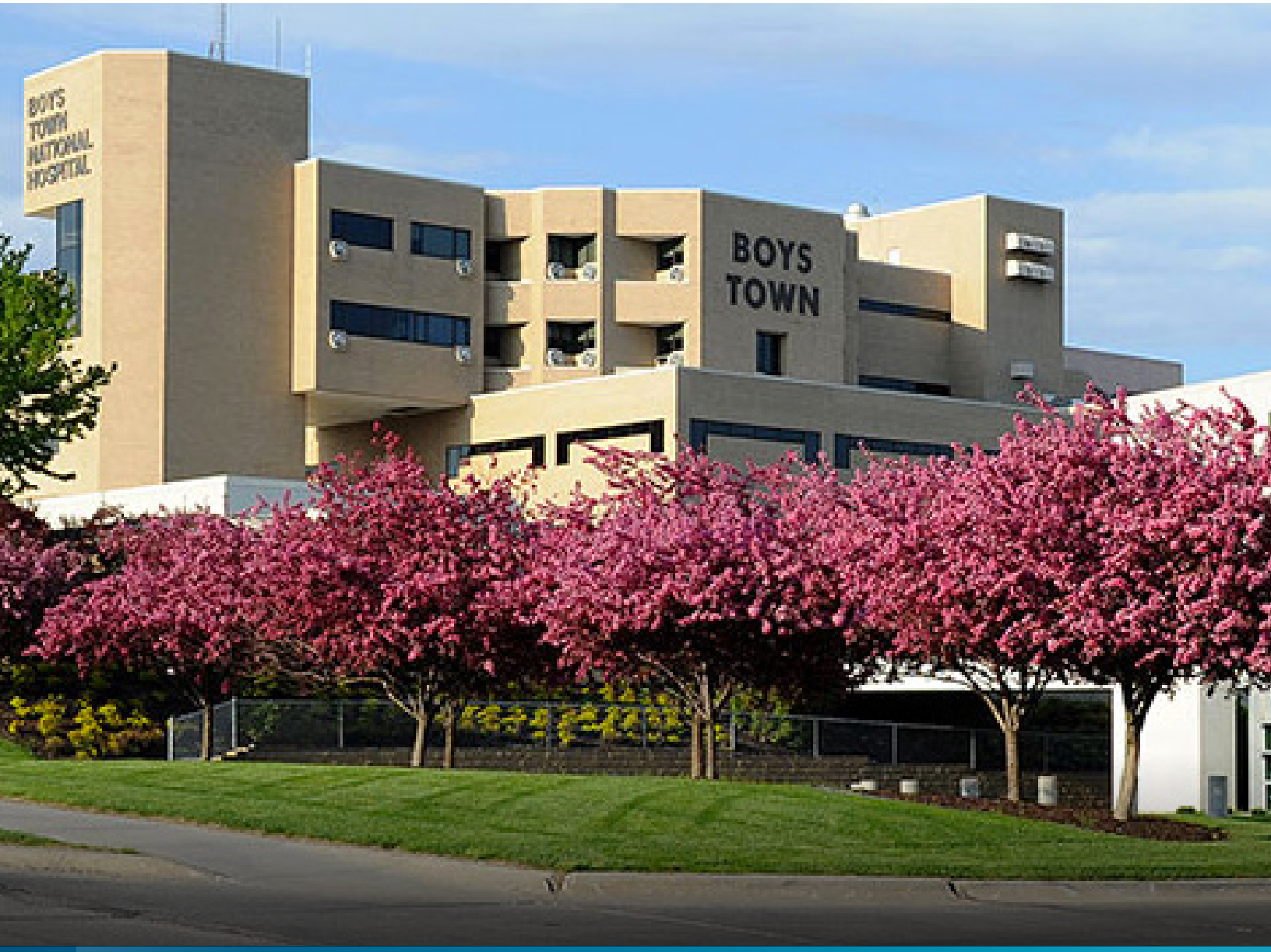
CPCC Annual Newsletter 2022



Boys Town National Research Hospital® established the Center for Perception and Communication in Children (CPCC) in 2014 with support from a Centers of Biomedical Research Excellence (COBRE) grant from the National Institute of General Medical Sciences (NIGMS) under Award Number P20GM 109023. We're proud to share our research team's progress and highlights from this last year!

BOYS TOWN National Research Hospital®

Center for Perception and Communication in Children

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Join Boys Town

Open Positions

Research Scientist – Center for Childhood Deafness, Language and Learning at Boys Town.

Post-Doctoral T32 Fellowship –

Boys Town National Research Hospital (BTNRH) invites applications for an open post-doctoral fellowship position within our NIH T32 training program. Candidates must be able to join before 6/30/2023, be permanent residents or US citizens and have training in hearing science/speech science/psychology/linguistics/language science/ balance disorders/cognitive science neuroscience/biomedical engineering or other related areas.

Laboratories involved in the T32 program conduct translational research in the vestibular system, hearing and speech perception in children and adults with hearing loss who use hearing aids and/or cochlear implants, and language, learning and literacy in children with hearing loss and/or language disorders. Information on the postdoctoral training program and a full list of potential faculty mentors can be found here: **https://www.boystownhospital.org/research/careers-training/postdoctoral**

Candidates who are women or from underrepresented/historically disadvantaged racial/ethnic minority backgrounds are particularly encouraged to apply.

Interested applicants are invited to fill out a preapplication form here:
https://www.boystownhospital.org/research/careers-training/postdoctoral/pre-application

Research Core Updates

Administrative Core – Boys Town National Research Hospital has been a leader in research and clinical services for children who are deaf or hard of hearing for more than 40 years. The CPCC aims to further expand the scope of our research on speech, language, hearing and cognitive development in children with communication disorders.

The CPCC's Administrative Core, led by Lori Leibold, Ph.D. aims to promote the development of early career scientists by providing a collaborative and supportive research environment. The success and productivity of our CPCC project leads – *see pages 7-9* – is a testament to the power of our mentoring programs, our highly experienced research cores, as well as Boys Town's institutional commitment to supporting exceptional translational research.

The CPCC held our annual External Advisory Committee (EAC) meeting in-person this September for the first time since 2019. Lisa Bedore, Ph.D. (Temple University), Lisa Goffman, Ph.D. (University of Texas at Dallas) and Andrew Oxenham, Ph.D. (University of Minnesota) travelled to Omaha for the meeting, while Kevin Munhall, Ph.D. (Queen's University) and Robert Shannon, Ph.D. (formerly University of Southern California) attended via Zoom. The EAC members provided valuable individualized mentoring and feedback for our project leads, and we are extremely grateful for their time and expertise.

The CPCC program is currently in Phase II of our COBRE award. Dr. Leibold and her team will submit a Phase III application to NIGMS in May 2023 which, if funded, will provide a final 5-year cycle to solidify the infrastructure and resources developed in Phases I & II. We look forward to sharing more details about our plans to continue doing critical research for children with communication disorders for decades to come. Please visit our website for additional information here. Thank you for your interest and support!

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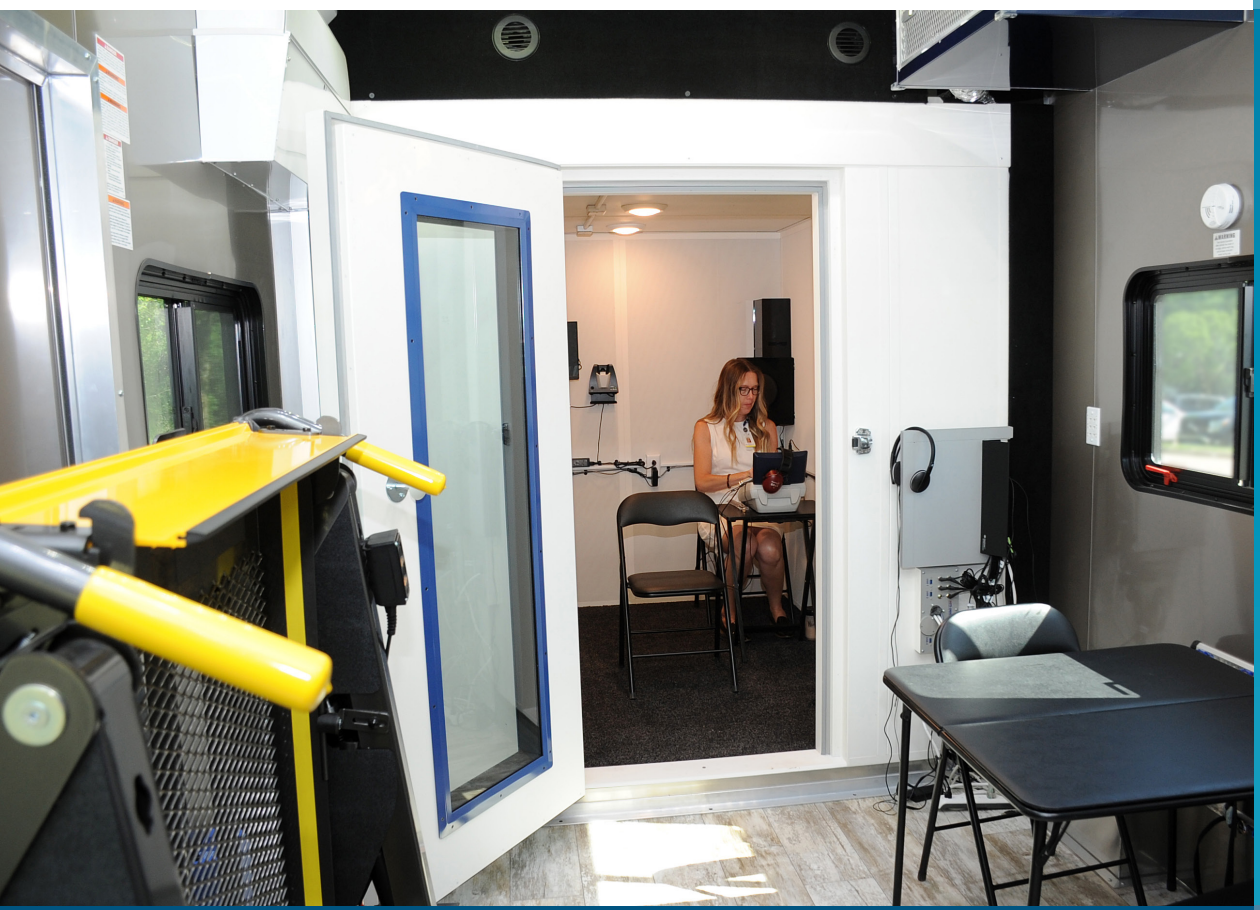

Research Core Updates

Human Subjects Core – Led by Karla McGregor, Ph.D. the Human Subjects Core (HSC) provides support for Boys Town researchers in the areas of clinical measurement, consent compliance and participant recruitment. The HSC members rolled out and supported critical recruitment and community engagement initiatives over the past year, three of which are highlighted below.

The HSC engaged community members to ensure effective recruitment materials and experiences. In the spring of 2022, the HSC led a collaborative project with members of our local Hispanic/Latinx community to ensure the materials that we use at community hearing/speech/language screenings are appropriate, useful and easily understood in English and Spanish. The committee was composed of 11 Spanish-English bilingual adults. During a series of surveys and discussion meetings, the committee reviewed five documents used for recruitment and screenings. Key areas of discussion were the use of formal versus common language, dialectical differences and use of medical terminology. The five documents were updated based on these discussions and efforts are underway to track their effectiveness.

The HSC pilots tabling events and meets with some success. Tabling events are opportunities for Boys Town's research labs to recruit interested individuals into research studies. From Fall 2021 through Spring 2022, HSC member Trinity Williams organized 10 tabling events at Creighton University. These tabling events saw variable success rates, at times enrolling over 50 volunteers into a study, and at times enrolling zero. Why so variable? We expect that characteristics of the studies, timing and location of the recruitment event, along with the enthusiasm and networking skills of lab staff, may influence outcomes. With these factors in mind, we are working to maximize the recruitment outcomes for upcoming tabling events.

The HSC assists with the coordination of multi-lab CI recruitment. Led by Ellen Peng, Ph.D. planning began in March of 2022 to realize a multi-lab CI recruitment and data collection effort. Dr. Peng, Angela Aubuchon, Ph.D., Monita Chatterjee, Ph.D., Christopher Conway, Ph.D., Kristen Janky, Ph.D. and their lab staff collected data from nine families who travelled to Boys Town this summer for CI clinic visits. Research visits ranged from one to four days due to the distances travelled and the large number of clinical and research opportunities available. Participants were offered compensation for their time, lodging, per diem, mileage, lunch on research/clinic days and tickets to the Omaha zoo. We are very grateful to the families that participated, and we are working on continuing this multi-lab recruitment with mini sessions during the school year and full sessions in the summer.

Research Core Updates

Technology Services Core – The Research Technology Services Core, directed by Chris Stecker, Ph.D., provides cutting-edge software and hardware solutions to support Boys Town's research needs. Our engineers work alongside scientists to develop precise, highly customized programs using a variety of languages including C++, Matlab, EPrime, Max, JavaScript, Python and more.

The Technology Services Core also includes an Anechoic Chamber for conducting spatial hearing experiments and an Audio-Visual sound booth designed for running studies using virtual reality tools. Both facilities are available for use by Boys Town scientists as well as at other research institutions. Contact **Chris.Stecker@boystown.org** or visit our **website** to learn more.

A focus for the Technology Services Core over this year has been developing a series of online, JavaScript-based tools to deliver speech, language and reading assessments for CPCC project lead, Hope Sparks Lancaster, Ph.D. Dr. Lancaster will use these assessments to collect thousands of data points to explore the role of genetics in our speech and language development and outcomes. In addition, research engineers Seth Bashford and Denis Fitzpatrick worked with Boys Town's network group to build a JATOS (Just Another Tool for Online Studies) server for hosting and running Dr. Lancaster's study. This server allows us to manage the technology on-premises rather than paying for cloud-based services. In fact, the JATOS server is already being used by multiple researchers and we expect the need for online studies will continue to increase. Another new technology recently developed by the core is a Linux server for running large-scale data analyses. Dr. Lancaster will be the first researcher to access this server as her project produces text from language and cognition tasks and audio files from speech production tasks, all of which require iterative scoring and evaluation – and eventually incorporating genetics information for thousands of records necessitates a high-power server. The solution the core developed includes a Nvidia GPU running Linux with an Ubuntu 20.04 open-source OS. The server also includes remote access functionality so analyses can be initiated from anywhere.

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Project Updates

Kaylah Lalonde – Kaylah Lalonde, Ph.D., Emily Buss, Ph.D. of the University of North Carolina School of Medicine, Dr. Leibold and Margaret Miller, Au.D. of BTNRH, published results of a study (available here) examining the effects of face masks on auditory and audiovisual consonant recognition in children with normal hearing and children with hearing loss. The study found that children with hearing loss identified consonants less accurately than children with normal hearing, but both groups were similarly impacted by face masks. The best mask for promoting speech understanding in noisy environments depended on whether visual cues were accessible. Disposable hospital masks were best under auditory-only conditions, but well-fit transparent masks were best when listeners had a clear, consistent view of the talker's face.

Dr. Lalonde and the Audiovisual Speech Processing Laboratory staff finished collecting data for her COBRE project examining the development of audiovisual speech enhancement in children with normal hearing. Dr. Lalonde is transitioning off COBRE funding after receiving an Early Career Research Award from the NIH National Institute on Deafness and Other Communication Disorders. Dr. Lalonde's new research grant is examining factors influencing audiovisual speech perception benefit in children with sensorineural hearing loss, as well as funding for a new study with Tina Grieco-Calub, Ph.D. of Rush University and Katherine Gordon, Ph.D. of BTNRH examining the effects of face masks on word learning in preschool-age children.

Angela AuBuchon – Angela AuBuchon, Ph.D. and her team completed data collection for Aim 1 of her study, focused on characterizing the developmental trajectory of rehearsal. Initial analyses of the data support predictions that children can engage in rehearsal and verbalization (e.g., "self-talk") at younger ages, but only when sufficient working memory resources are available. Further analyses are planned to examine whether children of varying ages can follow instructions to use either covert or overt rehearsal and how these instructions interact with list length. For Aim 2, Dr. AuBuchon built a series of mediation models by combining data from Aim 1 with data from 16 other labs from around the world. The models indicate that lexical access speed is a foundational language skill which supports early verbal memory, at least by age five. The changes in predicted variance from 5- to 7-years indicate that, even at these early ages, other more complicated strategies are emerging. In the future, Dr. AuBuchon hopes these findings will help parents know whether their children are meeting self-talk milestones and influence clinical guidelines on which self-talk skills to target with intervention at different ages.

Project Updates

Gabrielle Merchant – Gabrielle Merchant, Au.D., Ph.D. advanced her work on otitis media (OM) and conductive hearing loss in children. The first aim of Dr. Merchant's COBRE-funded research is to characterize the effect of fluid variations on an objective and non-invasive sound-based measurement of ear drum movement called wideband acoustic immittance (WAI) in pediatric ears with OM. The second aim of this project is to determine the effect of fluid variations on hearing in children with OM. Dr. Merchant and her team have collected audiological outcome measures including hearing, otoacoustic emissions and WAI in children who were diagnosed with OM and were scheduled to receive ear tubes. They compared information about each child's specific case of OM as assessed during surgery for ear tube placement with the hearing and WAI measurements. The results so far demonstrate that the amount of fluid in the middle ear drives how much hearing loss occurs, with ears that are completely full of fluid demonstrating the most hearing loss. The results also show that WAI can be used to determine the amount of fluid in the middle ear quickly, objectively and non-invasively – a practice that is not currently done in the clinic but could provide a helpful indication of how a child is hearing in cases where hearing is difficult to assess otherwise. This is very exciting as the number of children with OM that cannot have their hearing tested by traditional behavioral techniques is actually quite high. Dr. Merchant and her team completed a retrospective study that found that in ideal circumstances (i.e., in a research setting with multiple testers and ample time), behavioral hearing information is obtained on only 50% of children with OM. This drops to roughly 25% in clinical settings, where resources are more limited. In contrast, WAI was able to be completed in these same children in nearly 100% of cases. Thus, the ability for WAI to be able to estimate hearing loss when it may not be able to be measured behaviorally is very exciting.

In the next year, Dr. Merchant will recruit additional participants and expand this line of research to also consider the stability of the audiological profile during a course of OM as well as whether WAI can help predict the overall prognosis. She also plans to bring back previous participants for a pilot study on binaural processing. Dr. Merchant is currently preparing to submit an R01 and has four manuscripts in various stages of preparation.

Hope Sparks Lancaster – Hope Sparks Lancaster, Ph.D. and her team in the Etiologies of Language and Literacy Lab (eL^3) completed a prototype of the Remote Adult Language – Experiment (ReAL-E) tool. They completed user experience testing and further refined the ReAL-E based on user feedback. Mia Haschenburger, Ph.D. presented the process and preliminary results from the timed nonword reading task at the Society for the Scientific Study of Reading conference in July 2022. The eL^3 lab is gaining research momentum as pilot data collection is underway! The eL^3 team is establishing a collaboration with Natalie Parde, Ph.D. (University of Illinois at Chicago) to develop automatic scoring procedures. Dr. Lancaster will be presenting results from user experience and pilot testing at the 2022 American Speech-Language- Hearing Association Convention in New Orleans this November.

Project Updates

Ellen Peng – Dr. Ellen Peng and her team in the Functional Hearing Lab launched a one-year pilot project studying the roles of balance and vestibular dysfunction on spatial hearing outcomes for children with bilateral cochlear implants. They made great progress over the summer, welcoming eight children and young adults with cochlear implants as participants, as well as many children and adults with normal hearing who participated as controls. Dr. Peng shared preliminary results of this study at the 13th annual Midwest Conference on Cochlear Implants (CI CRASH 2022) in September. Dr. Peng has received support from two cochlear implant companies – Cochlear and Advanced Bionics – to conduct clinical research with cochlear implant users. Dr. Peng received an Early Career Research Award from the NIH National Institute on Deafness and Other Communication Disorders to investigate how normal hearing children develop functional spatial hearing abilities in realistic reverberant environments, such as classrooms. Dr. Peng also received support from GN Resound on this study for a pair of dummy hearing aids to create recordings of children's head-related transfer function.

With contributions of our team we continue to make strides in hearing, speech and language healthcare.

Alumni Notes

Heather Porter – Heather Porter, Ph.D. is the Co-Director of Boys Town's Human Auditory Development Lab and was the recipient of a COBRE pilot grant in 2020. Dr. Porter's pilot program contributed to improving clinical applications of high-frequency auditory brainstem response (ABR) testing. The resulting manuscript describing normative infant data for 6- and 8-kHz ABR waveforms was recently accepted for publication (Porter, H.L., Dubas, C., Vicente, M., Buss, E., & Kaminski, J. Auditory brainstem responses at 6 and 8 kHz in infants with normal hearing. American Journal of Audiology, in press) and a second manuscript describing the association between ABR threshold and behavioral threshold at 6- and 8-kHz is currently under review.

Dr. Porter recently received funding for an R21 proposal to continue her line of clinic-centered research, this time focusing on improving hearing healthcare outcomes for individuals with Down syndrome across the lifespan. Dr. Porter and her team are currently working to establish a community advisory board to contribute to and guide this research. The advisory board will be made up of individuals heavily involved with the Down syndrome community, including individuals with Down syndrome and close relatives or professionals who work with individuals with Down syndrome. The first aim of this new study addresses a potential confound to audiologic assessment by using in-ear acoustic measurements to examine the influence of ear canal stenosis. The second aim tests a model of functional auditory abilities for individuals with Down syndrome including factors that benefit masked speech perception in individuals who are neurotypical. This work comprises an integrated approach to reduce hearing health disparities in individuals with Down syndrome that span clinical and research domains.

Beyond research, Dr. Porter is constantly inspired and motivated through her involvement in a clinical working group at Boys Town that is dedicated to improving audiological assessment in individuals who are neurodiverse. On the home front, Dr. Porter supports our local pollinators with her garden of native pollinator plants, which was showcased in this year's Omaha Garden Walk sponsored by the Nebraska Statewide Arboretum.

Kristen Janky – Dr. Kristen Janky is the Director of the Vestibular and Balance Research Laboratory at Boys Town, which was established in 2011. Dr. Janky's lab was one of the first to receive support from the CPCC's COBRE funding, with a project running from May 2014 through February 2016 focused on visual acuity outcomes in children with hearing loss. The project resulted in pilot data for an R03 grant focused on the prevalence of vestibular loss in children with hearing loss and the gross motor and visual acuity deficits that occur with vestibular loss. In December 2021, Dr. Janky received a K23 Mentored Training Award to investigate whether the visual acuity and gross motor deficits in children with vestibular loss result in additional reading and cognitive deficits. This award runs for five years and provides Dr. Janky with mentorship in reading, cognition and eye tracking measurements.

Dr. Janky describes the COBRE funding she received as "a great foundation" to her career, providing her the means to establish her lab and opportunities for collaboration. Since then, Dr. Janky has received two NIH grants (R03 and K23) and has published 33 peer-reviewed manuscripts, one of which received the American Journal of Audiology Editor's Award (available here).

Outside of her professional accomplishments, Dr. Janky got married (2016) and has two children, Jake and Wesley, and continues to enjoy spending time with friends and family, running, lifting weights and taking trips to the mountains to hike.

BIPOC-CSD Network

The field of communication sciences and disorders (CSD) suffers from a concerning lack of racial and ethnic diversity, but the patient population served by CSD professionals is increasingly diverse. Students, post-docs, faculty, engineers, clinicians and others working in CSD who are from racially/ethnically underrepresented groups can feel isolated, without role models or mentors who can relate to experiences of microaggression or overt racism and the cumulative effects of racism in their everyday lives and work. The BIPOC-CSD network was founded in 2021 as a critical starting point for change in CSD.

The BIPOC-CSD network is an affinity space for individuals who are Black, Indigenous, or Other People of Color/from racially/ethnically underrepresented minority groups and are working in CSD (i.e., hearing, speech, language, balance, etc.) at any level (e.g., students, post-docs, faculty, technical staff, etc.). Within the BIPOC-CSD affinity space, members can meet, share resources with one another and facilitate collaborations and cohort formation. The primary goals of the network are to (i) support members, particularly students, post-docs and those at early-career stages, and (ii) provide information and resources to allies as they seek to diversify their laboratories and clinics. Meetings are held virtually and focus on mentoring and resource-sharing, including scientific presentations by members on increasing diversity, inclusivity and fairness in the laboratory and clinic. The network's leadership expects to organize in-person gatherings of BIPOC-CSD members at CSD conferences in the near future.

The network was founded by Dr. Monita Chatterjee, a scientist at Boys Town, together with co-founders Shauntelle Cannon, Au.D., an audiologist pursuing her Ph.D. at Ohio State University; Anahita Mehta, Ph.D., an Assistant Professor at the University of Michigan-Ann Arbor; Lina Reiss, Ph.D., an Associate Professor at Oregon Health Sciences University; Viral Tejani, Ph.D., an Assistant Professor and Senior Cochlear Implant Research Audiologist at University Hospitals, Case Western Reserve University; Tanvi Thakkar, Ph.D., an Assistant Professor at the University of Wisconsin-LaCrosse; and J. Tilak Ratnanather, Ph.D., an Associate Professor at Johns Hopkins University.

Those who identify as BIPOC/from racially/ethnically underrepresented minority groups and are working in CSD are welcome to join the network and stay informed by visiting the website **here**.

T35 Program

The T35 Program, currently directed by Dr. Kristen Janky, was initiated to address the shortage of audiology doctoral (Au.D.) students seeking training and career paths related to research. As such, the purpose of this training program is to provide Au.D. students with short-term, intensive research experiences related to hearing, vestibular, cognition and/or speech-language sciences. The overarching goal is to provide Au.D. students with the experience and encouragement to consider a Ph.D. or otherwise pursue clinical/translational research careers to address the shortage of clinician-scientists in the field. Regardless of the trainees' eventual career choice, the research experience obtained through this training program will enhance clinical service delivery to the approximately 48 million individuals in the United States with hearing loss.

Boys Town has been awarded three T35 training grants in the past 15 years, enrolling 72 Au.D. students. In the 15-year history of our program:

- 66% of trainees who completed the T35 program published their T35 project in the archival, refereed literature, for a total of 52 publications.
- Seven former trainees have earned a Ph.D. in related fields.
- Seven former trainees are currently enrolled in related Ph.D. programs.
- 15 former T35 trainees who have not entered Ph.D. programs currently work in research-related positions.

Boys Town was recently awarded our fourth T35 training grant, providing an additional five years of funding (2023-2028). We hope to continue the long-standing history of success of the T35 Program and are grateful for the hard work of our mentors and students! If you know an Au.D. student who would be interested in hands-on research training at Boys Town, encourage them to learn more and apply here.

The BTRV is a 31-foot gooseneck trailer that is fully insulated and climate controlled, equipped for testing speech, language, hearing and cognition in children and adults.

BTRV

In July 2022, Boy Town launched its brand-new mobile research lab, aptly named the Boys Town Research Vehicle (BTRV). The BTRV is a 31-foot gooseneck trailer that is fully insulated and climate controlled, equipped with a clinical-grade sound-isolating booth and a full complement of hardware for testing speech, language, hearing and cognition in children and adults.

Dr. Lori Leibold, Director of Hearing Research, is the Principal Investigator (PI) and visionary behind the BTRV. During the ribbon cutting on July 12, 2022, Dr. Leibold discussed her motivation for mobilizing research: "What we wanted to do is reduce some of the barriers that make it difficult for people to participate in research... some of those barriers are travel, time, having opportunities within your own community. So, this was our first step towards actually taking action to try to address some of these issues so our research becomes more relevant to everybody."

This summer, Dr. Leibold and her team hosted free hearing screenings in the BTRV on Boys Town's West Campus, inviting Boys Town employees and their families to be the first to benefit from this new research space. More than 150 people participated in free hearing screenings over 26 days, all of whom received information on how to follow up on their screening results and protect their hearing. Of these, 100 also signed up for Boys Town's research volunteer database. Over the next three years, we expect Boys Town researchers to use the BTRV for data collection locally and nationally, increasing the reach of Boys Town research and providing more people the opportunity to participate in our studies. Boys Town's clinical audiologists are also exploring partnerships with research to provide clinical services in the BTRV, leveraging the high-quality testing space to overcome similar barriers to patient care, like the time and costs associated with travel.

Take a virtual tour of the BTRV and hear from Ryan McCreery, Ph.D., VP of Research, and Dr. Leibold on the importance of research on the road here. More information is available on Boys Town's website, here.

Publications

October 2021 – October 2022

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Influence of audibility and distortion on the recognition of reverberant speech for children and adults with hearing aid amplification. *J Am Acad Audiol.* 2021 Oct 25:10.1055/a-1678-3381. doi: 10.1055/a-1678-3381. Epub ahead of print. PMID: 34695870; PMCID: PMC9112843.

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Using functional outcomes to predict vestibular loss in children. *Otol Neurotol.* 2022 Mar 1; 43(3):352-358. doi: 10.1097/MAO.0000000000003433. PMID: 34802017; PMCID: PMC8837677.

Publications

October 2021 – October 2022

Kamerer, A.M., Harris, S.E., Kopun, J.G., Neely, S.T., & Rasetshwane, D.M.
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