

Wayne State University Healthy Brain Aging Lab

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Description:

The Healthy Brain Aging lab studies changes in brain structure and function across the human lifespan, with particular emphasis on vascular and metabolic health factors and lifestyle behaviors that shape aging trajectories. Studies typically recruit community-dwelling adults of all ages to complete diverse cognitive testing, MRI and bloodwork with the intent for multiple assessments over several years. In this manner, we evaluate and quantify individual differences as a means to study the organization of human cognition, its relation to the brain, and mechanism of their decline over long periods.

By volunteering in the lab, you will gain hands-on experience with the methods and procedures we use to implement these studies, with opportunities for you to lead study design, data collection, analysis and reporting. Throughout training, the motivated student has an opportunity to earn certification and skill badges that represent their time and excellence in the lab. New volunteers will begin in the lab as a Research Technician; students who have volunteered in the lab for at least 1 year and earned 5 badges will be promoted to Senior Research Technician, which provides more opportunities for leadership and independent work in the lab.

Learning objectives:

1. The student will be able to describe the core procedures for research study design and implementation.
2. The student will be able to demonstrate their knowledge of the cognitive neuroscience of aging and vascular/metabolic health function.
3. The student will develop an expertise in specific research methods, based upon their interests and skill.

Reading materials:

Research is dynamic and the content of our conversations as a lab will change in response to current projects and innovations in the field. There is no required text; however, readings will be recommended based upon the current conversations or projects.

Recommended readings are posted to the shared lab server or MS Teams, organized by theme. The publications produced in the lab are stored in a separate folder. As an introduction to the lab and how we approach research questions, you should select a recent paper to read and review with a supervisor in the lab or Dr. Daugherty.

Communication and Project Management:

The lab uses MS Teams for daily communication, announcements and project management. There is a shared OneNote Notebook that includes private sections for all students. The Notebook is used for project notes, documentation, and sharing resources to support mentoring. Undergraduate and graduate students are expected to take notes on research projects, readings, and discussions; the Notebook can be used for this, but it is not required. You can use any note taking strategy you prefer.

Prerequisite:

If you are interested in volunteering in the lab, you should send your CV and letter of interest to the lab email (agingbrain@wayne.edu). Based upon review of your materials by the project manager and Dr. Daugherty, you will be invited for a brief in-person meeting to discuss interest and fit.

There is no pre-requisite for coursework, but experience in statistics, neuroanatomy, cognitive psychology, public health, and biomedical engineering may be useful platforms on which to develop additional skills in the lab.

Many undergraduate students who volunteer in the lab have majors in public health, psychology, and neuroscience; several are pre-med or pre-dentistry.

Graduate students are typically enrolled in doctoral programs in the Department of Psychology, the Translational Neuroscience Program in the Department of Psychiatry, or the joint MD/Ph.D. program in the School of Medicine. Graduate students and post-doctoral fellows are also expected to develop an affiliation with the Institute of Gerontology.

Requirements:

Volunteers in the lab are expected to complete the following:

1. Minimum 10 hours per week (scheduling is flexible, but must be discussed with the project manager)
2. Complete basic training (see below)
3. Interact with participants with respect and professionalism
4. Complete assigned tasks efficiently and accurately
5. Act in accordance with the university policies, academic integrity and ethical research practices, and common social courtesies

Basic Training:

All lab members are expected to complete the following basic training:

1. CITI Training
2. Research Ethics training in Working with Older Adults
3. Cognitive Assessment
4. Blood Pressure Assessment

5. Participant Recruitment/Retention
6. Cognitive Scoring/Data Entry

Encouraged Activities:

Attending Lab Meeting. There are weekly lab meetings throughout the calendar year (except on University holidays). The day and time of the meetings are set at the beginning of each semester based upon the group's availability. Lab meetings are typically 1 hour and held at the IOG or online. In lab meetings we discuss study progress and concerns that may have arisen, identify hurdles to productivity, and provide education or training on topics relevant to the research. Lab members are encouraged to present in lab meetings on relevant topics, their own projects and practicing for presentations. Undergraduate technicians are not required to attend lab meetings, but it is encouraged. Graduate students are expected to attend.

Developing a Skill Expertise. There are many different methods employed in the lab and opportunities for the motivated student to take a leadership role on study design, data analysis and reporting. At the end of the document is a list of skills available for training. You are encouraged to identify an area of the broader research program to develop a content expertise in the material and expertise in relevant methods. The list is not exhaustive; if you have an interest not on the list, Dr. Daugherty is happy to discuss your interests and identify possible opportunities that would fit within the program of research.

Presentations and Publication. Our work together should be completed with the goal to present or publish the data. Undergraduate technicians are encouraged to identify opportunities on campus, local meetings, and relevant national meetings to present a poster. **Abstracts and posters must be approved by Dr. Daugherty prior to submission or presentation—allow at least 1 week for approval.** If you are interested in presenting a poster, you should schedule a meeting with Dr. Daugherty to discuss the opportunity. There may be financial support for travel and meeting costs.

Lab members who make a substantial contribution to a project will be considered for co-authorship of a manuscript based upon Dr. Daugherty's discretion (see following authorship policy). Graduate students and post-doctoral fellows will have the opportunity to lead projects and develop manuscripts as first-author, deliver professional talks, or community education talks. More rarely, advanced undergraduates may be invited by Dr. Daugherty to lead a manuscript.

Letter of Recommendation

If you would like a letter of recommendation to be included in an application for a graduate, medical or professional school application, you should send me an email at least 3 weeks prior to the due date. In the email, include details of the program you are applying to, what you think I can speak to in the letter, the details on date and procedure to submit the letter, and a copy of your CV or resume. I will advise if I can write a strong letter of recommendation for you. The quality of the letter will reflect the time and effort you have spent in the lab—I recommend spending at least a semester in the lab and completing the required skill certifications.

Authorship Policy

The lab follows recommended practices for ethical and fair publication practices reviewed in: <https://hms.harvard.edu/sites/default/files/assets/Sites/Ombuds/files/AUTHORSHIP%20GUIDEL>

[INES.pdf](#).

1. Everyone who is listed as an author should have made a substantial, direct, intellectual contribution to the work. For example (in the case of a research report) they should have contributed to the conception, design, analysis and/or interpretation of data. Honorary or guest authorship is not acceptable. Acquisition of funding and provision of technical services, patients, or materials, while they may be essential to the work, are not in themselves sufficient contributions to justify authorship.
2. Everyone who has made substantial intellectual contributions to the work should be an author. Everyone who has made other substantial contributions should be acknowledged.
3. When research is done by teams whose members are highly specialized, individual's contributions and responsibility may be limited to specific aspects of the work.
4. All authors should participate in writing the manuscript by reviewing drafts and approving the final version.
5. One author should take primary responsibility for the work as a whole even if he or she does not have an in-depth understanding of every part of the work.
6. This primary author should assure that all authors meet basic standards for authorship and should prepare a concise, written description of their contributions to the work, which has been approved by all authors.

Student Disability Services

If you have a documented disability that requires accommodations, you will need to register with Student Disability Services for coordination of your academic accommodations. The Student Disability Services (SDS) office is located at 1600 David Adamany Undergraduate Library in the Student Academic Success Services department. The SDS telephone number is 313-577-1851 or 313-202-4216 for videophone use. Once you have your accommodations in place, I will be glad to meet with you privately to discuss your specific needs. Student Disability Services' mission is to assist the university in creating an accessible community where students with disabilities have an equal opportunity to fully participate in their educational experience at Wayne State University. You can learn more about the disability office at www.studentdisability.wayne.edu

To register with Student Disability Services, complete the online registration form at: https://wayne-accommodate.symplicity.com/public_accommodation/

Badges—Excellence in Research and Development of Skill Expertise

Badge	Requirement
Cognitive Assessment	Complete Core Assessment Methods
Reporting Standards	Complete Core Reporting Methods
Research Ethics	Complete Research Ethics
CMB	Complete Cerebral Microbleed training
ICV	Complete Intracranial Volume Training
MRI Specialist I	Complete 3 MRI methods or structures
MRI Specialist II	Complete 6 MRI methods or structures

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MRI Specialist III	Complete 9+ MRI methods or structures
Stats Analysis I	Complete Multiple Regression
Stats Analysis II	Complete Factor Analysis and Mediation/Moderation
Stats Analysis III	Complete an Advanced Method
1st Poster	Present a poster
1st Paper	Co-author a paper
First-Author Paper	Lead a manuscript
Comm. Education	Give a community education talk
Pro. Talk	Give a professional talk
Reporting Leadership	Complete 5 of the reporting activities
Trainer	Become a certified trainer

Note: The list of badges may be expanded or revised. Any changes will be made available on the lab server and discussed in lab meeting.

Available Skill Training

Note: This is not an exhaustive list of skills or methods in the lab, and this list may be expanded or revised. Any changes will be made available on the lab server and discussed in lab meeting. Skills that are underlined are required of all volunteers in the lab; * indicates skills that are only available for training to graduate students, post-doctoral fellows or advanced undergraduate technicians at Dr. Daugherty's discretion.

Category	Technical Skill	Prerequisite	Training	Requirement to Demonstrate Expertise	Estimated Time to Complete
Research Ethics	<u>CITI Training</u>	None	Complete online CITI training for all modules	Email certificates to lab manager and Dr. Daugherty	1 week
	<u>Working with Older Adults</u>	None	Review training materials	Sign-off by lab manager or Dr. Daugherty	1 day
	Topics in Research Ethics	CITI Training	Identify a supplemental reading, online seminar or workshop to be approved by Dr. Daugherty or lab manager	Provide a 2-page written report to Dr. Daugherty on the special topic OR give a lab meeting presentation	variable
	Research Ethics Campus Seminar	CITI Training	Attend at least 1 on campus seminar on a topic related to ethics in research methods or reporting	Provide a 2-page written report to Dr. Daugherty on the special topic OR give a lab meeting presentation	variable
Core Assessment Methods	<u>Cognitive Assessment</u>	Introduction to assessment	Complete a sample session as mock participant, review methods with certified tech, detailed practice with training materials	Pass a mock session with the lab manager or Dr. Daugherty	1 month
	<u>Blood Pressure Assessment</u>	None	Review methods with a certified tech, detailed practice	Pass an assessment with the lab manager or Dr. Daugherty	1 week

Core Reporting Methods	<u>Participant Recruitment/Retention</u>	Cognitive Assessment	Review recruitment materials, train in protocol with certified tech	1 week supervised phone calls, participant scheduling and interaction, with lab manager or Dr. Daugherty's approval	1 week
	<u>Cognitive Scoring/Data Entry</u>	Cognitive Assessment; Participant Recruitment	Review data dictionary, train in protocol with certified tech	1 month supervised scoring/entry, with lab manager or Dr. Daugherty's approval	1 month
	Actigraphy	Cognitive Assessment	Review methods with a certified tech, review manual and recommended readings, review example report scoring and interpretation	Provide a 3-page written summary of the measures collected and their interpretation; give an informal presentation of a report interpretation to the lab manager or Dr. Daugherty	1 month
	Blood Biomarkers	Cognitive Assessment	Review methods with a certified tech, review manual and recommended readings, review example report scoring and interpretation	Provide a 3-page written summary of the measures collected and their interpretation; give an informal presentation of a report interpretation to the lab manager or Dr. Daugherty	1 month
MRI, Manual Segmentation	Cerebral Microbleed Measurement	Introduction to MRI	Review methods with trainer; complete practice with review and feedback	Pass reliability assessment	3 weeks
	SWI, Iron measurement	Cerebral Microbleed, Intro to MRI, Intro to neuroanatomy	Review methods with trainer; complete practice with review and feedback	Pass reliability assessment	1 month

	White Matter Hyperintensity	Intro to MRI, Intro to neuroanatomy, ICV or SWI	Review methods with trainer; complete practice with review and feedback	Pass reliability assessment	3 months
	Intracranial Volume (ICV)	Intro to MRI	Review methods with trainer; review training materials; complete practice with review and feedback	Pass reliability assessment	2 weeks
	Cerebellum Volume	ICV	Review methods with trainer; review training materials; complete practice with review and feedback	Pass reliability assessment	1-2 months
	Hippocampal Volume	ICV	Review methods with trainer; review training materials; complete practice with review and feedback	Pass reliability assessment	2-3 months
	* Hippocampal Subfield Volume	Hippocampus	Review methods with trainer; review training materials; complete practice with review and feedback	Pass reliability assessment	3-6 months
	* Prefrontal Cortex Volume	Cerebellum or Hippocampus, Basal Ganglia	Review methods with trainer; review training materials; complete practice with review and feedback	Pass reliability assessment	3-6 months
	Corpus Callosum Volume	Cerebellum or Hippocampus	Review methods with trainer; review training materials; complete practice with review and feedback	Pass reliability assessment	1-2 months

	Basal Ganglia Volume	Cerebellum or Hippocampus	Review methods with trainer; review training materials; complete practice with review and feedback	Pass reliability assessment	3-6 months
	* Insula Cortex	Prefrontal Cortex	Review methods with trainer; review training materials; complete practice with review and feedback	Pass reliability assessment	3-6 months
	* Parahippocampal Gyrus	Prefrontal Cortex	Review methods with trainer; review training materials; complete practice with review and feedback	Pass reliability assessment	3-6 months
MRI, Automated Methods	Freesurfer	Intro to MRI, Intro Anatomy, ICV	Review methods with trainer; complete practice with review and feedback	Pass reliability assessment	2 weeks
	* ASHS Subfield Atlas	Hippocampal Subfields	Review methods with trainer; complete practice with review and feedback	Pass reliability assessment	1 month
Statistical Analysis	Descriptive Statistics	Intro to Stats; How to work with MRI data	Review methods with trainer; review training materials; complete practice set with feedback	Complete an analysis with short written or verbal report (determined by trainer)	1 month
	Core univariate methods	Descriptive Statistics	Review methods with trainer; review training materials; complete practice set with feedback	Complete an analysis with short written or verbal report (determined by trainer)	2-3 months

	Multiple Regression	Core univariate methods	Review methods with trainer; review training materials; complete practice set with feedback	Complete an analysis with short written or verbal report (determined by trainer)	1 month
	* Mediation and Moderation	Multiple Regression	Review methods with trainer; review training materials; complete practice set with feedback	Complete an analysis with short written or verbal report (determined by trainer), potentially towards developing a manuscript	1 month
	* Factor/Component Analysis	Multiple Regression	Review methods with trainer; review training materials; complete practice set with feedback	Complete an analysis with short written or verbal report (determined by trainer), potentially towards developing a manuscript	1 month
	* Advanced Methods (e.g., SEM, HLM, Profile Analysis)	Factor Analysis and Formal Coursework pending Dr. Daugherty's approval	Review methods with trainer; review training materials; complete practice set with feedback	Complete an analysis with short written or verbal report (determined by trainer) with the aim to develop a manuscript	variable based on project and current skill level
Reporting / Presentation	Lab Meeting Presentation	None	Review documents on expected format and content of a presentation; sign up for a topic	Give a lab meeting presentation	variable
	Poster Presentation	Project Lead, Lab Meeting Presentation	Develop an abstract with Dr. Daugherty or direct supervisor; present the	Dr. Daugherty must approve the abstract and poster before	variable

			content or practice poster in lab meeting	submission/presentation; Deliver a professional presentation	
	* Professional Talk	Lab Meeting Presentation	Abstract submissions must be pre-approved by Dr. Daugherty; Daugherty or director supervisor will provide feedback on format and content	Deliver a professional presentation	variable
	* Community Education Talk	Lab Meeting Presentation	Opportunities for talks should be discussed with Dr. Daugherty; Daugherty or director supervisor will provide feedback on format and content	Deliver a professional presentation	variable
	Co-authored Manuscript	Substantial contribution to project	Discuss opportunities with Dr. Daugherty		variable
	* First-author Manuscript	Independent Project	Discuss opportunities with Dr. Daugherty		variable
	* Website contributions	1 year in the lab	Discuss opportunities with Dr. Daugherty		variable
Management / Mentoring	* Direct supervision of a research technician	1 year in the lab, relevant certifications	Discuss opportunities with Dr. Daugherty		variable
	* Trainer	Complete relevant certifications; 6	Discuss opportunities with Dr. Daugherty		variable

		months independent experience			
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