

Science of Behavior Change Common Fund Program FY2010-2014

Human behavior accounts for about 40 percent of the risk associated with preventable premature deaths in the United States (Schroeder, 2007, *NEJM*). Health-injuring behaviors such as smoking, drinking, and drug abuse, as well as inactivity and poor diet are known to contribute to many common diseases and adverse health conditions. Unfortunately, there are still too few effective approaches to adopting and maintaining healthful behaviors over time, and validated approaches have not been widely adopted. It has been the goal of the Science of Behavior Change (SOBC) program to enhance understanding of the basic mechanisms of behavior change across a broad range of health-related behaviors, and in so doing, unite often disparate research fields and bridge the gulf between basic and clinical research, ultimately leading to more effective and efficient interventions.

Understanding the Mechanisms and Drivers of Behavior Change. Mechanisms of behavior change operate at multiple levels of analysis (e.g., social, contextual, behavioral, psychological, neurobiological, and genetic) and at multiple timescales to drive the initiation and maintenance of behavior change. As with a medical model, designing effective behavioral interventions is most difficult when one cannot identify intervening mechanistic processes or biomarkers in the disease process. Understanding basic mechanisms of behavior change allows for: 1) rational design of strategies targeting these mechanisms; 2) tests of target engagement by assessing the effect of interventions on mechanism-relevant biomarkers (at the appropriate level); and 3) approaching individual differences in response to intervention by their impact on bio(behavioral) markers. Furthermore, underlying behavioral mechanisms and contextual factors transcend disciplinary boundaries and understanding the common operative mechanisms can facilitate the design of interventions that are more efficacious, and that remain effective and efficient at scale.

Barriers to Progress in Behavior Change. Efforts to understand mechanisms common to problem behaviors have also been thwarted by the effective balkanization of different problem behaviors by their end disease state. Experts in the basic science of human behavior rarely interact with clinical scientists who seek to address significant health problems. While developing SOBC between 2007 and 2009, we found that 17 institutes, centers, and offices at NIH supported research in behavior change in a mission-specific way. As a result, in many cases, NIH program staff and grantees working on similar problems had never met or become aware of advances made in another research silo. Similarly, translation into clinical effectiveness is quite difficult, and not as linear a process as the term *translation* might imply. Nonetheless, these difficulties have, perhaps surprisingly, afforded significant opportunities for *use-inspired research*.

A Brief History of SOBC. SOBC was funded following a June, 2009 trans-NIH meeting of experts representing a wide range of scientific perspectives in basic and clinical research who recommended the NIH should focus on common mechanisms that could serve as putative intervention targets across diseases and health conditions.¹ This and other recommendations guided the development of two Funding Opportunity Announcements. The first announcement, RFA-RM-10-002² (“Science of Behavior Change: Finding Mechanisms of Change in the Laboratory and the Field”), funded ten R01 projects covering a range of behavioral problems from preventing excess weight gain in toddlers to smoking cessation and investigating levels of explanation ranging from molecular genetics to affective neuroscience to behavioral economics, united in their focus on mechanisms of change across diverse contexts and populations. The second announcement, PA-12-119³ (“Use-Oriented Basic Research: Change Mechanisms of Behavioral Social Interventions”), provided administrative supplement support to seven ongoing behavior change clinical trials in order to incorporate research on basic mechanisms into existing clinical studies. All SOBC projects are clustered around four broad classes of mechanisms: 1) stress and stress reactivity; 2) social

¹ <http://commonfund.nih.gov/behaviorchange/meetings/sobc061509/index>

² <http://grants.nih.gov/grants/guide/rfa-files/RFA-RM-10-002.html>

³ <http://grants.nih.gov/grants/guide/pa-files/PA-12-119.html>

factors; 3) emotions; and 4) cognitive processes (e.g., attention). Early results of these funded studies have supported the potential for these four areas to help us unify the science of behavior change.

Meetings for Behavior Change. SOBC has also sponsored several meetings aimed at breaking down disciplinary boundaries, catalyzing collaborations, and homing in on common mechanisms that guide behavior and behavior change. At the first annual meeting, funded investigators recommended studying mechanisms of change in the context of experimental manipulations, rather than relying on statistical modeling. The next two annual meetings leveraged other NIH-funded basic behavioral science by hosting combined grantee meetings with investigators supported by the NIH OppNet “Basic Mechanisms Influencing Behavioral Maintenance” and “Basic Research on Self-Regulation” RFAs⁴, where the use of behavioral, genetic, and neurobiological approaches to understanding mechanisms of habit maintenance and behavioral control across a range of behavioral and clinical domains were explored. A second trans-NIH expert meeting on use-inspired basic research⁵ (Revisiting Pasteur’s Quadrant: Use-inspired Basic Research) brought together our supplement program grantees and researchers incorporating basic research into clinical application. Bridging approaches ranging from mechanistically informed clinical interventions for psychopathology and drug abuse to community-based approaches to behavior change, this meeting revealed the value of designing interventions to explicitly test mechanisms and exploit new adaptive designs. A 2013 workshop on “Harnessing Neuroplasticity for Behavior Change” investigated the value added when neurobiological variables are included as moderators or mediators of desirable behavioral outcomes. Participant recommendations focused on the need to better understand interactions between behavioral and biological mediators of behavior change, environmentally sensitive interventions, individual differences, and the best use of animal models to probe neurobiological mechanisms.

Overall, these activities are creating a new climate where basic researchers tackle behavior change questions that are relevant to, and also studied within, the clinical context of intervention development research. SOBC has demonstrated that: 1) a diverse set of basic and clinical scientists support the need for a SOBC Common Fund Program; 2) the broader community of health behavior researchers appreciates the contributions of SOBC to advancing progress in meaningful behavior change; and 3) many barriers may be overcome by a better understanding of causative mechanisms.

The Future of SOBC. Three prominent themes have recurred in all SOBC activities, and these lay the groundwork for the next level of activity for SOBC. **First**, the centrality of a mechanistic understanding of change is more deeply appreciated, with the prospects of applying a more “medical model” to behavior change, if we can provide tools to more systematically define and measure key constructs. **Second**, the dialogue between clinical and basic scientists needs to be strengthened. Disorder-focused interventions targeting behavioral mechanisms may hold potential for application across an array of behavioral and clinical outcomes, and advances in basic research on behavioral mechanisms will enhance understanding of the etiology of multiple diseases, conditions, and life-course developmental outcomes. **Third**, a unified science of behavior change could reshape NIH’s future approach to the design of and investment in behavior change interventions. As one example outlining the approach, *mechanisms of self-regulation* may serve as a putative intervention target, yet its multiple facets are measured in different ways at many different levels of analysis. Having uniform definitions and measurement instruments could transform clinical research through the personalization of behavior change strategies or verification that putative target mechanisms have been engaged. Further, new approaches to trial design and the explicit incorporation of mechanistic hypotheses could enhance the value of clinical trials. SOBC is well-poised to continue this work, given our extensive contact with the range of basic and clinical researchers who will design the next generation of behavior change interventions.

⁴ <http://grants.nih.gov/grants/guide/rfa-files/RFA-HL-11-035.html> and <http://grants.nih.gov/grants/guide/rfa-files/RFA-AG-11-010.html>

⁵ <http://commonfund.nih.gov/behaviorchange/meetings/sobc102012/index>