International Workshop on New Computationally-Enabled Theoretical Models to Support Health Behavior Change and Maintenance
First Idea Set
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Extending behavior theory (please respond to one question in this category)

- What do you think are the 'necessary ingredients' to develop models of health-related behavior that can account for momentary, short-term and long-term behavior change?

There are likely different sets of "necessary ingredients" to consider for momentary, short-term, and long-term behavior change, but also some common ingredients. The common ingredients may include motivations and rewards (needs satisfaction), decisional balances about the pros and cons, as well as self-regulatory capacities and tools. These individual-level ingredients are needed for all durations of behavior change. Necessary ingredients for momentary change may come more from proximal elements, though, – momentary cues/prompts to engage/not engage; immediate affect and satisfaction from behavior; and immediate rewards. Short-term behavior change may need to add in a sense of self-efficacy and local contextual factors, as well as dynamic feedback loops about the behavior and its change effects. Short-term behavior change may also rely more heavily on incentive systems. Longer-term behavior change builds further out in terms of potential multi-level environmental supports and structures, as well as depth of individual level variables (stronger levels of motivation for maintenance, satisfaction from changes, and depth of value and identity congruent with the behavior change). At all levels, we need to consider the congruence of the desired behavior or change with the individual's value systems (cultural differences) and support system – and how these influence motivations.

Measurement of behavior (please respond to one question in this category)

- Are some types or magnitudes of incentives (financial, game rewards, social feedback, etc.) far more effective than others in supporting engagement?

There is not a "one size fits all" answer to the question of effective incentives. Incentives are necessary and can be powerful, but may need to be tailored to the individual's characteristics (including values and developmental stage) as well as to the behavior (including its stability, phase of change in terms of new behavior change or long term maintenance). Static incentive systems may have less long-term effectiveness than more dynamic ones that get refreshed. Having adaptive incentive systems – that vary the frequency and intensity and perhaps category of incentive may be more effective than fixed ones. It is likely that a combination of small incentives for even small engagement steps and accomplishments is useful along with larger summative incentive/rewards/acknowledgements. Incentives need to be sustainable and controllable for the long term change. Providing ongoing summative feedback about progress, incentives reached, and goal achievements may be helpful. The value of individual versus group based incentives may also need to be considered. Thinking about appropriate incentives may require us to take more of a "consumer orientation" and marketing perspective than we often do – what are we trying to sell or encourage a "consumer" to do and what makes it worth their time and effort?

Evaluation (please respond to one question in this category)

- What are the implications for experimental design and statistical methods for evaluating time series systems with real-time automated behavioral measurement and an intensive human-algorithmic feedback loop in the system?

It is time to move beyond our traditional views of packaging everything as a randomized controlled clinical trial, with strong internal validity, and often limited external generalizability. From a design perspective, we need to reconsider how we can improve upon single case design methodology; incorporate factorial or fractional factorial designs; or consider adaptive designs. Equally important is to move away from the fixed interval assessment/measurement time frame to considering one that is more adaptive – measurement may intensify or decrease depending on the pattern of the behavior of interest. Our statistical models are easily up to handling assessments of unequal intervals, yet most investigators are unfamiliar with these approaches. Similarly, in order to ramp up our frequency of measures/outcomes/behaviors, we need to develop very brief assessment protocols, and find ways to measure key constructs as briefly as possible. A fresh look at the measurement requirements is needed so investigators don't simply "slap on" traditional, long, but psychometrically sound measures onto each assessment. Taking better advantage of advances in measurement theory and approaches (e.g., IRT, adaptive testing) will equip us better to collect data at more frequent and meaningful time points, and to have measures that are most sensitive to change. From a statistical standpoint, we need to pay more attention to the issue of stability of behavior (or variance in behavior) and move beyond examinations of only mean levels or multiple sequential "dip stick" assessment approaches. Engaging computer scientists who are experts in complex data visualization and patterning of data would be useful as well to help understand, display, and disseminate results. New approaches to design, analysis, and measurement also require preparing journal editors and reviewers to know how to handle and to be receptive to these approaches. Providing an introductory primer may be useful to prepare the field to accept and be ready to understand these newer approaches.

General question *(please respond to this question)*

- What could participants in the meeting collectively do before, during, and after the meeting to significantly impact the field of health behavior change and maintenance? Be as concrete as you can, and think boldly.

The field of health behavior change is being re-energized by the infusion of new disciplines and collaborators; we are moving well beyond the core behavioral and public health disciplinary focus. However, these integrated teams are limited in number, and few health behavior investigators know how to access or incorporate a stretch into a more multidisciplinary team (such as moving beyond behavioral science to include engineering, computer science, or even more traditional economics; and vice versa). Although we all are well familiar with the current mantra that complex behavior problems are best addressed with a multidisciplinary perspective, these integrated teams rarely cross into the more basic applied sciences (e.g., engineering, computer science). Participants can start to serve as ambassadors to try to introduce investigators in their own fields to the value of these collaborations and how to achieve them as well as reach out to investigators in non-traditional health behavior areas. Participants can start to collect some "case-based" learning examples of how to address questions of health behavior change from multiple lenses, what the contributions of various team members from different disciplines could be, and how the specific "needs" of each disciplines can be met through the collaborations. Prior to the meeting, participants can start to engage new collaborators from stretch disciplines in research discussions to start to develop some examples/principles of how these collaborations might gel. During the meeting, participants should set a goal to actively explore collaboration potentials with other participants from a different disciplines; and after the meeting, participants should work on products to disseminate and to train others. Some of these

products might be proposals for new ways of teaching health behavior change classes; symposia at “nontraditional” professional scientific meetings (not just SBM, for example), and development of papers for publication on the value of, models of collaboration, and guidelines for investigators at each stage of their career for moving in a multidisciplinary direction. Team science requires institutional buy-in as well (e.g., from promotion and tenure committees for junior investigators), and having some publications and ambassadors to champion and move consideration of team science forward is needed. Developing a special issue of several key journals that have broad reach in nontraditional behavior change fields may be useful following the conference.