The Human Factors and Aging Laboratory at the Georgia Institute of Technology focuses on understanding the fundamentals of psychology as they relate to human behavior in the context of technology interactions. Our research areas include healthcare technologies; design for aging; technology acceptance; human-automation interaction; aging-in-place; human-robot interaction; cognitive aging; aging with disabilities; and skill acquisition and training.

The laboratory is funded by: the National Institutes of Health as part of the Center for Research and Education on Aging and Technology Enhancement (www.create-center.org); and the Department of Education Rehabilitation Engineering Research Center on Technologies to Support Successful Aging with Disability (www.techsage.gatech.edu). We are also an active member of the Aware Home Research Initiative (http://awarehome.imtc.gatech.edu).

In This Issue

From the Directors ..................... 2
Awards and Achievements ........... 3
New Faces ................................ 5
Recent Publications ................. 6
Research Spotlights ................... 7
Undergraduate Corner .............. 8
Collaborators ......................... 10
Research in Brief ..................... 14

www.hfaging.org
From the Directors...

Improving Human-Technology Interactions for Adults of all Ages and Abilities

Technology represents advances in knowledge that change the way humans perform tasks. Ideally, technology will make the task easier, more efficient, safer, or perhaps more pleasurable. Unfortunately, new technologies can sometimes make a task more difficult, slower, dangerous, or perhaps more frustrating. Most adults interact with a variety of technologies in the course of their daily activities and thus products should be designed to be used by people of varying ages and abilities. In our laboratory we focus on understanding the relevant constructs in psychology for the design and deployment of technology – from understanding what people need, to identifying their preferences for design characteristics and defining their capabilities and limitations that will influence technology interactions.

One particular area of focus is healthcare technologies. In industrialized societies a shift is occurring in the medical model toward self-management of health. People are living longer, but many are also living longer with chronic conditions. Younger age groups are becoming more aware of the importance of remaining healthy and thus a focus on wellness activities is evident in all age groups. Managing wellness and illness imposes many demands on people including goal selection; information collection and interpretation; decision-making; and actions such as exercise or use of medical devices. These processes can impose substantial cognitive demands on people, who may also struggle with a lack of understanding about disease characteristics and necessary self-management behaviors. Moreover, effective self-management often requires coordination between multiple components of the care network (e.g., physicians, specialists, patients, family members). Our research efforts in the next few years will reflect these different components, ultimately leading to better design and integration of healthcare technologies.

The success of our laboratory is due in large part to the high quality of our students. We recruit top-notch graduate students and they excel in the demanding environment that is Georgia Tech. Our graduate students win awards, present at the major conferences in our field, and have been highly successful in publishing their research in leading journals. We also have many undergraduates participating in research projects every semester. These students are actively involved in all aspects of research, some as paid research assistants, for course credit, or as part of their senior thesis projects. Several in the past few years have been awarded the Georgia Tech President’s Undergraduate Research Award, which is very competitive and provides them with a small stipend to support their research activities. We are fortunate to have these graduate and undergraduate students as a part of our team.

Wendy A. Rogers, Ph.D. & Tracy L. Mitzner, Ph.D.
Director & Associate Director of the Human Factors and Aging Laboratory
Awards and Achievements

Laura Barg-Walkow:

**George Health Systems Fellowship**
Laura has been selected to receive this award from the GT/Emory Health Systems Institute. This award is for students with a Health Systems focus and demonstration of leadership.

**Foley Scholar Finalist (2014)**
Laura was 1 of 8 finalists for Foley Scholar Award. Recognizes innovative research in shaping technology for a broad range of challenges in modern society on the basis of personal vision, brilliance, and potential impact.

**Georgia Institute of Technology President’s Fellowship**
Awarded to doctoral students with exemplary levels of scholarship and innovation.

**Google User Experience Research Intern (May-August, 2014)**
Laura worked on all aspects of user experience research for the DoubleClick Search and DoubleClick Bid Manager projects.

Christina Harrington:

**Gerontological Society of America Accelerating Translation of Knowledge to Community Practices for Older Adults**
Christina received a travel award and the opportunity to present her research at the workshop.

Sean McGlynn:

**Human Factors and Ergonomics Society Student Chapter**
Sean was elected as the Treasurer of the Georgia Tech HFES Student Chapter.

**Residential Care Facilities for the Elderly Authority of Fulton County Scholar Award**
This award is to support students whose research is focused on improving the quality of life for older adults through their program in the College of Sciences.
Akanksha Prakash:
Human Factors & Ergonomics Society Student Member with Honors
Akanksha Prakash was awarded Student Member with Honors at this year’s Annual Meeting in Chicago. This designation honors students who have made an outstanding contribution to the discipline of human factors during their tenure as a student.

Georgia Institute of Technology GVU Travel Award
Akanksha was awarded $500 for international travel to attend Human-Robot Interaction conference in Bielefeld, Germany.

Passed Preliminary Exam
Akanksha passed her preliminary examination. The goal of her exam paper was to understand changes in social connectedness as effected by aging and technology use.

Wendy Rogers:
Human Factors and Ergonomics Society Oliver Keith Hansen Outreach Award
Wendy received this award for significant activities that broaden the awareness of the existence of the human factors and ergonomics profession and the benefits it brings to humankind.

Congratulations to our newest graduates!

Dr. Sara McBride defended her dissertation “Understanding the cognitive processes of problem detection and decision making among assisted living caregivers.”

Dr. Cory-Ann Smarr defended her dissertation “Applying a qualitative framework of acceptance of personal robots.”
New Faces in the Lab

Denise Geiskkovitch
Denise is a 1st year graduate student in Engineering Psychology with a background in psychology from the University of Manitoba in Canada. She is interested in a variety of topics including human-robot interaction, companion robots, and technology for older adults with impairments. Currently, she is investigating how certain types of technological devices can enhance emotional well-being (e.g., through stress reduction) in older adults.

Christina Harrington
Christina is in her second year as a doctoral student in Industrial Design studying accessible design for older adults and persons with disabilities. Her goal is to understand how people with varying abilities can best interact with the everyday products and environments around us and how design can facilitate positive experiences during these interactions. In the HFA lab she is involved in studies of telewellness technologies, exergames, and social networking. Christina has worked for various engineering and design research firms prior to starting her PhD at Georgia Tech, and upon completing her degree is hoping to continue in the area of research and development of products that can help a wide range of users.

Melanee Nugent
Melanee is a 1st year doctoral student in engineering psychology. Melanee is currently involved in the Telepresence Interview Study where older adult participants will be interviewed about their perceptions of telepresence technologies, and how these technologies affect physical, social, and health behaviors. She is also assisting with the activity self-efficacy w/ kinect study, which examines the relationship between older adults’ experience using Xbox Kinect and self-efficacy among older adults. Melanee’s general interest relates to improving health and quality of life for older adults.

Max Silverman
Max is a 1st year graduate student in Engineering Psychology. For his first-year project, he is interested in the physical activity of older adults and the factors that influence or prevent older adults’ exercise behaviors. He is additionally interested in how older adults incorporate activity-monitoring technologies to assist them with exercise plans. Furthermore, he is assisting on a project analyzing older adults’ perceptions of social networking websites (e.g., Facebook, Twitter, LinkedIn) to better understand why older adults do or do not use such social media.
Selected Recent Publications


Participation Opportunities

If you are over the age of 60, would like more information about participating in one of our research studies, or you would like to be removed from our participant list, please contact Melanee Nugent at (404) 385-0798 or hfaging@psych.gatech.edu. Please feel free to share our contact information with others who may be interested. Thank you!
Imagine you have just received a new device to aid you with driving directions. When the device alerts you to turn left, do you follow its instructions? How reliable do you think the device is? Do your thoughts about and use of the system change over time? These are some of the important components to consider when introducing a technology.

Technology is a ubiquitous component of many domains, ranging from the life-critical medical and military fields to use in homes. One important component of technology is automation, which is when a machine performs a task that used to be performed by a human (e.g., device to aid you with driving directions). Automation can lead to safer, more efficient everyday tasks. However, automation is often not 100% reliable; therefore, it is important that we understand how people think about and use automated systems. One factor that is known to affect how people use imperfect automation is the person’s initial expectations of the system. Therefore, it is important that we understand how introductions influence the way people think about and use automated systems.

One method of introducing automated systems to users is to explicitly tell people what to expect through statements, such as “the system is 75% reliable”. Another common method is to give people an initial exposure to the system, such as using a 75% reliable system. However, there are gaps in our scientific understanding of the impact of these different introduction types on human responses to automation—both initially and over time.

In my Master’s Thesis and follow-up study, participants either received an explicit statement about the reliability of the automated system or initially experienced altered system reliability. For each introduction format, there were three levels of reliability: higher-than (90%), lower-than (60%), or the same-as (75%) the actual system reliability (75%) for the rest of the experiment. Following the manipulation, all participants used the exact same system with a constant reliability (75%) to isolate the effects of the introduction.

For my Master’s Thesis, the experiment lasted two days to track human responses to automation, both initially and over time. We used identical manipulations of expected reliability, actual system reliability, dependent measures, number of trials, length of study, and error types, frequencies, and timing. Holding these measures constant allowed for direct comparisons of the different introductions.
Participants were 60 undergraduate students between the ages of 18 and 23, 37 males and 23 females.

In my Master’s Thesis, the explicit statement introductions had a greater effect on perceived system reliability than did initial exposure introductions, particularly initially. There were few initial differences between introduction formats on system usage. In general, system use stayed the same or increased as time using the system increased for all groups. Some of the effects of the explicit statement introductions on perceptions persisted throughout the experiment, leaving the open question of the effect duration.

To understand how long-lasting the effects of introductions were, we conducted a follow-up study. In this study, we focused on the explicit statement introduction with higher-than (90%) and lower-than (60%) levels of reliability across four days to better understand how long the effects of introductions persist. Participants were 20 students between the ages of 18 and 23, 12 males and 8 females. Results from the follow-up study were similar to results from my Master’s Thesis for both perceptions and use of the system. Interestingly, we found that one simple statement (“The system is 60% reliable”) continued to influence perceptions of the system (e.g., “The system is less than 75% reliable”) even after four days of using a 75% reliable system. If the initial explicit statement was lower than the actual system reliability, participants continued to believe the system was less reliable than its actual performance.

Conceptually, the results from this research provide a deeper understanding of the relationship between introduction formats, perceptions, and system use. These results can inform how automated systems should be introduced to users, through design, instructions, and training programs. Future studies will need to include a wider range of participants as well as variations in introduction types to further assess how introductions influence perceptions and use of systems.

**Undergraduate Corner**

We would like to recognize the hard work of all of our undergraduate research assistants for the year 2014-2015: Hunter Bobbey, Hiyong Byun, Evelyn Chang, Victoria Contreras, Jackie Gilberto, Jordan Hartley, Nathan Katica, Shawn Kemple, Shelby Long, Cambre Mabry, Laura Matalenas, Ayah Mostafa, Brandon Newberry, Mimi Phan, Patrick Pietrzak, Danielle Redmond, Alex Remillard, Banafsheh Bonnie Shoai, Mallory Skelton, Catherine Stephens, and Angela Tran.

**Evelyn Chang** received a Georgia Tech President’s Undergraduate Research Award in Spring 2014. Evelyn assisted Laura with research about how introductions affected perceptions of system reliability. This project was presented at the Undergraduate Research Symposium in Spring 2014.
As the population of adults over the age of 65 continues to grow and average life expectancy increases, there is a rapidly expanding need for support for older adults. Many older adults prefer to age in the comfort of their own homes, and evidence suggests that those who are able to do this experience health benefits. However, age-related declines can make maintaining independence in the home difficult. Even for those who are able to live alone and support themselves, there are additional risks such as becoming lonely or socially isolated, which can also lead to negative health-related outcomes. Because a majority of older adults live independently in their own homes, there is a need to provide them with social and emotional support.

One way to provide support is with the use of technology. In general, there has been a focus by developers of technology to aid in supporting the physical needs of older adults, but less attention has been given to using technological devices to provide social and emotional support.

This type of socio-emotional support has been shown to be beneficial to adults with health issues such as depression and dementia, yet it remains unclear if healthy older adults could experience similar benefits from technology that aims to improve emotions. An open question is whether healthy older adults would be open to the possibility of having such devices in their homes. Thus, this study aimed to understand if generally healthy and independent older adults would be accepting of an emotionally-oriented technological device, and if so, how might they use it.

To assess this, older adults participated in one-on-one interactions with an emotionally-oriented technology. Participants filled out questionnaires regarding their current emotions and their perceptions of how useful and easy to use they thought the device would be. We also videotaped the interactions to determine the amount and types of engagement behaviors participants exhibited during their time with the device. Furthermore, we asked the participants questions about how they themselves would use the device, if they would want to own it, and if they thought it would be useful to other people.

Our results suggested that in general, the older adults in the study were open to using this type of technology. In fact, more than half of the participants said they would prefer using this device to using similar, existing forms of emotional support. They perceived uses not only for themselves, but for other people as well such as their
friends or grandchildren, or especially for those who were lonely, socially isolated, or needed a mood boost. The participants were never told what the purpose of the device was, so the fact that they mentioned these emotionally-compromised individuals as a potential user group was a particularly interesting finding. The videotape of the interaction period revealed that most participants engaged with the device, and did so in a variety of ways.

With these encouraging results, and the knowledge that we have about the potential benefits of emotionally-oriented technology, we are now interested in exploring whether these devices can aid individuals who are at risk for social isolation. Social isolation is known to have negative effects on physical, mental, and psychological health. Furthermore, studies show that older adults living in private communities experience social isolation often, with rates as high as 43%, demonstrating the importance of finding a solution. Therefore, we are excited about investigating potential benefits that emotionally-oriented technology can provide in supporting the well-being of older adults at risk of social isolation.

Research Support and Collaborators

[Images of various organizations and logos]
Understanding Older Adults’ Memory Issues in the Home

By Akanksha Prakash and Ayah Mostafa

People rely on their memories to perform a number of tasks in their everyday lives. To function independently, they must remember to do many things such as pay the electric bill, adhere to a medication regimen, purchase appropriate items at the store, go to scheduled physicians appointments, eat nutritious meals, exercise regularly, and so on. This process of remembering to do something in the future is referred to as prospective memory. Frequent forgetting of these prospective memory tasks may result in poor nutrition, health, and safety of the individuals.

Failure of prospective memory is a common occurrence in everyday life for people of all ages. In general terms, older adults tend to perform more poorly than younger adults on prospective memory tasks. However, some studies have shown that if older adults are able to rely on mnemonic aids such as notes or diaries, they may even outperform younger adults. Moreover, although remembering to do things in future is an important memory task, it is not the only type of memory that matters. Retrospective memory that involves remembering names, faces, conversations, locations, and so on, is also essential for independent functioning. There is less clear understanding of how demanding these tasks are for older adults living independently in their homes. And when memory problems arise with these tasks, how do they deal with them?

With these ideas in mind, we conducted a study to assess the range of memory problems older adults experience at home, particularly the source and nature of problems; contexts in which they occur; and strategies and aids used to counteract them. We focused particularly on memory issues that could obstruct health management and social/interpersonal activities in the home. We conducted one-on-one interviews with 26 independently living older adults (65-80 years in age). Participants also filled out a memory questionnaire wherein they provided information about how frequently they forgot various tasks, activities, and things in the home.

Overall, participants reported more issues with remembering names and conversations as compared to other social/interpersonal activities and health-management tasks. Many participants reported use of effective strategies and memory aids for managing medication and health-care provider appointments (e.g., following a routine or a well-planned system, using calendars). Within the social domain, calendar use was reported to help remember significant social events, although participants seemed selective in their efforts to remember certain birthdays and anniversaries based on the extent to which the person mattered to them. Remembering to return calls and messages appeared the least problematic of all social tasks in terms of memory issues. Responding immediately, writing a note, and relying on voicemail were strategies that helped to significantly reduce memory problems for returning calls and messages.
Participants seemed to struggle the most with remembering names and conversations. Recalling “who” seemed more problematic than “what” from past conversations. Moreover, some participants reported having trouble remembering what they were about to say in ongoing conversations. Some participants tried forming associations to remember names and conversations although this strategy was not always effective. Asking to be reminded of the name, or not calling the person by name were some other ways participants dealt with the issue of name-forgetting.

The external memory aids and support systems currently available and used in the home (e.g., calendars, notes, post-its, voicemail, and more advanced reminder systems) primarily support prospective memory tasks. However, some memory issues in the social domain, such as forgetting names and conversations, are still not sufficiently supported by use of memory aids. Thus, the traditional memory support devices appear to be non-ideal as they do not support a range of memory activities, and focus mainly on prospective memory challenges.

Technology initiatives can move beyond the relatively simple and narrow-focused solutions. One avenue of exploration is to develop a collaborative assistant which is always there when needed; is proactive rather than just reactive; and can be tailored to the task at hand depending on task difficulty and individual preferences. Interactive wearable devices such as Google glass are steps in this direction that can create detailed audio-visual logs of people’s lives and can help remember retrospective details (e.g., names, faces, conversations) as well as prospective tasks (e.g., future appointments). However, there are various questions related to privacy and autonomy that also need to be addressed if such technologies are going to be successful in supporting memory needs. Nonetheless, there is tremendous potential for technology to holistically support memory functioning in the home.
As a part of a research exchange program, research assistant Christina Harrington had the opportunity to travel to Winterswijk, Netherlands to conduct an observational study of older adults in residential eldercare facilities. As a part of this research exchange, Christina along with another student researcher from Emory University visited several facilities in the Eastern Netherlands region and worked closely with nursing personnel and healthcare providers to study cultural differences and similarities between these facilities and those in the U.S.

The focus of Christina’s research study was to perform a cross-national assessment of challenges in task performance, including environmental barriers and potential facilitators for older adults with disabilities in residential living facilities. This study aimed to identify which aspects of bathing, toileting, and grooming proved difficult, and what technologies and systems might be appropriate in aiding older adults. Residents of four different residential facilities between Winterswijk and Groenlo were interviewed and observed performing various tasks in the bathrooms. Observational data collected included: 1) challenges faced by older adults in performing normal activities in the bathroom environment; 2) environmental barriers or modifications found within the bathroom; and 3) current devices being used as facilitators in bathrooms within eldercare communities across various cultural regions. The goal is to identify which of these tasks will lend themselves to remote monitoring and smart technology devices to address difficulties experienced by older adults in task performance. Results will inform the design of smart technologies to help in the monitoring, communication, and assistance of bathroom tasks for older adults.

In addition to her research efforts, Christina had the opportunity to visit the Kroeller Muller Museum in Arnhem, ride bikes along the canals of Amsterdam, and learn some introductory Dutch.
Research in Brief

Acceptance of Wellness Management Technologies Among Older Adults
In collaboration with GTRI’s HomeLab, Kimberly Preusse is exploring the attitudes of older adults toward using technologies designed to help self-manage health and wellness. We are exploring both what about the technology makes it more likely to be accepted and what about the individual makes him or her more likely to accept the technology. Understanding the opinions older adults have towards these technologies, such as their perceptions of usefulness and ease of use, may help explain what promotes and what hinders acceptance.

Aging, Health, and Emotion Variability
Sean McGlynn is investigating the extent to which older adults’ emotions fluctuate throughout the course of the day. He is interested in what causes certain people to fluctuate more than others, and if these short-term mood shifts lead to changes in how people perceive their own physical health status.

Participation in the Atlanta Science Festival

By Laura Barg-Walkow

The goal of the Atlanta Science Festival, which occurred in March 2014, was to showcase scientific research and build a stronger culture of science in Atlanta. Members of our lab participated in the Exploration Expo, where hundreds of people of all ages interacted with hands-on activities to celebrate and learn about science. The goal for our demonstration was to spread awareness of the importance of designing technologies to be accessible for people of all ages and how usability testing can improve the design of technology.

Specifically, we presented information about our longitudinal field trial of the Personalized Reminder Information and Social Management (PRISM) system that was a project of the Center for Research and Education on Aging and Technology Enhancement (CREATE). Our presentation consisted of a poster displaying research findings about older adults’ use of computers, two computers with the PRISM system installed for demonstration, brochures on PRISM and aging, and an interactive aging simulation. The aging simulation enabled attendees to try to interact with computers with first-hand experience of some of the barriers older adults face with standard interfaces due to perceptual and motor difficulties.

Plans for the 2015 Atlanta Science Festival are underway and you can learn about it here: http://atlantasciencefestival.org/expo.
Barriers and Facilitators of Older Adults’ Physical Activity
Max Silverman is investigating the barriers and facilitators that older adults face in executing exercise behaviors. The overarching goal of this study is to develop a comprehensive framework of how older adults view exercise with a plan to develop an intervention to increase their exercise and physical activity behaviors.

Errors of Execution
Have you ever written your own name incorrectly? Or have you walked into a room only to forget why you entered? These are two examples of errors of execution, where an individual has a correct understanding for how to perform a task, but completes the task incorrectly. We are currently investigating patterns for errors of execution.

Exergames Usability Study
This study looks to assess the usability of kinect-based exergames for older adults. We are looking to discern the common errors made during the use of this game and the associated design guidelines that should be proposed for development of future exergames systems.

Exploring Perceptions of Automation Errors
Kimberly Preusse is investigating how humans interpret errors made by automation. The overarching goal of this project is to understand how errors are attributed to inform design and training.

Older Adults’ Value Perceptions of Social Networking Websites
Akanksha Prakash, Christina Harrington, and Max Silverman are conducting research to understand older adults’ perceptions of social media such as Facebook, Twitter, and LinkedIn. The study will also gauge how and why older adults use these websites.

Social Connectedness of Older Adults Living Alone
Akanksha Prakash is analyzing data gathered from a large-scale field study to understand the social connectedness of older adults who live alone and have minimal exposure to communication technologies such as the Internet.

Technology to Support Emotional Well-Being
Denise Geiskkovitch is exploring how certain types of technological devices can enhance emotional well-being, for example through stress reduction. The goal of this project is to improve the well-being and quality of life of individuals who are at risk for social isolation.

Technology Use by People with Hearing Impairment
Older adults with hearing impairment may have more difficulty using certain types of technology. We developed a survey that investigates which types of technology prove to be more troublesome, and why that may be. We are in the process of analyzing these data which will provide insights for design improvements to accommodate the needs of these individuals.
Wendy Rogers received the Human Factors and Ergonomics Society Oliver Keith Hansen Outreach Award from Dr. Richard Hornick this fall.

Akanksha Prakash received the Human Factors and Ergonomics Society Student Member with Honors Award.