

# **Control Systems Engineering of Human Behavior Change: The Final Frontier**

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This presentation is meant to give a philosophical perspective on efforts over the last decade in the Control Systems Engineering Laboratory (CSEL) to apply concepts from both system identification and control design to the analysis, design, and implementation of novel interventions in behavioral medicine, which are referred to in the behavioral health literature as *adaptive interventions*. Time-varying adaptive interventions provide a means to personalize and ultimately improve the effectiveness of interventions geared for important public health problems; these include (but are not limited to) smoking, obesity/physical inactivity, and chronic pain.

In describing some of the behavioral health problems that CSEL has worked over the years, we will point out the enablers (mainly stemming from developments in mobile health/mHealth) for using control engineering concepts, and how behavioral theories and methods from quantitative psychology can inform the process of dynamic modeling applicable to behavior change. Furthermore, how control approaches such as hybrid model predictive control (HMPC) represent a meaningful approach for deciding on the ordering and magnitude of behavioral component over time will be discussed. Despite significant advances, many challenges remain in this problem space, providing for some exciting opportunities for transdisciplinary research between control systems engineers and behavioral and social scientists.