BOYS TOWN National Research Hospital

Center for Perception and Communication in Children

Welcome!

Boys Town National Research Hospital (Boys Town) is pleased to share this year's Center for Perception and Communication in Children (CPCC) Newsletter, filled with news from our COBREfunded projects and broader institutional developments.

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Join Boys Town

Now hiring: <u>Research Scientist -</u> <u>Center for Childhood Deafness,</u> <u>Language, and Learning</u>

New Initiatives



The IMPACT Program

CPCC faculty had the honor of contributing to a new program that supports diversity in fields of Communication Sciences and Disorders (CSD).

Jessica Sullivan, PhD, and Lauren Calandruccio, PhD, of Hampton University (HU) and Case Western Reserve University (CWRU). respectively, launched the Innovative Mentoring and Professional Advancement through Cultural Training (IMPACT) program in the fall of 2020 to support students from underrepresented minority groups interested in CSD. The IMPACT program engages students in activities that connect them to diverse professionals in CSD and resources for professional development with the goal of preparing them for success in graduate school and beyond. Check out the Hearing Journal's recent article on the IMPACT program here, including a Q&A with Drs. Sullivan and Calandruccio.

Boys Town researchers met the IMPACT program's inaugural class over virtual 'Family Dinners' and a virtual tour of laboratories. Through these activities, students connected with researchers with whom they could identify and gained exposure to CSD-related research initiatives. See the article on Boys Town's involvement in the IMPACT program <u>here</u>.



Boys Town Research Vehicle

Boys Town National Research Hospital will soon hit the road in our new, state-of-the-art research suite, aptly named the Boys Town Research Vehicle, or Boys Town RV. This custom, climate-controlled trailer will be equipped with hospital-grade audiological and speech and language testing equipment, including a sound booth and electric wheelchair ramp.

The design and installation of the 31-foot gooseneck trailer is being completed by Advantage Trailers (Chicago, IL), with booth installation by Eclipse Acoustical Systems (Belle Plain, MN). The expected delivery is spring 2022. The Boys Town RV provides a unique opportunity to overcome common barriers to participation in research, including traveling to the hospital for testing. The approach is to move out of the lab and into the community by providing opportunities at community sites. Immediate plans for the Boys Town RV include community hearing screenings for children and adults in the Omaha area, coordinated by the Human Subjects Core. In the meantime, the planning stage is in full swing!

The purchase of the Boys Town RV was partially supported by an administrative supplement from the NIGMS Institutional Development Award (IDeA). Sign up for Boys Town's Research Connection newsletter <u>here</u> to receive the latest news on this and other exciting research initiatives.

Highlights from Boys Town & Beyond

Translational Hearing Center

Featured COBRE: Creighton University

Our colleagues in the Translational Hearing Center at Creighton University were recently awarded a Phase I COBRE grant. Led by Peter Steyger, PhD, professor of biomedical sciences and director of the Translational Hearing Center, and Jian Zuo, PhD, chair of the Department of Biomedical Sciences at Creighton, research efforts will focus on translating hearing loss research into practical therapies such as pharmacotherapeutic strategies. Like the CPCC, this center will support the career development of early career scientists by providing scientific mentoring and access to cutting edge infrastructure and resources. This grant also represents a working partnership between Creighton University, the University of Nebraska Medical Center, and Boys Town National Research Hospital. Click here to learn more.

RAISN

Featured Resource: RAISN Network

Research audiologists are an integral part of the CPCC research labs. Our research audiologists use their skills to recruit a diverse population of participants and collect data that may translate to clinical practice. While research audiology is a growing field, not every research audiologist in the country has the same resources at their disposal as those in the CPCC. The research audiologists at Boys Town established the Research Audiologist Information and Support Network (RAISN) in 2016 in response to the need for resource sharing.

The overall mission of RAISN is to promote research audiology as a career path, provide career development opportunities, and create a resource network. Since 2016, the RAISN network has expanded to include research audiologists, audiology students, post-doctoral students, and hearing scientists from all over the country. RAISN hosts annual webinars for students interested in research audiology and career development seminars for professionals. This year's webinar, titled "Designing and delivery: Effective scientific presentations," took place on October 12, 2021, with featured speakers Drs. Matthew Winn and Kelsey Anbuhl. You can request a recording of this presentation and past presentations on RAISN's website here. Follow RAISN on Facebook here and request a monthly newsletter by contacting raisnmail@gmail.com.

Celebrating our Growth

Boys Town has experienced tremendous growth over the last year. This expansion has encompassed both the research program, led by 41 faculty scientists, as well as the hospital's myriad clinical services and expert providers.

2020		
September	M. Rohan Fernando, PhD, joins as Director of the Molecular Diagnostic Laboratory	Dr. Fernando focuses on the development of novel non-invasive molecular diagnostic and prognostic tests for childhood and adult cancers and other diseases. Learn more <u>here</u> .
2021		
January	Tony Wilson, PhD, establishes the Institute for Human Neuroscience	The Institute for Human Neuroscience (IHN) was launched, with a team of nearly 50 scientists and their staff, led by Dr. Wilson. The IHN studies the impact of traumatic events on brain development, as well as the emergence of psychiatric conditions such as depression, anxiety,
April	Jason Bruce, MD, is appointed Executive Vice President of Healthcare and Director of Boys Town	and schizophrenia. Learn more <u>here</u> . Dr. Bruce joined Boys Town in 2006 as a pediatrician and has held many leadership positions throughout his tenure, including most recently Chief Medical Officer and interim Executive Vice President. Learn more <u>here</u> .
June	Ellen Peng, PhD, joins as Director of the Functional Hearing Laboratory	Dr. Peng's research centers around understanding spatial hearing in children with normal hearing and in children with bilateral cochlear implants. Learn more <u>here</u> .
July	Boys Town announces collaboration with Mayo Clinic	Boys Town announced an innovative new collaboration with Mayo Clinic to provide pediatric cardiology care. Learn more here. Dr. Werfel, director of the Written Language Laboratory, was hired as part of
August	Krystal Werfel, PhD, joins as Director of the Written Language Laboratory	the Center for Childhood Dearness, Language, and Learning. Dr. Werfel's research focuses on language and literacy acquisition in children with hearing loss. Dr. Madhavan was appointed Chief Medical Officer and Vice President of
September	Deepak Madhavan, MD, MBA, is appointed Chief Medical Officer and Vice President of Medical Affairs	Medical Affairs at Boys Town. Dr. Mahavan joined Boys Town in 2019 with a focus to build the most comprehensive pediatric neuroscience program in the region and to increase access to neurological care for children. Learn more <u>here</u> .



Center for Perception and Communication in Children

Research Cores

Human Subjects Core News

Led by Karla McGregor, PhD, the Human Subjects Core (HSC) provides support for Boys Town researchers in the areas of clinical measurement and participant recruitment. Due to challenges created by the COVID-19 pandemic, our usual activities were severely restricted in 2020-21. Here are two ways we adapted in the HSC:

We shifted our focus to internal recruitment efforts by offering enrollment in our research volunteer database to all new patients at our Boys Town clinics. This effort doubled database enrollment in the first two quarters of 2021 compared to 2019.

We also developed procedures that allow for administration of clinical measures via virtual visits. HSC staff trained labs in these procedures, which allowed data collection to continue for multiple projects. Additionally, we shifted from conducting pediatric hearing and language screenings in person to offering them remotely, which allowed families to access a valuable service and allowed us to continue recruiting children, particularly those with language disorders.

We are happy to report that HSC staff have returned to providing in-person research visits and recruitment efforts. As a result, Boys Town Research has been represented in five community events since late July. Close to 50 participants have been seen by HSC staff for study visits involving administration of clinical measures!

Additionally, the HSC, in collaboration with Boys Town Marketing, updated and promoted the 'Participate in Research' webpage in July of this year. Click <u>here</u> to check it out! Compared to the months prior to the update, there has been a 500% increase in the number of visits to the web page and a 1395% increase in the number of unique page views, meaning the webpage was the first Boys Town page an individual clicked on. Additionally, the Principal Investigators of the studies listed on the webpage have reported an increase in study inquiries and enrollment since the page went live.

Spotlight: HSC New Hire



Trinity Williams

One of the HSC's newest team members, Trinity Williams, joined in April 2021 as a Clinical Research Specialist/Participant Coordinator. Trinity's primary role is to facilitate the recruitment of Boys Town patients into research studies

by building and strengthening relationships between clinicians and researchers. She will also support with building more relationships between community members and Boys Town researchers. Trinity has a passion for community outreach, teaching, and training. We are thrilled to have her as part of our team!

Spotlight: Remote Testing

Acoustical Society of America Task Force on Remote Testing

A number of Boys Town researchers, students, and staff were recently involved in a special initiative of the Acoustical Society of America Technical Committee on Psychological and Physiological Acoustics (P&P). Partly motivated by the pandemic-related shift away from in-lab testing, the P&P Task Force on Remote Testing set out to explore and evaluate research approaches involving data collection at remote sites. The task force evaluated online/web-based research platforms such as *Gorilla*[™] and *Prolific*, as well as "take-home" approaches in which lab personnel deliver calibrated (and sanitized) lab equipment to a participant's home and supervise the research remotely. Task-force outcomes were reported online (here), at conferences (here), and in a manuscript now in preparation.



Research Cores Cont.

Technology Core News

This year, Chris Stecker, PhD, took on the role of Director of the Technology Core (TC). Dr. Stecker brings a unique research and technical perspective to the TC. An expert in spatial hearing and psychoacoustics, Dr. Stecker also has extensive experience developing software to support perception experiments in his lab and those of his collaborators at sites including the University of Washington, Oregon Health & Science University, Vanderbilt University, and Arizona State University. He is particularly interested in the development and application of virtual-reality (VR) and augmented-reality (AR) technologies to support research and clinical testing. See his 2019 article in the Hearing Journal <u>here</u> for more on this topic.

The TC develops highly customized software for experimental design and data acquisition; provides acoustic calibration expertise and technical support for studies including EEG, EMG, and fNIRS; and provides administrative support for several software tools and platforms used by Boys Town's research staff. In 2021, TC engineer Denis Fitzpatrick, PhD, worked with CPCC investigator Hope Sparks Lancaster, PhD, to create an online tool for speech-language genetics research, allowing Dr. Lancaster's research to reach large and diverse populations of research participants from around the world. The TC also houses the Auditory-Visual (AV) Core Facility and the Anechoic Chamber Core Facility. These facilities enable Boys Town researchers to conduct cutting-edge research on communication in simulated but realistic environments such as virtual classrooms and cocktail parties.





Boys Town Remote Testing Highlights

As research labs shut their doors to in-person participation, scientists at BTNRH and their lab members rose to the challenge by either transitioning their current studies to a fully remote platform or developing new remote studies to keep research participants safe and healthy during the COVID-19 pandemic. Labs did everything from dropping loudspeakers and computers off at front doors to mass-recruiting and testing on online platforms.

Remote testing has opened up a whole set of possibilities, as labs can now overcome one of the greatest challenges to research, getting participants to the lab. As it turns out, participants liked having the research lab brought to them:

Since March 2021, research labs at Boys Town tested 671 people.

And, even though we are back in person, 8 of the 11 labs that adopted remote protocols continue to test remotely in some capacity.

Photos: Remote testing equipment used for a hearing research study at Boys Town. A - MacBook Pro, plus case and charger

- B Two speakers
- C Two speaker power cables
- D Cable to connect speakers to MacBook
- E Power strip
- F Mat for placing MacBook and speakers
- G Cart for materials



Current Projects



Project Highlights: Kaylah Lalonde, PhD

Dr. Lalonde along with her colleague Lynne Werner, PhD, published an extensive review of research about babies' and children's abilities to use visual cues (e.g., lip reading) to help understand speech in noisy environments, which was featured

in a special issue of the journal Brain Sciences <u>here</u>. The article explains how our brains use visual information to understand speech and the ages at which we begin to use various visual indicators such as temporal and phonetic cues. Their findings indicate that temporal cues are beneficial for infants, but phonetic cues may not become beneficial until around 4 years of age. According to Dr. Lalonde, "The research tells us that even very young kids can understand you better when they can see your face. We should keep that in mind when we're wearing face masks. Minimizing noise and speaking clearly may help."



Project Highlights: Angela AuBuchon, PhD

Dr. AuBuchon, along with Emily Elliott, PhD, of Louisiana State University and Candice Morey, PhD, of Cardiff University, published results (available <u>here</u>) from a multi-site Registered Replication Report of a 1966 study from Flavell, Beach, and Chinksy.

The 1966 study found marked differences in the production of self-talk behaviors when comparing young children (age 5) with older children (age 10). The replication study included 977 children from 17 labs – including the three lead authors along with colleagues representing the United States, the United Kingdom, Turkey, Norway, New Zealand, Germany, Costa Rica, Switzerland, Italy, and Austria. Findings from this new study were largely consistent with the 1966 study; however, many more 5- and 6- year-olds used self-talk during the memory task than would have been predicted by the original 1966 study. With the expanded sample, 75% of 5year-olds were found to verbalize as a memory tool at least part of the time, versus 10% in the 1966 study. The updated research has implications for theories of cognitive development. Especially important was that samples worldwide not only followed a similar developmental trajectory, but also displayed similar levels of individual variability. The team made all their materials available on Open Science Framework (OSF) here.

Update: External Advisory Committee

7th Annual EAC Meeting

The 7th annual meeting of the CPCC's External Advisory Committee (EAC) was held on May 26 and 27, 2021. Due to COVID-19 restrictions, the meeting was held virtually. This committee is composed of five members: Drs. Robert Shannon (Chairperson), Lisa Bedore, Lisa Goffman, Kevin Munhall, and Andrew Oxenham. Committee members met individually and in a group with Project Leads, providing an opportunity to share direct feedback and suggestions for future research. Find out more about the EAC and the projects that were discussed <u>here</u>.



Current Projects Cont.



Project Highlights: Gabrielle Merchant, AuD, PhD

Dr. Merchant published three articles from her COBRE work. The first article (available <u>here</u>) investigated the impact of variations in surgically confirmed middle-ear effusion characteristics (volume, viscosity,

and purulence) in children with otitis media with effusion (OME) on hearing outcomes. Results from this study indicate that effusion volume - categorized as clear, partial, or full has an impact on audiologic measures pre-operatively. Children with full effusions were found to have moderate hearing losses, whereas children with partial effusions or with ears clear of effusion at the time of tube placement had normal to near-normal hearing, though their hearing was significantly poorer than age-matched peers with no recent history of OM. In addition, significant differences in hearing persisted postoperatively between all ears with OME and normal-hearing control ears. The second study (available here) investigated the effects of effusion volume on a non-invasive measurement of middle-ear mechanics, called wideband acoustic immittance (WAI), in the same groups of children. The study found that WAI, and in particular absorbance, was a strong indicator of the volume of the middle-ear effusion, which is a notable finding given the correlation between effusion volume and hearing loss. Finally, the last paper (available here) utilized a computational modeling approach to model the WAI data in order to estimate the middle-ear input impedance to determine if this would improve the clinical utility of these measurements by removing the influence of the ear canal. The results suggest that middle-ear impedance estimation may provide useful information of potential clinical value to improve the diagnostic utility of WAI measurements for OME. Dr. Merchant's internal COBRE mentor, Stephen Neely, DSc, is a collaborator and co-author on the latter two papers.



Project Highlights: Hope Sparks Lancaster, PhD

Dr. Lancaster joined the CPCC as a Project Lead in 2020, starting the Etiologies of Language and Literacy Lab (eL3). She hired Mia Haschenburger, PhD, as Lab Manager and, together with Technology Core engineers Denis Fitzpatrick, PhD, and Seth

Bashford, is ready to begin user experience testing with a new online language tool called Remote Adult Language -Experiment (ReAL – E). Two research articles from Dr. Lancaster's postdoctoral work at Arizona State University were also published this year. In the first article (available here), Dr. Lancaster and her colleagues demonstrated that children with and without reading disabilities do not differ on selective visual attention skills, but they do differ on how these skills relate to reading comprehension, decoding, and listening comprehension. The second article (available here) provides initial evidence that children with nonsyndromic cleft palate, with or without cleft lip, have lower pre-reading skills and may be at risk for problems learning to read. Dr. Lancaster has submitted a third article with co-authors Drs. Valentin Dinu, Jing Li, and Jeff Gruen, available as a pre-print here. This work highlights shared predictive genetic markers for reading ability found in genes that help regulate and guide brain development.



Alumni Notes



Michael Gorga, PhD

Michael Gorga, PhD, directed the Clinical Sensory Physiology Laboratory at BTNRH from 1982 until his retirement in 2016. Dr. Gorga paved the way for clinical-translational research at Boys Town. Highlights include his longstanding program of research focused on understanding auditory function in individuals with normal hearing and with hearing loss, and his work on identification and quantification of hearing loss during infancy and early childhood. Dr. Gorga also founded the Core Center for Communication Disorders in 1998, which was instrumental to the establishment and growth of the current Human Subjects Core in the CPCC. Dr. Gorga has generously hosted the annual CPCC dinner each year at his beautiful house in the Dundee neighborhood of Omaha. He enjoys spending time with his family and friends, cooking, and takes advantage of opportunities to see the Rolling Stones in concert.



Daniel Rasetshwane, PhD

Daniel Rasetshwane, PhD, recently moved to California where he is employed as a Hearing Scientist at Apple, Inc. Dr. Rasetshwane joined Boys Town in 2010 as a Research Computer Engineer, working closely with Drs. Stephen Neely and Michael Gorga. In 2015, Dr. Rasetshwane established and began directing the Auditory Signal Processing Laboratory. He made many contributions to research at Boys Town and within the CPCC. A few highlights include serving as the Core Lead for the Technology Core, collaborating with multiple investigators at Boys Town, and mentoring early career scientists. We wish Dr. Rasetshwane and his family the very best as they embark on their new journey.



Publications

July 2020 - October 2021

The following publications received support from our COBRE grant (Award Number P20GM 109023).

Al-Salim S, Tempero RM, Johnson H, Merchant GR. Audiologic profiles of children with otitis media with effusion. Ear Hear. 2021 Mar 26;42(5):1195-1207. doi: 10.1097/AUD.00000000001038. PMID: 33974785; PMCID: PMC8387329.

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Alcohol use disorder and cannabis use disorder symptomatology in adolescents is associated with dysfunction in neural processing of future events. Addict Biol. 2021 Jan;26(1):e12885. doi: <u>10.1111/adb.12885</u>. Epub 2020 Mar 5. PMID: 32135572; PMCID: PMC7483381.

AuBuchon AM, McGill CI, Elliott EM. Decomposing the role of rehearsal in auditory distraction during serial recall. Audit Percept Cogn. 2020;3(1-2):18-32. doi: <u>10.1080/25742442.2020.1842996</u>. Epub 2020 Nov 10. PMID: 33458602; PMCID: PMC7810201.

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Reduced top-down attentional control in adolescents with generalized anxiety disorder. Brain Behav. 2021
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Flaherty MM, Browning J, Buss E, Leibold LJ. Effects of hearing loss on school-aged children's ability to benefit from F0 differences between target and masker speech. Ear Hear. 2021 Jul-Aug 01;42(4):1084-1096. doi: <u>10.1097/AUD.00000000000979</u>. PMID: 33538428; PMCID: PMC8222052.

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- Jorgensen EJ, McCreery RW, Kirby BJ, Brennan M. Effect of level on spectral-ripple detection threshold for listeners with normal hearing and hearing loss. J Acoust Soc Am. 2020 Aug;148(2):908. doi: <u>10.1121/10.0001706</u>. PMID: 32873021; PMCID: PMC7443170.

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Lalonde K, Werner LA. Development of the mechanisms underlying audiovisual speech perception benefit. Brain Sci. 2021 Jan 5;11(1):49. doi: <u>10.3390/brainsci11010049</u>. PMID: 33466253; PMCID: PMC7824772.

McCreery RW, Miller MK, Buss E, Leibold LJ. Cognitive and linguistic contributions to masked speech recognition in children. J Speech Lang Hear Res. 2020 Oct 16;63(10):3525-3538. doi: <u>10.1044/2020_JSLHR-20-00030</u>. Epub 2020 Sep 3. PMID: 32881629; PMCID: PMC8060059.

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Publications Cont.

July 2020 - October 2021

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- Merchant GR, Neely ST. The influence of otitis media with effusion on middle-ear impedance estimated from wideband acoustic immittance measurements. J Acoust Soc Am. 2021 Aug;150(2):969. doi: <u>10.1121/10.0005822</u>. PMID: 34470321; PMCID: PMC8349246.

Merchant GR, Schulz KM, Patterson JN, Fitzpatrick D, Janky KL. Effect of cochlear implantation on vestibular evoked myogenic potentials and wideband acoustic immittance. Ear Hear. 2020 Sep/Oct;41(5):1111-1124. doi: <u>10.1097/AUD.00000000000831</u>. PMID: 32032225; PMCID: PMC7392788.

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