

Jon Gilbert Fox



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WAVE OF THE FUTURE

BY SUSAN GREEN

CAN MOBILE TECHNOLOGY TOOLS HELP PEOPLE MAKE LARGE CHANGES in their health behavior—like stopping problematic drug use, improving mental health problems, or helping people better manage chronic diseases? Is it possible to detect cocaine use from heart rate data captured by a smartwatch? Can peer-to-peer support on Facebook reduce smoking among young adults with serious mental illness? Can social media data be utilized to identify indicators of risky behavior?

In the rapidly growing field of behavioral health technology, these are a few of the many questions occupying researchers affiliated with Dartmouth’s Center for Technology and Behavioral Health (CTBH). Launched five years ago CTBH—a National Institute of Drug Abuse (NIDA)-funded Center of Excellence—conducts advanced research in the use of digital technology for understanding behavioral health, particularly substance use disorders (SUD) and mental health, and develops and validates new scientific-based interventions to help people overcome or manage their medical conditions.

“As a national center, we are involved with a broad range of scientific studies ranging from basic science questions to national and international multi-site implementation studies,” says Lisa Marsch, PhD, director of CTBH and the Andrew G. Wallace Professor of psychiatry at Geisel. “We are also charged with being a national resource for using science to define the evolution of technology and health, which means our researchers serve in governmental advisory roles, as advisors to a national and international research community, in training pre- and post-docs and faculty across the nation, in defining methodological frameworks for conducting state-of-the art research, in disseminating information through seminal books, publications and presentations, and in implementing new models of health care delivery that centrally embrace evidence-based digital health systems.”

Based on their prodigious work, CTBH has developed a strong reputation among researchers and service providers

as a mentor and leader in developing, evaluating, and implementing these technology-based therapeutic tools.

And this summer the center received a five-year \$6.8 million renewal grant award from NIDA to continue its work, which is quite an achievement. This highly competitive renewal award was granted to continue support of CTBH due to its marked impact to date on the science and the practice of digital health, as well as its promise for helping to change the future of medicine. With this renewal grant, CTBH is able to further direct its research efforts in answering new scientific questions regarding real-world implementation of technology-assisted intervention models for SUD and mental health treatment and related behavioral health issues.

A driving force behind CTBH’s success is its core infrastructure.

Originally organized around four cores: Treatment and Development, Dissemination and Implementation, Pilot (which grant funds one-year projects with potential of becoming extramurally funded projects), and Administrative, the renewal grant enabled the creation of a fifth core—Emerging Technologies and Data Analytics, which formalizes the center’s growing collaborations with faculty across Dartmouth. Marsch says the addition of this core “grows our number of talented colleagues who are partnering with us on the mission of the center.”

Led by Dartmouth’s Dave Kotz, PhD (DC’86), Champion International Professor in computer science, this new core is tasked with identifying, developing, and experimenting with emerging

technologies for monitoring and measuring relevant behaviors. “Everything from wearable sensors to smartphone apps, as well as the human interfaces needed to help people report and understand their own behavior,” Kotz says. “We have an excellent group of affiliated faculty from across the campus, including Professor Ryan Halter from Thayer, Professor James O’Malley from Geisel, and Professors Lorie Loeb and Andrew Campbell from Computer Science.”

Though health-tracking wearable sensors are not new, two projects—computational jewelry for mobile health and smartwatches specifically designed to detect cocaine use—are looking beyond the daily recording of physical activity to health care delivery. For wearable mobile health applications for health care to succeed, a variety of perceived barriers need to be overcome, such as the privacy and security of the applications. Researchers within this core are working on strategies to overcome these barriers.

With expertise in machine learning and natural language processing, this interdisciplinary group of technical experts are delving into analyzing social media data to understand people’s changing needs over time in order to better develop flexibly adaptive tools that respond to those changing needs. The new core is also a central repository of shared resources, including shared hardware, shared foundational algorithms, and user interface resources for CTBH affiliates.

Many of CTBH’s projects are seeded through the Pilot Core, which prioritizes the rapid execution of funded pilots. Since the center’s inception, this core has awarded 19 competitive, peer-reviewed grants to promising emerging projects ranging from mobile health methodologies and analytics to novel technology-based interventions.

One pilot underway is looking at Facebook data. By virtue of their socially rich datasets, social media, particularly Facebook, represent a wealth of information useful to social scientists. CTBH researchers are creating a free, flexible, and easy to use web application—with data security and anonymity in mind—to safely collect data from social media users. Using this applica-



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tion, researchers can create surveys around information they want to collect while giving end-users an opportunity to selectively consent to the surveys. The project is examining links between Facebook profile data, substance use, and other health issues.

Specifically organized around an interdisciplinary expert team, the Treatment, Development and Evaluation Core (TD&E), led by Alan Budney, PhD, a professor of psychiatry at Geisel, focuses on enhancing quality, efficiency, and impact of research projects along with sharing and promoting scientific understanding of the effectiveness of technology-based interventions. Consumer engagement also plays a key role here—outside the bounds of traditional treatment, understanding how technology-based interventions work beyond research studies, aka the real world, is a key element to implementing optimal interventions to specific populations.

Once interventions have moved beyond research, the Dissemination and Implementation Core aids researchers with knowledge transfer. Led by Sarah Lord, PhD, an assistant professor of psychiatry and of pediatrics at Geisel, researchers have at their finger-tips a mobile application review tool to rate information and effectiveness of the available array of behavioral health mobile applications and roadmaps, which include guidelines for implementation of technology tools.

This core also maintains an active social media presence, via a Twitter feed, a

LinkedIn group, and a Facebook group to promote innovations in the field. An innovation blog also highlights innovations in technology, SUD, and behavioral health.

Working with international partners in Latin America, CTBH has mounted an ambitious project to create a new mental health service delivery model for Latin America, which includes the integration of mobile technology for behavior change. The prevalence of depression and substance abuse in Columbia is notable, with only 11 percent of the population with mental health disorders receiving care. According to Marsch, this project brings together an outstanding team of experts to test and refine an entirely new model for delivering widespread, science-based, mental health care in Latin America.

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“The renewal of this grant allows us to expand our work and learning in new directions and to continue to scale up our implementation activities with our growing number of partners.”

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