In today’s hustle and bustle, many consider their smartphones essential for their daily lives. A phone can serve as a guided map, instant news source, entertainment device, deal-finder, and a communication tool. There is almost no limit as to what you can do with a smartphone these days.

Dr. Shirley Rietdyk, Professor of Health & Kinesiology and CALC Faculty Associate, collaborated with Dr. Babak Ziaie, Professor of Electrical and Computer Engineering, to take advantage of smartphone technology to assess balance and mobility, in order to predict how likely a person is to fall. The device is called SmartGait™, where gait refers to a person’s walking patterns.

Why It Is Relevant
Among adults ages 65 and older, falls are a serious cause of both fatal and non-fatal injuries. A fall can lead to chronic pain, disability, and nursing home admission. It is also the leading cause of injury-related death in older adults.

The number of Americans aged 65 and older is expected to double from 44 million today to 90 million by 2060. Research shows that 33% of seniors will fall each year and 7% will suffer a fracture from the fall. The cost of medical care and/or nursing home care will cause a significant financial burden in years to come.

SmartGait™ is a fall-risk assessment tool that enables a timely deployment of preventive measures in order to prevent falls. "SmartGait™ assesses fall-risk in the same way blood pressure is used to identify risk of heart attack – a person at risk of falling is identified before the fall occurs, so that appropriate interventions can be implemented. "Our goal is not only to prevent injuries, but also to maintain quality of life and promote independence in older adults," says Shirley Rietdyk, PhD. Healthcare professionals can use the data to guide the selection of fall prevention measures, such as exercise, physical therapy, or vision correction, and to determine the effectiveness of the interventions.

How It Works
SmartGait™ is a wearable device that consists of a smartphone application with peripheral accessories: a wide-angle lens, colored-markers worn on each shoe, a belt, and a phone holster.
In action, a person wears SmartGait™ for approximately 10 minutes while standing and while walking. The camera of the smartphone tracks the shoe markers as the individual moves. The software isolates images of the feet markers and measures how much the trunk sways, step length, step width, gait speed, and the variability of these measures. The device records the data in real time so the SmartGait™ administrator can provide immediate feedback to the client. The data can also be stored in a cloud-based system so healthcare practitioners can track changes over time. Ideally, a person’s balance and gait are measured on a monthly basis, which allows practitioners to plot the path over time and watch for both acute changes and slow changes that are associated with fall-risk.

Benefits
SmartGait™ is easy-to-use, inexpensive, and portable. Most competitor’s devices are costly, require large dedicated clinical space, and highly trained personnel.

One of the best features of the SmartGait™ system is that it is portable. It is an easy way to measure balance and mobility in a person’s natural environment. Fall-risk can be quickly and accurately assessed in the home, community, clinic, and even bedside in a hospital.

There are several other benefits of the SmartGait™ system:

1) It provides immediate and objective quantification of balance, mobility, and fall risk.
2) Caregivers can acquire longitudinal reporting and data analysis via the online portal.
3) It provides an objective quality of care assessment.
4) It is low-cost compared to other gait assessment tools.
5) The system is easy to use and requires little to no training.

Bringing It to Market
Since May 2017, SmartGait™ has been beta-tested in three area locations: Westminster Village, a continuing care retirement community in West Lafayette; Purdue University’s A.H. Ismail Center for Health, Exercise, and Nutrition; and The Center @ Jenks Rest, a senior center in Lafayette.

SmartGait™ has submitted information to the FDA in preparation for FDA clearance.

Once approved, SmartGait™ will be a valuable tool for independent physical therapists and those working in retirement communities.

Many of us think our smartphones are vital to our existence. With SmartGait™ technology, Dr. Rietdyk and her team have turned a smartphone into an actual lifesaver.

SmartGait™ Flow Chart, developed by SmartGait LLC

Interested in health disparities in later life, Dr. Patti Thomas’ research focuses on the impact of older adults’ social relationships on outcomes such as physical and cognitive health. In an article recently published in Journals of Gerontology: Social Sciences, Dr. Thomas collaborated with Dr. Debra Umberson, Professor of Sociology at University of Texas at Austin, to examine how strain in parent-adult child relationships influences cognitive health of both older men and women. Surprisingly, they found that relationship strain was associated with better cognitive health in older adults; however, more so for men than women. They suggest that strain may be an indicator of presence and care in relationships between adult children and their fathers, and that children’s assertive behaviors might get fathers to behave in ways that increase their cognitive health. Mothers might consider their children’s controlling behaviors as a threat to their good mother identity, which causes more stress in their lives.

In a subsequent paper currently under review, this gender difference in the impact of strain is found to be salient for older adults’ physical activity as well. Dr. Thomas continues to examine the ways in which strain in several types of social relationships is related to various health outcomes in later life. In an active project, she will collaborate with Ken Ferraro, CALC Director, and Monica Williams, CALC graduate student, to examine how support and strain in adult social relationships might mediate the impact of stressful life events in childhood on later life health outcomes. Dr. Thomas has plans to further expand her expertise on the topic of social relationships and health, but also believes that mentoring the next generation of scholars is an equally important contribution. She says, “In five years, I still see myself on this trajectory of research. But being able to mentor and foster the up-and-coming scholars, it would be neat to play a larger role in that.”

Dr. Patti Thomas

Dietary supplements can provide nutrients to help older adults meet recommended intake levels, but can also increase the risk of excessive intakes or drug-nutrient interactions. Therefore, Dr. Bailey and colleagues evaluated the dietary supplement usage among older adults aged 60 years and older using NHANES 2011-2014 data. Seventy percent of older adults reported using at least one dietary supplement in the past 30 days, with 29% of users taking 4 or more products. Multivitamin or mineral products (39%) were the most frequently used products, followed by vitamin D (26%) and omega-3 fatty acids (22%). The use of any type of dietary supplement was higher for women, those in older age groups, those who had higher educational attainment, and nonsmokers than their counterparts.

With regard to race/ethnicity, the use was higher for non-Hispanic Black than non-Hispanic Black and Hispanics. Top five reasons for using dietary supplements were to improve overall health (41%) and bone health (37%), to maintain health (36%), to supplement the diet (22%), and to manage heart health and cholesterol (22%). This study found that dietary supplement use was very high among U.S. older adults. Professor Bailey concludes that dietary supplement use and its nutritional and health impacts should be carefully monitored by health care professionals.

Dr. Regan Bailey

Regan Bailey, Associate Professor of Nutrition Sciences, and her colleagues recently published a study describing dietary supplement usage patterns among older adults in the United States (citation in box). Older adults can experience undernutrition due to reduced food intake, biological and physiological changes, and socioeconomic conditions. Dietary supplements can provide nutrients to help older adults meet recommended intake levels, but can also increase the risk of excessive intakes or drug-nutrient interactions. Therefore, Dr. Bailey and colleagues evaluated the dietary supplement usage among older adults aged 60 years and older using NHANES 2011-2014 data. Seventy percent of older adults reported using at least one dietary supplement in the past 30 days, with 29% of users taking 4 or more products. Multivitamin or mineral products (39%) were the most frequently used products, followed by vitamin D (26%) and omega-3 fatty acids (22%). The use of any type of dietary supplement was higher for women, those in older age groups, those who had higher educational attainment, and nonsmokers than their counterparts.

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Dr. Regan Bailey
Dr. Elliot Friedman is particularly interested in aging as a biopsychosocial process and the extent to which positive psychological status, discrimination, psychological functioning, and behavior (e.g., sleep) interacting with one another over time. He inflammatory proteins older adults. current research program centered on the connections between psychological well being and biological functioning in older adults. Dr. Friedman has always been interested in how psychological experiences affect biological processes related to health. As a graduate student at the University of Wisconsin-Madison, he pursued training in behavioral neuroscience and immunology, and his doctoral research examined the immunological consequences of psychological stress as well as how behavior is affected by chemicals released by the immune system in response to viruses or bacteria. His postdoctoral work at the University of California, San Diego focused on abnormal immune function in a genetic animal model of depression. After teaching at Williams College for a number of years, he became increasingly interested in the links between social context and health. He returned to the University of Wisconsin-Madison to pursue additional training in population health through the Robert Wood Johnson Health & Society Scholars program where he began his current research program centered on the connections between psychological well-being and biological functioning in older adults. Dr. Friedman’s research continues to focus on health-related biological processes – most notably circulating levels of inflammatory proteins – and examines the ways in which they are patterned by social factors (e.g., socioeconomic status; discrimination), psychological functioning, and behavior (e.g., sleep) interacting with one another over time. He is particularly interested in aging as a biopsychosocial process and the extent to which positive psychological functioning may slow or compensate for the health effects of changes and challenges in later life.

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2017 Outstanding Professor Award

During the Fall symposium, Elliot Friedman was presented with the Outstanding Professor Award. Professor Friedman is the William & Sally Berner Hanley Associate Professor of Gerontology at Purdue University.

Professor Friedman teaches Multidisciplinary Gerontology and Health in Social Context for graduate students. CALC students appreciate his ability to clearly explain and expand upon many concepts and processes related to aging from multiple disciplinary perspectives. They nominated him specifically because he fosters an environment of critical thinking, leads insightful discussion, and allows them the freedom to pursue their own interests while guiding them with overarching themes. The students feel that Dr. Friedman creates a warm and welcoming classroom, and is a great mentor and a valuable instructor.

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American sociologist C. Wright Mills coined the phrase sociological imagination to describe the ability to “think yourself away from the familiar routines of everyday life” and look at them from an entirely new perspective. Throughout his distinguished career as a sociologist, Professor Kenneth Ferraro has been inspired by the concept as it relates to gerontology.

After years of consideration and penning a few chapters that laid dormant, Professor Ferraro was determined to put all of his ideas on paper. Easier said than done for a busy professor who teaches several courses, served a stint as interim Department Head of Sociology, and is Director of CALC. Combining his personal commitment with a valuable network of colleagues who readily shared their feedback and ideas, The Gerontological Imagination: An Integrative Paradigm of Aging was recently published with Oxford University Press.

About the Book
The scientific study of aging is a relatively nascent field of inquiry. Although philosophic and literary reflections on what it means to grow older appear in the earliest historical records, the systematic study of aging began in earnest about a century ago. Scholarly interest in the topic has accelerated in recent decades, due in part to rapid population aging in developed nations. As a result, the study of aging has been incorporated into many disciplines, emphasizing concepts, theories, and methods to elucidate the antecedents and consequences of growing older.

Although each discipline has key concepts and empirical generalizations about aging, there is little agreement across disciplines about the intellectual core of gerontology. Each discipline brings its own intellectual heritage and perspective to the study of aging, but the question posed by Professor Ferraro is whether there is an emergent perspective or way of thinking about aging that transcends the disciplines. Biologists, psychologists, and sociologists may claim an interest in gerontology, but do they have a common image of aging or a set of principles to guide their research? Do they share a paradigm — a fundamental image of aging — that incorporates concepts and empirical generalizations from multiple disciplines? And when disciplinary approaches to gerontology clash, which approach or conceptualization of aging is likely to emerge as part of the paradigm?

The Gerontological Imagination provides an integrative paradigm of aging that makes it the first book to identify intellectual common ground among scholars studying aging. Professor Ferraro identifies an underlying set of principles that constitute a paradigm for the study of aging: causality, life course analysis, multifaceted change, heterogeneity, accumulation processes, and ageism. The proposed paradigm provides an efficient way to identify and interpret essential ideas, findings, models, and theories across multiple disciplines that study aging.
This past semester, CALC students had a new opportunity to make a difference in the lives of seniors in the community by participating in Opening Minds through Art (OMA) at Westminster Village, a life plan community in West Lafayette. OMA is an intergenerational art program for people with dementia. It was founded in 2007 at the Scripps Gerontology Center at Miami University of Ohio and is now held in locations across the United States and throughout the world.

The program is founded on the fact that people with dementia are capable of expressing themselves creatively; while its mission is to build bridges across age and cognitive barriers through art. Volunteers are paired with older adults who have dementia or other neurocognitive diseases to create art projects. For residents with neurocognitive diseases, working on art projects that focus on their strengths and imagination helps them feel successful. There is a growing body of empirical evidence that creative expression improves their physical and psychological well-being.

OMA started at Westminster Village in 2016. Since its inception, more than 80 high school and college students have volunteered as art partners. This fall, ten graduate and undergraduate students from Purdue University became art partners. The students went through a comprehensive training program and then met weekly with their resident artists to create art together. They made beautiful watercolors, funky prints, and a myriad of other projects. At the end of the semester, the art partners and their residents hosted an art show for families and the community.

Residents look forward to the OMA program. They are often waiting at the doors of their rooms for their art partners to arrive and walk with them to the art room. Mary Marshall, a graduate student, shared, “Each time I arrive to meet my resident, she exclaims excitedly how happy she is that we get to be artists again. She genuinely enjoys our time together.”

The students also benefit from the experience. They learn more about neurocognitive diseases through the training and through their interactions with the residents. The students are able to see them for who they are — contributing members of the community. If you would like to participate in OMA locally, please contact Mary Marshall at marsha48@purdue.edu.

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**AWARDS & TRANSITIONS**

Valerie Miller (Dual-title PhD, 2016) was awarded a Purdue Research Foundation Research Grant for her proposal, The Early Social Origins of Premature Aging.

Roland Thorpe (Minor, 2004) was elected by the membership of The Gerontological Society of America to serve on the Executive Committee as Member-at-Large for the Behavioral and Social Sciences section.

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Monica Williams (CALC student) was awarded the 2017 -2018 Robert L. Eichhorn Fellowship in Medical Sociology, which provides support for doctoral students in medical sociology to study health, aging, or the organization of health services.

Kyle Timmerman (Minor, 2006), PEAK MODalities co-founder, received the 2017 Edison Gold Award for the company’s apps, SPEAKAll™ and SPEAKmore™. SPEAK MODalities also won the ChanceLight Behavioral Health and Education Prize and the Milken Family Foundation Grand Prize at the Milken-Penn GSE Education Business Plan Competition for its work developing evidence-based speech and language therapy applications for individuals with severe autism or developmental disabilities.

In the summer of 2018, Min Zhang (Faculty Associate) was promoted to Professor of Statistics at Purdue University.
We are extremely grateful for our 2017 donors. It is with your continued support that we are able to advance discoveries about the aging process and train a new generation of scholars focused on aging. Through the generosity of our donors, CALC will launch its first summer research fellowship in 2018.

With Special Thanks To:
Steve Amireault
Regan Bailey and Weston Schempf
Benevity Blackrock, Inc.
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Wadsworth
Mick and Jennifer Murray
Shirley Rietdyk
Andy and Traci Robison
Joy Steele-Morris
Patti Thomas
Nick Turiano
Lindsay Wilkinson

Add Your Name to This List in 2018.
Use the envelope provided or donate online at www.purdue.edu/aging.

Kathleen Abrahamson (Faculty Associate) received the Excellence in Public Health Science Research Award, a Hulman Health Achievement Award given by the Indiana Public Health Association. The award recognizes those who conduct impactful, innovative research that focuses on disease prevention, health promotion and population health outcomes.

Regan Bailey (Faculty Associate) was designated a Purdue Showalter Faculty Scholar for 2017.

Kathy Berlin (Dual-title PhD, 2012) was appointed Department Chair of Applied Health Sciences. She achieved promotion and tenure at the rank of Associate Professor at Indiana State University.

Wayne Campbell (Faculty Associate) is serving as one of seventeen members of the U.S. federal government Physical Activity Guidelines Advisory Committee. The second edition of the Physical Activity Guidelines for Americans is expected to be released in late 2018.

Jason Cannon (Faculty Associate) was designated a Purdue Showalter Faculty Scholar for 2017.

Aleda Chen (Dual-title PhD, 2011) was promoted to Assistant Dean and Associate Professor of Pharmacy Practice at Cedarville University in Cedarville, Ohio.

Angela Doehring (Dual-title PhD, 2012) is Assistant Professor in the department of Allied Health at University of Illinois in Springfield, Illinois.

Alex Francis (Faculty Associate) gave an invited talk, Using Psychophysiological Measures to Assess Affective Response to Communication Challenges across the Lifespan,” at the 7th International & Interdisciplinary Aging and Speech Communication Research Conference.

Katie Hill Gallant (Minor, 2010; Faculty Associate) was awarded the American Society for Bone and Mineral Research Travel Grant.

HyeYoung Cho
Health & Kinesiology

Anna Forster
Nursing

Samuel Hatala
Human Development & Family Studies

Yifei Hou
Sociology

MK Huffman
Health & Kinesiology

Valerie Miller
Anthropology

Carrie Shorey
Human Development & Family Studies

Michele Forman
Professor and Department Head, Nutrition Science

Dr. Forman received her PhD in Nutritional Epidemiology at University of North Carolina. Her career focuses on nutritional epidemiology and clinical nutrition research across the globe with an emphasis on early life exposures and risk for chronic disease as well as the role of nutrition in growth and health across the life course.

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Your contribution helps us further our mission: optimal aging – for life.
One could argue that cancer is a disease of aging. The older one gets, the more likely he or she is to develop cancer. Although cancer varies by type, more aggressive cancers tend to occur among younger than older persons. Family history is a crude detector of cancer risk, but it is often the current standard for early detection. Ideally, family history should consider both genes and environment, but because cancer is rarer than the prevalence of chronic diseases, such as cardiovascular disease or diabetes, it is more challenging to garner quality data.

Mary Beth Terry, PhD, Professor of Epidemiology at Columbia University and one of the speakers at the 2017 CALC symposium, is on a mission to identify the role of family lineage on cancer risk. Professor Terry received her PhD in Epidemiology from Columbia University. Her research focuses on breast cancer and the molecular epidemiology and life course methods of the disease. Through her research, Dr. Terry argues that cancer screening should not be based on chronological age, but instead on physiological age - how well or poorly one’s body is functioning relative to actual calendar age. One example to support her theory came from a study printed in Cell Press. That study showed that breast cancer incidence is not closely related to mutation accumulation as many scientists believed. Instead, physiological age is mapping closely to cancer incidence.

The Role of the Gene-environment Interaction
Professor Terry’s research also addresses why there has been a rapid increase in early onset of breast cancer during the past ten years - nearly 2% per year. Given this increase, identifying better ways for early detection is critical. Unfortunately, most empirical evidence on environmental carcinogens and breast cancer is limited. Most studies with cohorts based on family lineage do not account for underlying susceptibility and fail to look at the age when the breast developed and changed in function. Professor Terry has spent the past 15 years examining environmental signals in families. In one of her studies, she found that sisters diagnosed with breast cancer compared to their sisters without breast cancer had:

- Higher levels of oxidative stress markers
- Shorter telomeres
- Lower likelihood of global repetitive element methylation
- Poorer ability to repair DNA damage (showing DNA repair phenotype of a much older woman).

Influence of Early Life Conditions on Rare Outcomes
There are windows of susceptibility that may provide additional information in the risk assessment for breast cancer. Understanding that pubertal milestones play an important role in the development of breast cancer, Professor Terry seeks to link changes in adulthood with what has occurred earlier in a woman’s life. Using an objective low-cost measure, she monitors changes in breast tissue characteristics during adolescence. She found that earlier breast development may occur in girls with a family history of breast cancer, and continues to investigate how the home environment may influence that risk.

Improving Risk Assessment and Cancer Prevention
The ability to link exposures early in life to diseases later in life is a great feat, but the ultimate goal of Professor Terry’s research is intervention: how to target individuals for screening and prevention. Intergenerational studies can help improve clinical risk models by providing evidence for environmental factors, early life and adolescent factors, and gene-environment interactions.

By developing better clinical risk assessment, we can more effectively target those who are truly at risk. It will ensure that we do not over-screen or over-treat, and have a positive impact on the quality of life of the women we love.

Maternal Capital and the Metabolic Ghetto: An Evolutionary Perspective on How Society Shapes the Intergenerational Transmission of Health
DR. JONATHAN WELLS

Our other symposium speaker, Dr. Jonathan Wells, described his multi-disciplinary approach that integrates studies of human physiology, evolutionary biology, and societal factors to examine early life nutrition and its relationship to later health. Wells began by observing that aside from lifestyle choices (e.g., diet, exercise) there are also a number of physiological predictors (e.g., low birth weight) of chronic disease. From Wells’ perspective, aging begins very early in one’s life.

Physiology
When studying chronic disease, attention has long been given to the role of lifestyle choices. More recently, however, there has been a heightened interest in growth patterns in early life. For example, studies show that low birth weight (<2,500 grams or 5 lbs. 8 oz.) elevates risk for heart disease, glucose intolerance, and diabetes. Smaller fetuses with an inadequate supply of energy respond by reducing the growth in some organs, such as the liver and pancreas in order to protect the brain. Later in life those smaller organs have lower tolerance of nutritional excess. This is one example of how the body experiences a set of reaction norms that affect the rate of aging and other physiological responses in the body.

Evolutionary Biology
Species adapt to volatile environments by developing biological systems of risk management. Ideally, when offspring are most sensitive to ecological stresses, the mother would buffer those stresses and the offspring would pick up a lifelong imprint of “maternal capital.” According to Dr. Wells, “maternal capital,” is the maternal phenotype (somatic or behavioral) that imprints in the offspring an adaptive response to the environment. Based on this model, Dr. Wells predicts that if a mother has difficulty or is unable to invest in offspring during such critical windows of development, the offspring will have lasting negative consequences, such as a faster rate of aging and a shorter lifespan.

Society
The maternal environment is also influenced by societal factors. For example, minority status and poverty are associated with poorer health outcomes for mothers and their offspring. Dr. Wells argues that certain environmental factors (e.g., food deserts, gender inequality) can constrain nutritional behavior or coerce consumption through product marketing and norms for portion sizes. Dr. Wells argues that chronic disease has a societal bias and he urges a reexamination of how resources, including nutritional resources, are distributed at the societal level to support population health. Dr. Wells is a Professor of Anthropology and Paediatric Nutrition at the University College London Institute of Child Health. He received his PhD in Biological Anthropology and Nutrition at the University of Cambridge. Professor Wells is involved in numerous collaborative projects worldwide to understand the links between early-life nutrition and later health.

Thanks to our event sponsors:

Purdue University Retirees Association
Purdue University Department of Anthropology
Purdue University Department of Nutrition Science