

TecHealth

Technology Center to Promote Healthy Lifestyles

FY 2014-2015 Annual Report

Director: Delia Smith West, PhD

Timeline

Building a visionary center dedicated to exploring the transformative application of emerging technologies to promote healthy lifestyles for every citizen of South Carolina.

This is the newly-created vision statement for the Technology Center to Promote Healthy Lifestyles. The 2014-2015 fiscal year, marked the first full year of Dr. West's appointment as the director of the Center and was highlighted by several important economic, collaborative, research and personnel developments which advanced the process of turning the vision for the Center into a reality.

Upon her arrival at the University of South Carolina in August 2013, Dr. West transferred her subcontract for "Behavioral Consultant to the Look AHEAD 2-Year Competing Continuation" and "iReach2 Internet Assisted Obesity Treatment Enhanced by Motivational Interviewing," both National Institute of Diabetes and Digestive Disorders and Kidney Diseases (NIDDK) extramurally funded grants. During the past fiscal year, Dr. West continued her work on these two projects, which upon completion, will result in \$690,895 in revenue to the USC system.

In 2014, Dr. West, in collaboration with the University of Vermont, submitted a competing continuation of her current, "iReach2 Internet Assisted Obesity Treatment: Enhanced by Motivational Interviewing." In the spring of 2015, Dr. West received notification that the application, "iReach3 Internet Assisted Obesity Treatment Enhanced by Financial Incentives," will receive funding from NIDDK starting July 1, 2015. The major goal of this randomized, controlled trial is to determine whether the addition of financial incentives to an effective online weight management program enhances weight loss outcomes and to examine the cost effectiveness of economic incentives in the context of online weight management. Over a 5-year period, the grant will bring in \$1,818,001 to USC and in addition to Dr. West, will employ a postdoctoral scholar, recruitment-retention coordinator, project director, behavioral interventionist and a research assistant.

Dr. West also served as co-investigator on a \$1.8 million NIH Small Business Innovation Research Grant (SBIR), "Developing the Dietary Inflammatory Index for Clinical Application," during the FY 2014-2015, a role which continues into FY 2015-2016. The Dietary Inflammatory Index, a successful research tool, will be refined for use in clinical settings. Using computers or smart phone apps, patients will input dietary data for evaluation using the Dietary Inflammatory Index. Health care providers will be able to counsel patients to improve their diets to reduce chronic inflammation, which is the root of a host of chronic diseases. Dr. West is lending her expertise in conducting research using technology to improve lifestyle behaviors to this project, which will impact the health, well-being and likely the productivity of adults in the Columbia area. The ultimate goal of this grant is to produce a marketable tool which will be disseminated with partners in SC Blue Cross Blue Shield.

"A Collaborative Partnership to Reduce Health Disparities through Technology-and Evidence-Based Health Promotion Innovations in Underserved Communities," a collaborative submission with Dr. West and Dr. Dawn Wilson, USC Professor of Psychology, as Dual PIs, resulted in a Research Engagement Collaborative Award from the Office of the USC Provost for \$25,000 in January 2015. The Healthy

Communities Collaborative will engage underserved and hard-to-reach minority communities in South Carolina with effective, evidence-based obesity interventions combining the use of innovative technologies for health promotion with community-based participatory strategies that ensure programmatic relevance and feasibility. The use of intergenerational technology will be explored with the goal of promoting healthy lifestyle behaviors through technology and social connections.

The award of this seed money allows Dr. West and Dr. Wilson to submit a full proposal to the Office of the USC Provost for an Implementation Project Award to continue to work on solving this grand challenge, and to build a research and scholarship portfolio which contributes to the development of community infrastructure, adequately prepared students, as well as an engaged workforce, who will contribute to efforts to address effectively the public health challenge of obesity treatment and prevention, using technology to leverage empirically-supported approaches to promoting health lifestyles. Dr. West and her collaborators anticipate submission of a full-scale Implementation Project for intramural funding (up to \$300,000 per year for up to 5 years) in September, 2015, which will employ investigators, staff and students, as well as engage community members and developing scholars in training efforts.

During the year, Dr. West also collaborated with Dr. Stacy Fritz, program director of the ASPH Physical Therapy Program, on a grant submission to the American Heart Association, "Treating Individuals Post Stroke in a Dyad-Based, Technology-Assisted Weight Loss Program." The proposed study would engage overweight or obese individuals with a history of stroke along with their caregivers in a technology-assisted, behavioral, weight-management program tailored to their unique situation. The majority of stroke victims are overweight or obese and suffer from associated health conditions such as heart disease, high cholesterol and diabetes. Often plagued by mobility limitations, they are usually excluded from typical weight-reduction studies. By engaging the stroke survivor along with his or her caretaker, the study would utilize a built-in support system with the likely result of improved health for both individuals. The relevance of this study to the South Carolina cannot be overstated. In 2011, 15,042 people were treated for stroke in the state's hospitals and stroke is the third largest cause of death in the state, as well as substantial burden from stroke-related co-morbidities.

This application was not funded by American Heart Association in this cycle, but the Dr. West and Dr. Fritz anticipate revising and re-submitting this proposal to another funding source in the upcoming year.

Postdoctoral scholars Sandra Coulon, PhD, and Courtney Monroe, PhD, joined the staff of the Center in August 2014, each bringing educational and research experience that compliments the needs of the Center. Dr. Coulon applied for an NIH postdoctoral fellowship (F32) during FY 2014-2015 with Dr. West as her mentor and sponsor. She has been awarded the grant with funding to start July 1, 2015. The fellowship will fund 2 years of training and research for her study, "Weight Loss Outcomes Enhanced by Integrating Technology-Assisted Stress Management Techniques in Women with Metabolic Syndrome" and will provide funds to cover her salary and other expenses associated with her fellowship and research (\$110,032 total costs). The study combines a technology-assisted behavioral weight control program with a stress management element for women with high stress levels and metabolic syndrome. Dr. Coulon, a clinical psychologist with experience in health psychology, conducted a review of available stress management apps and submitted several publications in collaboration with Dr. West.

In May 2015, Dr. Monroe, a kinesiologist with interests in self-perceived and measured physical fitness, received a \$5,000 ASPIRE 1 grant for her upcoming study entitled, "The Use of Technology to Enhance Social Support for Weight Loss." The funding mechanism is the inaugural award of funds to support

postdoctoral fellows in their efforts to develop a research career and Dr. Monroe is supported on this award by Dr. West. This trial will harness the potential of combining existing social support with the power of technology by providing participants in a behavioral weight control program with fitness tracking technology devices for their established social networks and cultivating social support for effective weight management behaviors, a novel approach to improving the challenging task of initiating and maintaining weight loss among obese and overweight individuals. This research area is one which has high interest across several NIH institutes, as well as the CDC, and therefore the pilot data gathered as part of this ASPIRE award will provide the foundation upon which an extramural application will be built.

The fiscal year also saw the implementation and conclusion of two Center-funded pilot studies, Caregiver Healthy Lifestyle Assisted by Technology Study (CHAT) and HealthE U. From July through September 2014, CHAT researchers gathered data on the health status of caretakers of patients with Alzheimer's disease through extensive phone surveys. Using activity tracking technology to monitor their activity and sleep patterns, a selected group of the caretakers participated in a concurrent substudy of the pilot study. In addition to collecting these important data on a population that is often at high risk because of poor health behaviors, this project engaged three graduate students who learned about lifestyle research and technology to assess physical activity. Currently, planning is underway for publication and presentation opportunities to share the information gathered in the CHAT pilot study.

The transition from childhood to young adulthood is a critical period for establishing what will become lifelong health habits and therefore health promotion efforts among college students provide fertile ground for developing lifestyle behaviors that can produce a healthy and productive next generation of South Carolinians. The HealthE-U pilot study was focused on promoting healthy weight (and counteracting college-related weight gain) and physical activity among young adults using technology to support these efforts. The pilot delivered a Healthy Weight intervention and HPV vaccination awareness program (the control group for the Healthy Weight intervention) through the use of social media, fitness tracking devices, apps and wi-fi scales to College of Charleston undergraduates. The planning for the HealthE U pilot began in July 2014 with the resulting pilot study running from January through May 2015. A subset of the students will be contacted in FY2015-2016 for a long-term follow-up of the study. The pilot data from this study are currently being analyzed and written up for dissemination in peer-reviewed journals, and a federal grant application submission is expected in the upcoming fiscal year to provide a more extensive evaluation of the interventions, as well as a more rigorous assessment of the sustained impact on the health and well-being of young adults from South Carolina.

The technological needs of the Center's upcoming research projects will be filled by a recent addition to the staff. After an extensive search, Michael Scribellito was hired for the position of Senior Software Applications Analyst and will begin work at the Center in mid-July 2015. A graduate of the University of South Carolina's College of Engineering and Computer Science, Mr. Scribellito's experience and abilities expand the capability of the Center to stay at the forefront of technical innovation in obesity research.

Importance of Obesity Prevention and Treatment for the Economic Health of South Carolina

The Center endeavors to impact the economic health and well-being of the state of South Carolina and her residents by directly and specifically focusing research, scholarship and grant funding activities on preventing and/or treating obesity. The savings in healthcare costs and increase in worker productivity created by reducing the obesity rate and encouraging a healthy lifestyle through exercise and diet are vital to the future of the state. In 2013, 31.7% of South Carolina adults were obese, the tenth highest

rate of any state in the nation. If obesity rates continue on the current trajectory, by 2030, 62.9 percent of South Carolinians will be classified as obese, and the majority of the remainder of the population will be overweight.

Obesity is associated with a variety of debilitating medical conditions including: type II diabetes, stroke, high blood pressure, heart disease, sleep apnea, some types of cancer and gallbladder disease. The price of treating these diseases is high. In 2003, obesity-related medical costs were an estimated \$1.06 billion in South Carolina with more than half of the cost paid by taxpayer funded Medicaid and Medicare programs. In 2009, the estimated medical expenditure rose to \$1.2 billion, with a projected increase to \$5.3 billion by 2018. Aside from medical costs, obesity impacts the business community, accounting for 6.5 to 12.6 percent of total workplace absenteeism costs, amounting to approximately \$260 per year for each obese employee. Further, costs of “presenteeism” among obese employees are significant. For example, the estimated annual cost from presenteeism among very obese men has been shown to be the equivalent of 1 month of lost productivity and costs employers an average \$3792 per year for each morbidly obese male employee.

Using rigorous scientific research, our current projects employ an arsenal of technology weapons: websites which deliver evidence-based behavioral weight management strategies, wi-fi scales, smartphone apps, fitness and sleep trackers along with social media and other electronic communications to establish the best methods for obesity prevention and amelioration. The participants in our research projects reflect the many facets of our state: grandparents and their grandchildren; caretakers of loved ones suffering from Alzheimer’s disease; college students; and minority and underserved populations. Through our work, we will make a better future for them and for all of the citizens of South Carolina, as well as contribute to the body of knowledge available to address this critical public health problem. By tackling this significant challenge to the health of our state (and our nation) using advanced technologies integrated with behavioral principles we will not only enhance the physical, social and economic health of South Carolinians, but establish the Center as a national model of research and scholarship on technology to promote healthy lifestyles.

Summary of Proposed Objectives

The objectives of the Center were clarified through new mission and vision statements.

Mission Statement

Fostering collaborations between scholars from multiple disciplines, innovative businesses, and community partners to design and evaluate technology-assisted lifestyle behavioral interventions that will improve the health, quality of life, and economic capacity of South Carolinians.

Vision Statement

Building a visionary center dedicated to exploring the transformative application of emerging technologies to promote healthy lifestyles for every citizen of South Carolina.

Summary of Research & Project Collaborations

FUNDED

iReach 3-Internet Assisted Obesity Treatment Enhanced by Financial Incentives-NIH R01

Dual PIs: Delia West PhD-USC, Ex Sci and Jean Harvey, PhD-University of Vermont, Dept. of Nutrition and Food Sciences

iReach2 Internet Assisted Obesity Treatment: Enhanced by Motivational Interviewing-NIH R01

Dual PIs: Delia West PhD-USC, Ex Sci and Jean Harvey, PhD-University of Vermont, Dept. of Nutrition and Food Sciences

Behavioral Consultant to the Look AHEAD 2-year Competing Continuation-NIH*(Subcontract from Wake Forest University)*

PI: Delia West, PhD-USC, Ex Sci

Developing the Dietary Inflammatory Index for Clinical Application-NIH SBIR

James Hébert, PhD-USC, CPCP, Director SC Statewide Cancer Prevention and Control Program

Michael Wirth, PhD-USC, Epi Bio

Gabrielle Turner McGrievy, PhD-USC, HPEB

Delia West, PhD-USC, Ex Sci (Co-Investigator)

A Collaborative Partnership to Reduce Health Disparities through Technology and Evidence-Based Health Promotion Innovations in Underserved Communities (The Healthy Communities Collaborative)-

USC Provost-funded research

Dual PIs: Dawn Wilson, PhD-USC, Psychology, and Delia West, PhD-USC, Ex Sci

Mahmud Khan, PhD-USC, Chair HSPM

Jose M. Vidal, PhD-USC, College of Engineering and Computing

Abraham Wandersman, PhD-USC, Psychology

Delia West, PhD-USC, Ex Sci

Dawn Wilson, PhD-USC, Psychology

Technology Assisted Stress Management and Weight Control in Metabolic Syndrome-NIH, F32

Sandra Coulon, PhD-USC, Ex Sci

Delia West, PhD-USC, Ex Sci

Using Technology to Enhance Social Support for Weight Loss-ASPIRE I, Track II-B grant

Courtney Monroe, PhD-USC, Ex Sci

Delia West, PhD-USC, Ex Sci

HealthE U-Technology Center to Promote Healthy Lifestyles feasibility pilot, SmartState Center funded

Heather Brandt, PhD-USC, HPEB

Courtney Monroe, PhD-USC, Ex Sci

Beth Sundstrom, PhD- College of Charleston, Communications

Gabrielle Turner-McGrievy, PhD - USC, HPEB

Delia West, PhD-USC, Ex Sci

Sara Wilcox, PhD-USC, Ex Sci, Director Prevention Research Center

Caregiver Healthy Lifestyle Assisted by Technology Study (CHAT)-Technology Center to Promote Healthy Lifestyles pilot, , SmartState Center funded

Maggi Miller, PhD-USC, Office for the Study of Aging

Xuemei Sui, PhD-USC, Ex Sci

Delia West, PhD-USC Ex Sci

UNFUNDED PROPOSALS

Treating Individuals Post Stroke in a Dyad-Based, Technology-Assisted Weight Loss Program-*American Heart Association*

PI: Delia West, PhD-USC, Ex Sci

PI: Stacy L. Fritz, PhD-USC, Ex Sci

Jessica Richardson, PhD-USC, COMD

Sara Wilcox, PhD, Ex Sci

Brent Hutto, MSPH, PRC

Summary of Graduate Education and Training

Undergraduate and graduate students affected by center activities:

1 Master's practicum student-completed practicum in spring 2015

3 Master's ASPH students- served as research assistants in Center pilot research project

1 Master's computer science student completed internship in spring 2015

2 Postdoctoral scholars started in August 2014

Dr. West-Guest lecturer-ASPH EXSC 700- Physical activity and health: epidemiology, research, and practice.

Dr. West-Guest lecturer-ASPH Exercise Science Seminar Series

Professional Presentations

Coulon, S.M., & Wilson, D.K. Gene-environment effects of the neighborhood context on obesity and physical activity in African-American adults. Paper presented at the annual meeting of the International Society for Behavioral Nutrition and Physical Activity, Edinburgh, Scotland, June 2015.

Coulon, S.M. & Wilson, D.K. The Interaction of Neighborhood and Genetic Risk in Predicting Blood Pressure and Stress-related Outcomes in the PATH Trial. Paper presented at the annual meeting for the Society of Behavioral Medicine, San Antonio, TX, April 2015.

Larsen CA, West DS. (Sept 2014) Choose to Lose Online: Evaluation of Communication Patterns in a Pilot Online Weight Management Program. Poster presented at the 2014 SEC Prevention of Obesity: Overcoming a 21st Century Public Health Challenge Symposium, Atlanta, GA, September 2014.

Note: Presentation with graduate student

Monroe CM, Thompson DL. UT Moves: An Internet walking program. Southeast American College of Sports Medicine Annual Meeting, Jacksonville, FL, February 2015 (oral presentation).

Monroe CM, Thompson DL, Bassett DR Jr, Fitzhugh EC, Raynor HA. Effect of adding online social support tools to an adult walking program: randomized controlled trial. Poster presented at the American College of Sports Medicine Annual Meeting, San Diego, CA, May 2015.

West DS. (2014, May). Counseling Strategies to Encourage Behavior Change in Weight Loss. Academy of Nutrition and Dietetics Level 2 Certificate of Training in Adult Weight Management Program, Charlotte, NC

West DS.(2015, April). Current Research in Technology-Based Interventions to Promote Healthy Lifestyles. South Carolina Smart State Council of Chairs Forum, Greenville, SC.

Krukowski R, **West D,** DiCarlo M, Andres A. Influences on Expectations for Gestational Weight Gain. The FASEB Journal; 2015:29 (Suppl 1), 590.2

Sobik S, Krukowski R, **West D**, Cleves M, Andres A. Subclinical depression is associated with lower birth weight in obese women. The FASEB Journal; 2015:29 (Suppl 1), 590.11

Significant Research Publications.

Delia S. West, PhD-3

Sandra Coulon, PhD-1

Courtney Monroe, PhD-1

Turner-McGrievy, PhD-13

West-Text of two professional publication abstracts from FY 2014-2015

Unick JL, Hogan P, Neiberg R, Cheskin L, Dutton G, Evans-Hudnall G, Jeffery R, Kitabchi A, Nelson J, Pi-Sunyer X, West D, Wing RR for the Look AHEAD Research Group. Evaluation of early weight loss thresholds for identifying non-responders to an intensive lifestyle intervention. (2014). Obesity, **22, 1608-1616.**

Objective: Weight losses in lifestyle interventions are variable, yet prediction of long-term success is difficult. The utility of using various weight loss thresholds in the first 2 months of treatment for predicting 1-year outcomes was examined.

Methods: Participants included 2327 adults with type 2 diabetes (BMI:35.8+6.0) randomized to the intensive lifestyle intervention (ILI) of the Look AHEAD trial. ILI included weekly behavioral sessions designed to increase physical activity and reduce caloric intake. 1-month, 2-month, and 1-year weight changes were calculated.

Results: Participants failing to achieve a $\geq 2\%$ weight loss at Month 1 were 5.6 (95% CI:4.5, 7.0) times more likely to also not achieve a $\geq 10\%$ weight loss at Year 1, compared to those losing $< 2\%$ initially. These odds were increased to 11.6 (95% CI:8.6, 15.6) when using a 3% weight loss threshold at Month 2. Only 15.2% and 8.2% of individuals failing to achieve the $\geq 2\%$ and $\geq 3\%$ thresholds at Months 1 and 2, respectively, go on to achieve a $\leq 10\%$ weight loss at Year 1.

Conclusions: Given the association between initial and 1-year weight loss, the first few months of treatment may be an opportune time to identify those who are unsuccessful and utilize rescue efforts. Trial Registration: clinicaltrials.gov Identifier: NCT00017953

Sui X, Brown W, Lavie C, West DS, Pate R, Payne J, Blair S. Prospective study of the associations between television watching and car riding behaviors and development of depressive symptoms. (2015). Mayo Clinic Proceedings, **90, 184-193.**

Objective: To examine the longitudinal association between sedentary behaviors and risk of development of depressive symptoms.

Patients and Methods: The study population consisted of 4802 participants in the Aerobics Center Longitudinal Study (1012 women and 3790 men) aged 18 to 80 years who did not report depressive moods when they completed a health survey during 1982 in which they reported their time spent watching television (TV) and riding in a car each week. All participants completed a follow-up health

survey when they responded to the 10-item Center for Epidemiologic Studies Depression Scale. Those who scored 8 or more on the Center for Epidemiologic Studies Depression Scale were considered to have depressive symptoms.

Results: Among the 4802 participants, 568 reported depressive symptoms during a mean follow-up of 9.3 years. After multivariate adjustment including moderate- and vigorous-intensity physical activity, time riding in a car, time watching TV, and combined time spent in the 2 sedentary behaviors were positively associated with depressive symptoms (each $P < .05$ for trend). Individuals who reported 9 h/wk or more riding in a car, more than 10 h/wk watching TV, or 19 h/wk or more of combined sedentary behavior had 28%, 52%, and 74% greater risk of development of depressive symptoms than those who reported less than 5 h/wk, less than 5 h/wk, or less than 12 h/wk, respectively, after adjusting for baseline covariates and moderate- and vigorous-intensity physical activity. The positive association between time riding in a car or time watching TV and depressive symptoms was only observed among individuals who did not meet the current physical activity guidelines.

Conclusion: More time reported in these 2 sedentary behaviors was positively associated with depressive symptoms. However, the direct associations between time spent in car riding and TV viewing and depressive symptoms were only significant among those who did not meet the current physical activity recommendations.