

THE DEPARTMENT OF EDUCATIONAL PSYCHOLOGY'S RESEARCH METHODS,
MEASUREMENT, & EVALUATION (RMME) PROGRAMS AND THE DEPARTMENT OF
STATISTICS AT THE UNIVERSITY OF CONNECTICUT PRESENT:

CHALLENGES IN TIME-VARYING CAUSAL EFFECT MODERATION ANALYSIS IN MOBILE HEALTH

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Twin revolutions in wearable technologies and smartphone-delivered digital health interventions have significantly expanded the accessibility and uptake of mobile health (mHealth) interventions in multiple domains of health sciences. Sequentially randomized experiments called micro-randomized trials (MRTs) have grown in popularity as a means to empirically evaluate the effectiveness of mHealth intervention components. MRTs have motivated a new class of causal estimands, termed "causal excursion effects", that allow health scientists to answer important scientific questions about how intervention effectiveness may change over time or be moderated by individual characteristics, time-varying context, or past responses. In this talk, we present two new tools for causal effect moderation analysis. First, we consider a meta-learner perspective, where any supervised learning algorithm can be used to assist in the estimation of the causal excursion effect. We will present theoretical results and accompanying simulation experiments to demonstrate relative efficiency gains. Practical utility of the proposed methods is demonstrated by analyzing data from a multi-institution cohort of first year medical residents in the United States. Second, we will consider effect moderation with tens or hundreds of potential moderators. In this setting, it becomes necessary to use the observed data to select a simpler model for effect moderation and then make valid statistical inference. We propose a two-stage procedure to solve this problem that leverages recent advances in post-selective inference using randomization. We will discuss asymptotic validity of the conditional selective inference procedure and the importance of randomization. Simulation studies verify the asymptotic results. We end with an analysis of an MRT for promoting physical activity in cardiac rehabilitation to demonstrate the utility of the method.



Walter Dempsey is an Assistant Professor in the Department of Biostatistics, Assistant Professor of Data Science at the Michigan Institute of Data Science (MIDAS), and an Assistant Research Professor in the d3lab located in the Institute of Social Research at the University of Michigan. His research focuses on Statistical Methods for Digital and Mobile Health. Specifically, his current work involves three complementary research themes: (1) experimental design and data analytic methods to inform multi-stage decision making in health; (2) statistical modeling of complex longitudinal and survival data; and (3) statistical modeling of complex relational structures such as interaction networks.

Colloquium Access Information:

Friday, 24/01/25, 11am, ET

<https://tinyurl.com/rmme-Dempsey>

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