T35 Grants

Summer Research Traineeships for AuD Students

BY L. MAUREEN VALENTE AND WILLIAM W. CLARK
Summer research traineeships for AuD students represent one possible avenue for integration of optional and additional research into clinically-oriented doctoral programs. T35 grants are an example, generously made available through the National Institute for Deafness and Other Communication Disorders (NIDCD), upon application by the AuD/research program.

The profession of audiology rests upon a firm, scientific foundation. Since its inception following World War II, the profession and accompanying education have evolved from the entry-level bachelor’s and master’s degrees to a clinically-oriented doctoral degree. Doctor of audiology (AuD) programs across the United States vary in many aspects, including with respect to the research requirement.

Upon earning the AuD, graduates become competent clinicians who are skilled in evaluation and treatment of patients across the lifespan and across the scope of practice. Although they may not be performing research, per se, it is important that they develop critical thinking skills for effective clinical decision-making. In addition, it is crucial that they become consumers of the literature, effectively evaluating and incorporating the most current evidence into their daily practices.

Some programs require completion of an actual mentored research project. These may prepare the clinicians with additional skill sets for employment settings that...
combine clinical work with research endeavors. The research project requirement may also ignite interest toward research-oriented degrees and/or careers in students who may not have otherwise considered such a career path. We believe that clinical and research work are closely intertwined and that research-related principles may be integrated into coursework and a strong clinical practicum foundation.

Just as the profession developed from vast scientific underpinnings, it is critical to maintain this robust scientific and research-oriented base. Such maintenance provides for best practice that is outcome- and evidence-based. It allows our profession to continue to further develop with innovation, cutting-edge technology, and entrepreneurship as we follow the spirit of our founders.

Avenues for integrating research principles into clinically-oriented coursework are numerous and beyond the scope of this article. Examples may include assignments whereby students critique peer-reviewed journal articles, develop evidence-based practice skills, research methodology and statistics coursework, and more. Summer research traineeships for AuD students represent one possible avenue for integration of optional and additional research into clinically-oriented doctoral programs. T35 grants are an example, generously made available through the National Institute for Deafness and other Communication Disorders (NIDCD), upon application by the AuD/research program.

Currently, four institutions have been awarded such T35 grants and all accept student applications for such summer traineeships: Vanderbilt University (VU), Boys Town National Research Hospital (BTNRH), the National Center for Rehabilitative Auditory Research (NCRAR), and Washington University School of Medicine in St. Louis (WUSM). VU and WUSM offer AuD programs, accepting applications from their own students and also highly encouraging applications from students enrolled in other programs. The four institutions that offer the T35 have coordinated many processes, such as admission deadlines, but also vary with regard to length of summer program (two to three months) and number of trainee slots offered each year.

Mentorship and research topic choices also vary, although all offer diverse, high-quality experiences. All T35 sites have annually sent materials to all AuD programs, inviting applications from AuD students across the country. All involved have received great benefit from an original grant award’s five-year period, as well as successful grant renewals. Primary objectives of the T35 experience are to attract AuD students to research-oriented doctoral degree programs and eventual careers, sustaining much-needed science and research.

**Insights from the NIH/NIDCD Research Training Officer**

Alberto Rivera-Rentas, PhD, serves as the Institute’s research training officer and Amy Donahue, PhD, also plays an instrumental and supportive role within the Institute’s Division of Scientific Programs. They have shared that, “The goal of our research training programs is to increase the number, quality, and diversity of well-prepared and skilled investigators with knowledge and expertise in all areas supported by the Institute. This includes AuD audiologists interested in pursuing research careers.” A major focus is to provide hands-on experiences in the clinical and translational hearing sciences (http://grants.nih.gov/grants/guide/pa-files/PA-16-151.html).

Drs. Rivera-Rentas and Donahue have further stated that, The T35 is designed as a way to expose AuD students to the conduct of research and to allow them a chance to engage, hopefully fostering excitement and interest in the research enterprise. With this initial exposure, AuD students may decide to pursue the PhD. This traineeship involves conducting small-scale research projects suitable for presentation at a scientific meeting. These T35 programs serve as the first step for AuD students to develop research career trajectories through pursuing sustained programs of research training and career development such as the NIDCD Research Dissertation Fellowship for AuD Audiologists F32 program (http://grants.nih.gov/grants/guide/pa-files/PAR-16-210.html).

This trajectory could also include the NIDCD Mentored Career Development Award for Postdoctorate AuD/PhD Audiologists K01 program (http://grants.nih.gov/grants/guide/pa-files/PAR-16-320.html) that supports comprehensive and rigorous postdoctoral research training experiences for AuD/PhD audiologists who have the potential to become productive, independent investigators in scientific health-related research fields relevant to NIDCD’s mission. Students, mentors, and programs are highly fortunate to have this strong support in place and available.
A Better TV Listening Experience

Does this sound too familiar?

Grandpa Joe is sitting at home watching his favorite TV show with his wife and baby-sitting his grandkids. His wife has started to complain to him that the TV is becoming too loud and that they will not be able to hear their grandkids playing in the other room. When Joe turns the volume down, he realizes that he can no longer understand what is going on during the TV program. Joe realizes that he may have a hearing problem, but does not think it is bad enough to warrant a hearing aid. He agrees to make an appointment with an audiologist to get his hearing tested to prove to his family that he does not need a hearing aid. Joe just wants to find a better way to both be enjoy his favorite TV program without the TV needing to be on so loud.

Enter HyperSound Clear™ 500P.

HyperSound Clear™ 500P is unlike any other traditional speaker. It is something that you need to experience for yourself. and for people like Joe, it will provide them with the TV listening experience they want.

HyperSound Clear™ 500P is specifically designed to give you and those around you a better TV listening experience. It does this by focusing sound on you and giving you an immersive, high-quality audio experience while everyone else in the room enjoys great sound from the television at a normal volume.

HyperSound Clear™ 500P offers:

Innovative Features

HyperSound Clear™ 500P provides an immersive audio experience that's headphone-free. You also have complete control over the volume since you will have your own remote control for the unit. You can make the speakers as loud as you need to without disrupting your family in the room with you. The complaints about the TV being on too loud can now end thanks to HyperSound Clear™ 500P.

Sound Clarity & Speech Intelligibility

HyperSound Clear™ 500P improves sound clarity and speech intelligibility*. You will be able to select between 4 equalizer options to find the right one for you. It is also compatible with your hearing aid if you are currently wearing one. You can get the amplifier customized to your hearing preference from an audiologist, giving you an even more personalized TV listening experience.

New Technology

HyperSound Clear™ 500P speakers are not traditional audio speakers. Ordinary speakers diffuse sound much like how a bare light bulb diffuses light, and as a result, sound can be heard no matter where the listener is positioned. HyperSound Clear™ 500P emits sound in a highly controlled narrow beam and travels directly to the listener by using ultrasound to create sound in the air itself.

HyperSound Clear™ 500P has provided Joe and his family a better TV listening experience. They are able to enjoy watching TV together without any complaints or arguments.


12220 Scripps Summit Dr. Suite 100 San Diego, CA 92131
877.876.8026 info@hypersoundhearing.com
www.hypersoundhearing.com
Meet Our Principal Investigators (PIs) and Programs

Vanderbilt University

Linda Hood, PhD, serves as the PI from Vanderbilt University’s T35 summer research training program. She has indicated that, “five students enrolled in AuD programs across the United States complete two-month research traineeships at Vanderbilt University each year, funded through the NIH NIDCD T35 grant mechanism. Each T35 Trainee is involved in a specific research project, working full-time in active research laboratories conducting research in areas of basic and translational hearing science, vestibular science, and audiology.”

This program offers trainees the opportunity to choose from a pool of experienced investigators in areas such as motion perception, binaural and spatial hearing, cochlear implants, neuroanatomy, auditory physiology, auditory neuropathy/dys-synchrony, speech understanding, amplification, vestibular function, pediatric audiology, multisensory processing, neuronal mechanisms of auditory perception, cognitive processing, and brain activity.

There are additional learning opportunities, such as discussions on responsible conduct in research, campus-wide colloquia, and journal discussion groups. Dr. Hood emphasizes the additional and very valuable experience whereby all trainees and mentors come together to present their work at the annual meeting of the American Auditory Society. Further information about VU’s program may be found at https://medschool.vanderbilt.edu/hood-lab/t-35-traineeship.

Boys Town National Research Hospital (BTNRH)

Michelle Hughes, PhD, serves as the PI for the Boys Town’s T35 summer research training program. The program has provided an extensive array of investigators and labs for trainees. They and VU’s program have shown leadership in coordinating the T35 programs with the American Auditory Society’s annual meeting and in facilitating student presentations there. All PIs have worked to foster collaboration among themselves and with the NIDCD.

Dr. Hughes states that, “research areas include hearing aids, cochlear implants, auditory and audiovisual perception, vestibular disorders, auditory electrophysiology, speech and language development and outcomes in individuals with hearing loss, signal processing, and modeling/mechanics of the middle and inner ear.” BTNRH’s program offers five slots, typically in the summer, with each traineeship being three months in length.

As with other T35 programs, the majority of their trainees have published their projects in top-tier, peer-reviewed journals. Trainees attend a course on responsible conduct in research, attend journal groups and colloquia, and take part in local conferences. One unique feature, as Dr. Hughes indicates, is that this site has inexpensive housing available right across the street—“all five trainees can share a duplex, which leads to great opportunities for friendships and collaboration.” Further information about BTNRH’s program may be found at www.boystownhospital.org/research/training/pages/shorttermresearchaud.aspx.
Gabrielle Saunders, PhD, the PI from NCRAR, has described their T35 program as offering four positions during the summer, with each one lasting three months. Since beginning their T35 traineeships, they have enjoyed mentoring students from AuD programs in 19 different states. Although trainees complete an independent study under the mentorship of one of the NCRAR investigators, students also have opportunities to attend short courses hosted by NCRAR investigators, meet with and learn from all investigators, serve as a participant in a variety of interesting research projects, and immerse themselves in the many ongoing scholarly activities at the center. Dr. Saunders has shared that trainees present findings to the NCRAR staff at the end of the summer and that many students publish the findings of their summer research studies. She has concluded that, “everyone benefits from the T35 experience—students have an opportunity to participate first-hand in research (which for some is their first opportunity), and the NCRAR is energized by having an enthusiastic group of students in the environment.” Further information about NCRAR’s program may be found at www.ncrar.research.va.gov/education/audstudents.asp.

Washington University School of Medicine (WUSM)

William W. Clark, PhD, a research scientist, is the PI from Washington University’s Program. Jill Firszt, PhD, Maureen Valente, PhD, and Dr. Clark serve as the grant’s Executive Committee. WUSM offers five positions each summer, with each one lasting three months. Dr. Clark has described the rich cross-pollination that arises from offering research training to students from our own AuD program, as well as to students from other programs. He is energized by the trainees’ enthusiasm toward research, numerous highly-engaged and extraordinary mentors, and wide diversity of research topics: sensory regeneration and other basic science areas, communication benefit in cochlear implant recipients across the lifespan, speech perception, imaging as related to cognitive function, latest technology in phone application development, vestibular assessment, aural rehabilitation, and beyond.

Trainees meet regularly with members of our faculty for weekly journal club meetings and ethical discussions. They also have access to audiology grand rounds, ENT grand rounds, Department of Otolaryngology brown bag research seminars, interprofessional education, and all else that a vibrant medical school and community have to offer. It is rewarding when students become passionate about the research aspects of our profession and wish to embark upon research-related careers. Further information about WUSM’s program may be found at http://pacs.wustl.edu/programs/doctor-of-audiology/research-training-opportunities.

Trainee Experiences and Testimonials

Trainees engaging in T35 summer research traineeships represent a diverse student body enrolled in AuD programs across the United States. Personal statements submitted with applications speak of varied experiences, from those who have engaged in research and would like to continue this trajectory to those who are interested in a first-time experience. Mentorship and selected projects represent myriad timely topics in audiology and the hearing sciences: basic science, electrophysiology, amplification, cochlear implantation, speech perception, imaging, hearing conservation, and countless others.

Traineeship schedules may be flexible, as some programs choose to navigate schedules and integrate such research experiences with summer courses and clinical practicum requirements. In the authors’ program at WUSM, students may apply after a post-session course
that generally ends in early June. They are eligible after the first or second year of study, in essence substituting a summer of research for a summer of clinical practicum experience. They embark upon the fourth-year externship after the third year. Regardless of home program or selected T35 program, many students continue to work on projects throughout the year that follows the summer experience. Our students’ T35 experiences may serve as a springboard for their Capstone research project, completion of which is required by the end of the third year.

Brittany Wallace, AuD, is a recent graduate from the authors’ program. Her T35 project was a collaborative effort between WUSM and WU’s Department of Biomedical Engineering, under mentorship of Dennis Barbour, MD, PhD. The investigators focused on creating a novel algorithm for obtaining automated audiograms, with very real, future applicability. Dr. Wallace has described benefits of the rich collaboration, innovation, and dedication that she experienced, in addition to experiences that have been highly transferable to her future goals. These goals admirably described, of an ultimate career in research and academia.

Dr. Wallace states that, “The need for ongoing research to perpetuate the existence and significance of the field of audiology is something that should be of utmost priority to current and upcoming professionals as we continue to define and refine our place within the health-care system.”

Further, she speaks for herself and other trainees who have felt that such an experience may provide an added benefit with some sites during the externship and/or employment search, adding that, “This program better equipped me to serve my patients with the highest standard of care by applying clinical knowledge in conjunction with evidence-based practices.”

James Lewis earned both his AuD and his PhD from the University of Iowa. He currently is employed as an assistant professor at the University of Tennessee Health Sciences Center within the Department of Audiology and Speech-Language Pathology. He participated in the T35 program at BTNRRH, stating that this experience was, “one factor that contributed to my decision to pursue a PhD and a career in academia. The T35 program allowed me to be completely invested in research and made me realize how satisfying it can be to solve problems and answer questions that have the potential to improve the clinical care received by individuals with hearing loss.” Dr. Lewis has further expressed appreciation for “the friendships that have resulted, the contributions made to audiology and hearing science, and the opportunity to learn from some of the most well-accomplished, brilliant, and welcoming people in the field.”

Darius Zamani, AuD, was a Salus University student when he completed his basic science project within the authors’ T35 program, under mentorship of Keiko Hirose, MD. Dr. Zamani’s research topic was a study of immune response effects when cochlear hair cells are damaged in isolation without compromise to supporting cells in transgenic mice. He has stated that he feels very grateful to have had the opportunity to present this research at an annual meeting of the American Auditory Society and also to co-author a publication in the *Journal of Neuroscience.* Dr. Zamani has stated that, “The T35 was an experience that was indeed rewarding for me because it involved learning a variety of research techniques in the lab. It additionally triggered creativity, discipline, and a joy for discovery. I was very honored to work with a great team of scientists and inspiring mentors who supported me along the way. As a clinician, the experience helped further explain to patients about the future of hearing loss solutions when they inquired. As a researcher, it opened up venues toward research experiences in the biomedical sciences, where I learned and was able to present about novel imaging techniques.”

Samantha Gustafson earned her AuD from Arizona State University and is currently enrolled in a PhD program at Vanderbilt University. She has indicated that she considered enrolling in a PhD program from the very start of her AuD program. “However, it wasn’t clear to me that the opportunity to be a clinician and a researcher was worth the extra schooling required to complete both AuD and PhD programs. Participating in the T35 program [at BTNRRH] solidified my decision to pursue a PhD following my AuD program.” Benefits of the immersive research experience...
experience during the summer of 2010 provided her with confidence in her ability to contribute to our field. She also greatly benefited from valuable networking opportunities with researchers, both senior and junior in their careers. “These connections enriched my AuD experience and have continued to grow as I advance through my PhD program.” She has shared that the T35 experience can be a valuable tool for those interested in pursuing a PhD. The rich experience can help a student gauge interest in a future of research and begin collaboration with people who will likely become future colleagues.

Common threads related to overall and long-lasting benefits have been shared by trainees experiencing all programs, regardless of research topic.

**Mentor Perspectives**

Kevin Ohlemiller, PhD, and Jonathan Peelle, PhD, research scientists employed by WUSM’s Department of Otolaryngology, provided comments as mentors. They represent two of the numerous mentors who share their expertise and valuable experience with students. Dr. Ohlemiller studies genetic aspects of noise- and age-associated hearing loss using mouse models, finding that students who engage in highly-focused projects are able to complete them within a summer. The primary research area of Dr. Peelle’s lab is the degree to which hearing loss and other acoustic challenges draw on an individual’s cognitive resources. Students collect data on a behavioral task they hope will provide an index of cognitive challenge during speech comprehension, along with standard audimetric and neuropsychological testing.

Both mentors describe the trainee-mentor relationship as a “win-win” and a mutually beneficial situation, whereby students gain valuable research experience, help the mentor plan future research and grant submissions, and apply strong skills learned in audiology education. According to Dr. Ohlemiller, “Research is contagious and the experience gained has been decisive in the career choices of at least four students who decided to pursue research as the major emphasis of their careers. Because the questions addressed in the course of T35 research are real and important to us, I have been proud to include four students as co-authors on related papers.”

Further, Dr. Ohlemiller has stated that this mentored co-authorship greatly amplifies ‘research maturity’ of our students, placing them in a better position to serve as first author on papers related to work performed. He concludes that, “one of my most satisfying experiences as a scientist and mentor is to witness the transformation of a student who may have once had no interest in research, ‘get the bug’ and recognize that research is about discovery. They learn that anyone who is careful and observant can make history.”

Dr. Peelle also stated that he was thrilled to have a T35 student from Washington University last summer. In return for the audiological evaluation techniques that the AuD students are in a position to contribute, he provides training in experimental design and the practical aspects of conducting a research study (such as institutional review board approval, data collection, and analysis). He stated that he values “guiding the trainee toward placing the current study into the larger scientific context. My goal is always to teach skills and ways of thinking about research more than specific details—I want trainees to be able to understand general principles that they can use to interpret and conduct research on any topic.”

As with all research mentors, Dr. Peelle hopes that some trainees go on to be clinician scientists or researchers. He concludes that, “These research-related skills will be valuable in helping them become educated consumers of research and well-versed as they interact...
with researchers in the future. It is difficult to develop this expertise without a significant amount of protected research time.”

Dr. Peelle captures the program’s spirit in stating that the T35 program is an “excellent introduction to research” and that it hopefully sets the stage for Capstone and other research projects later in an educational program and/or career.

**Conclusion**

Students have enjoyed the full-time research requirement of working 40 hours per week in the laboratory of his or her research mentor, with many on a temporary hiatus from the juggling of coursework, research, clinical practicum, and other responsibilities. T35 trainees hold regular meetings with mentors and faculty, for example with weekly journal club meetings that focus on critical review of the literature. Trainees are also required to attend a specific number of discussions related to ethical considerations surrounding research. Trainees are integrated into the home research programs, as well as into the home university/facility, taking part in myriad educational opportunities within those institutions. They receive a monthly stipend and financial allotment for support of their research projects. Trainees also receive funding to attend and present a research-related poster at the American Auditory Society’s (AAS) annual meeting in Scottsdale, Arizona. This generous funding has been accomplished through shepherding by Dan Sklare, PhD, working in conjunction with the AAS to develop a supplement to the NIH conference grant.

The NIDCD-supported student research training grant is one important avenue to help integrate research into a clinically-oriented doctoral program and also to attract students to research-oriented career paths. The PIs, mentors, trainees, and all involved are truly grateful to the NIDCD for this generous funding and support of AuD student research. Mailings to program directors are sent out each fall, describing the programs and application processes. T35 programs cordially invite applications, due in January. In closing, may the scientific foundation and research base of the profession continue to flourish, as an important complement to strong clinical practice, under this excellent program and similar programs.

L. Maureen Valente, PhD, is the director of Audiology Studies and William W. Clark, PhD, is the director of the program in Audiology and Communication Sciences (PACS) at Washington University School of Medicine (WUSM) in St. Louis, Missouri. The authors hold associate professor and professor appointments, respectively, within WUSM’s Department of Otolaryngology.

**References**


