Emerging Issues for the Next Generation of Behavioral and Social Scientists?

William Riley, Ph.D., Director, Office of Behavioral and Social Sciences Research, NIH

OBSSR Strategic Plan 2017-2021

"I cannot imagine a more exciting time than now to be a behavioral and social science researcher"

Four Foundational Processes

- Communication
- Program Coordination
- Training
- Policy and Evaluation

Three Scientific Priorities

- Improve the Synergy of Basic and Applied Behavioral and Social Sciences Research
- Enhance and Promote the Research Infrastructure, Methods, and Measures Needed to Support a More Cumulative and Integrated Approach to Behavioral and Social Sciences Research
- Facilitate the Adoption of Behavioral and Social Sciences Research in Health Research and in Practice

Transformative Opportunities

- Integrating Neuroscience into Behavioral and Social Sciences
- Transformational Advances in Measurement Science
- Digital Intervention Platforms
- Large-scale Population Cohorts and Data Integration

SCIENCE TRANSLATIONAL MEDICINE | EDITORIAL

POLICY

NIH's transformative opportunities for the behavioral and social sciences

Francis S. Collins is director of the U.S. National Institutes of Health (NIH), Bethesda, MD 20191, USA.

William T. Riley is director of the Office of Behavioral and Social Sciences Research, U.S. NIH, Bethesda, MD, USA. Email: wriley@mail.nih.gov

Emerging scientific and technological opportunities, such as new sensor tools that better characterize neurological, behavioral, and social processes, have the potential to produce a scientific paradigm shift in the behavioral and social sciences. This shift from a fragmented data-poor science to an integrated data-rich science facilitates greater translation from basic to applied research and from applied research to clinical practice. In November 2016, the U.S. National Institutes of Health (NIH) Office of Behavioral and Social Sciences Research (OBSSR) released its strategic plan for fiscal years 2017 through 2021, which seeks to take advantage of these scientific and technological developments (*1*). Here, we outline four key developments that influenced the scientific priorities of the OBSSR strategic plan, each of which offers the potential for accelerating research and translation in the behavioral and social sciences.

INTEGRATING NEUROSCIENCE INTO BEHAVIORAL AND SOCIAL SCIENCES

Advances in neuroscience experimental approaches and technologies provide an ability to observe brain function and activity in real time and with increasing levels of granularity (*2*), but these brain functions and activities do not occur in isolation; they are influenced by an organism's environment and are expressed as behaviors that, in turn, have the potential to influence the environment. To understand these complex dynamic interactions, [illegible]

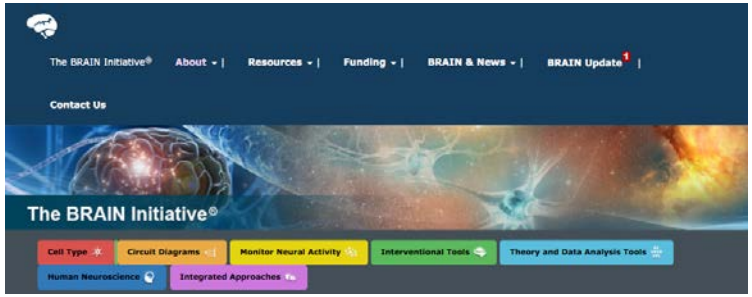
approaches have been improved greatly by the application of (i) modern psychometric theory (for example, item response theory) and (ii) smartphone technologies to obtain prospective, real-time assessments throughout the course of a day (for example, ecological momentary assessment). Digital footprints from routine interactions of people with technology provide new methods of capturing thought and behavior, and the rapid emergence of sensor technologies has provided an efficient and objective means for assessing physiology, behavior, and social and environmental contexts. The application of these scientific and technological advances to the measurement of behavioral and social processes provides a level of granularity and precision that has the potential to transform the behavioral and social sciences into a much more data-rich science (*3*).

DIGITAL INTERVENTION PLATFORMS

Advances in technology also hold the potential to transform the means by which behavioral and social science interventions are delivered. These interventions are often resource- and labor-intensive, which results in limited reach, scalability, and duration. The limited duration of these interventions negatively affects the ability to maintain behavioral change. The operationalization of these interventions into code ensures treatment fidelity from research to clinical practice settings and may extend their reach to anyone in any place at any time. Efficient delivery of behavioral and social change strategies via smartphones and [illegible]

Greater Integration with Neuroscience

Phase II:
#7. From BRAIN Initiative to the brain: Integrate new technological and conceptual approaches produced in Goals #1-6 to discover how dynamic patterns of neural activity are transformed into cognition, emotion, perception, and action in health and disease. The most important outcome of the BRAIN Initiative will be a comprehensive, mechanistic understanding of mental function that emerges from synergistic application of the new technologies and conceptual structures developed under the BRAIN Initiative.



Greater Integration with Neuroscience

CellPress

Neuron
Perspective

Neuroscience Needs Behavior: Correcting a Reductionist Bias

John W. Krakauer,[1,*] Asif A. Ghazanfar,[2] Alex Gomez-Marin,[3] Malcolm A. MacIver,[4] and David Poeppel[5,6]
[1]Departments of Neurology, and Neuroscience, Johns Hopkins University, Baltimore, MD 21287, USA
[2]Princeton Neuroscience Institute, Departments of Psychology and Ecology & Evolutionary Biology, Princeton University, Princeton, NJ 08540 USA
[3]Instituto de Neurociencias, Consejo Superior de Investigaciones Científicas & Universidad Miguel Hernández, Sant Joan d'Alacant, 03550 Alicante, Spain
[4]Neuroscience and Robotics Laboratory, Department of Neurobiology, Department of Mechanical Engineering, Northwestern University, Evanston, IL 60208, USA
[5]Department of Psychology, New York University, New York, NY 10003, USA
[6]Neuroscience Department, Max-Planck Institute for Empirical Aesthetics, 60322 Frankfurt, Germany
*Correspondence: jkrakau1@jhmi.edu
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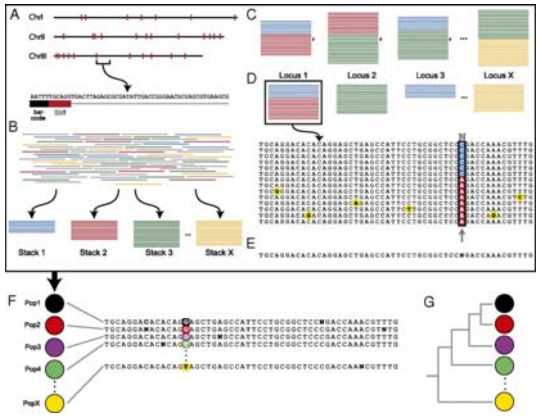
There are ever more compelling tools available for neuroscience research, ranging from selective genetic targeting to optogenetic circuit control to mapping whole connectomes. These approaches are coupled with a deep-seated, often tacit, belief in the reductionist program for understanding the link between the brain and behavior. The aim of this program is causal explanation through neural manipulations that allow testing of necessity and sufficiency claims. We argue, however, that another equally important approach seeks an alternative form of understanding through careful theoretical and experimental decomposition of behavior. Specifically, the detailed analysis of tasks and of the behavior they elicit is best suited for discovering component processes and their underlying algorithms. In most cases, we argue that study of the neural implementation of behavior is best investigated *after* such behavioral work. Thus, we advocate a more pluralistic notion of neuroscience when it comes to the brain-behavior relationship: behavioral work provides understanding, whereas neural interventions test causality.

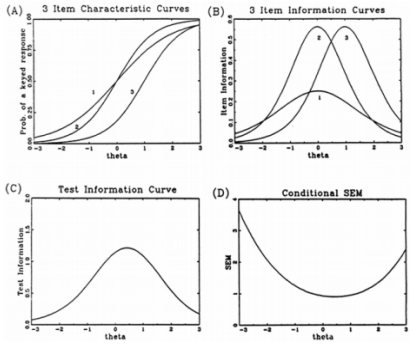
Transformational Advances in Measurement Science

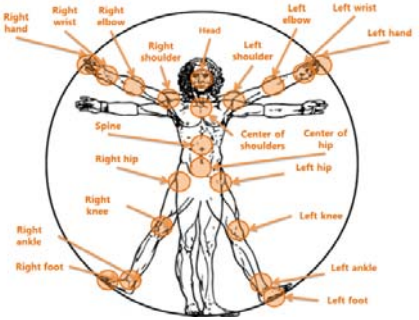


"Nearly all the grandest discoveries of science have been but the rewards of accurate measurement." Lord Kelvin, 1872

Transformational Advances in Measurement Science

- Item Response Theory (IRT) and Computer Adaptive Testing (CAT)
- Ecological Momentary Assessment (EMA)
- Passive Sensor Technologies
- Digital Footprints

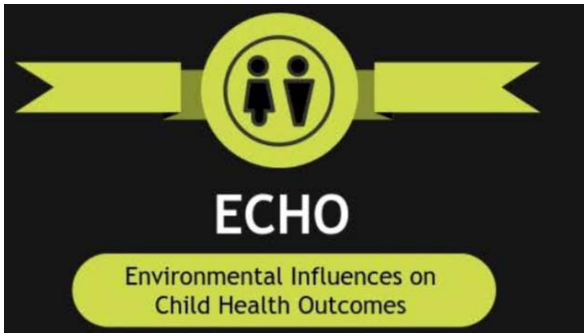




Digital Intervention Platforms

- Tech-based interventions can augment the provider-based intervention or fully automate the intervention
- Concerns: Fail to capture aspects of in-person interventions (difficult to operationalize or deliver)
- Benefits:
  - Delivered with greater fidelity
  - High initial fixed costs, but low variable costs
  - Increased reach and scalability (especially if fully automated)
  - Automate and embed outcome evaluation in intervention
  - Just-in-time Adaptive Interventions (JITAI)
- Cautions:
  - Mixed results from tech-based intervention studies
  - Sustaining engagement (stickiness)

Large Scale Population Cohorts and Data Integration

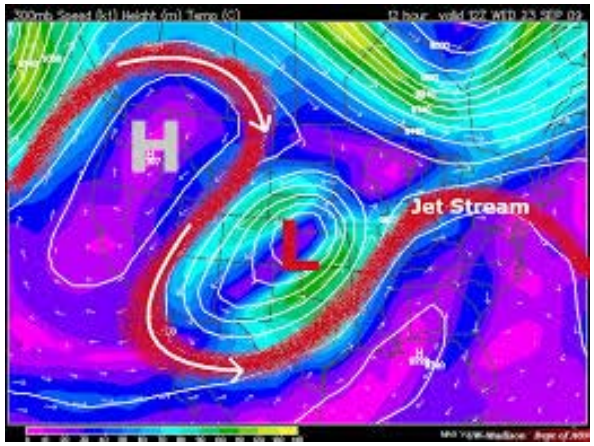


Research Methods in a Data Poor Environment

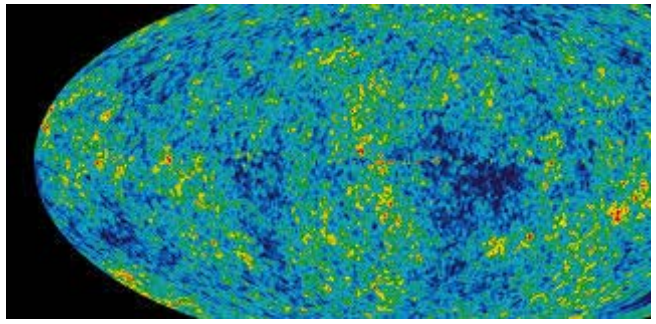
- Priority is on prospective design and data collection
- Limited data collection opportunities
- Predominately cross-sectional or minimally longitudinal designs
- Unable to assess or control myriad confounds
- Control confounds via randomization

Riley WT, A new era of clinical research methods in a data-rich environment. In BW Hesse, DK Ahern, E Beckjord, *Oncology Informatics*, 2016, pgs 343-355

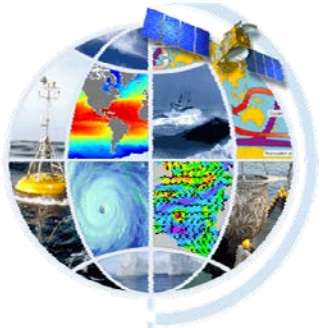
Research Methods in a Data Rich Environment



- Temporally Dense
- Computational
- Predictive



Evolution from Data Poor to Data Rich Meteorology Example

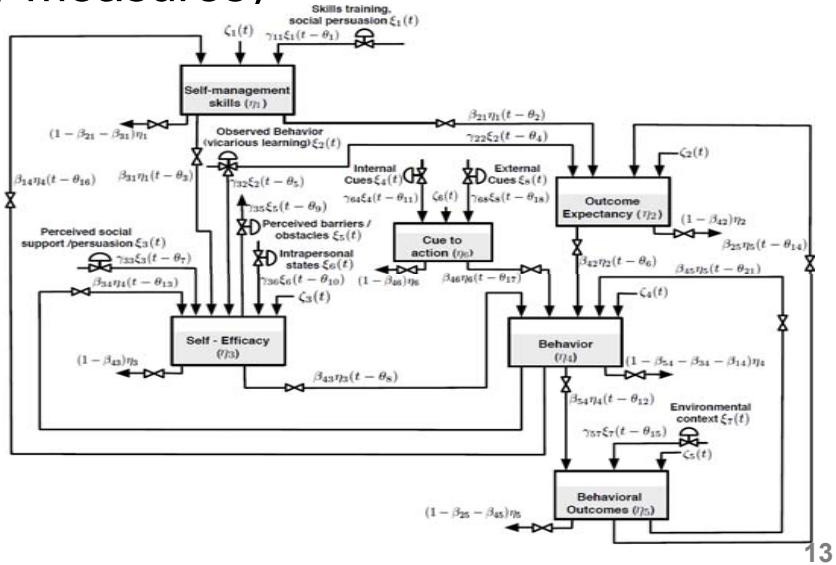


- Local, limited measurement
- Leverage communications technologies (telegraph) to connect data across sites
- Set standards for data integration
- Continued leveraging of technical advances in measurement and communication
- *Result: Rich, integrated data computationally modeled to explain and predict phenomena*

Is it possible for health research to become a data rich science?

On the Cusp of What We Need to be a Data Rich Science

- Temporally dense data on behavior and its influences
- Data Integration
  - Common Terminology (Behavioral Ontologies)
  - Common Metrics (Not necessarily measures)
  - Common Data Elements (CDEs)
- Data Science Capabilities
- Big Data Analytic Expertise



More on the OBSSR Strategic Plan

https://obssr.od.nih.gov/wp-content/uploads/2016/12/OBSSR-SP-2017-2021.pdf

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correspondence

Basic and applied behavioural and social sciences at the NIH

To the Editor — The National Institutes of Health (NIH) has a long-standing commitment to basic research[1,2], which extends to basic behavioural and social sciences research (bBSSR) that generates knowledge of how living systems interact with and are influenced by experiences at the individual, family, social, organizational, and environmental levels[1]. Consistent with its health mission, the NIH prioritizes bBSSR funding for projects that offer a plausible pathway to a health-relevant translation. Therefore, it is incumbent on bBSSR investigators applying for NIH funding to describe how discounting, and behavioural and neural links between speech delay and literacy.

To advance bBSSR, OBSSR seeks to integrate basic research efforts, not only across NIH institutes and centres, but also among the range of biological, behavioural and social disciplines that contribute to bBSSR. For example, advances in neuroscience approaches and technologies are providing an ability to study brain function and activity with increasing levels of granularity[4]. Since these brain functions evolved to regulate the physiology, behaviour and environment of the organism, the brain is better

research, however, appears increasingly less grounded in bBSSR. OBSSR, along with its various NIH partners, has worked to address this disconnect between basic and applied research via initiatives such as the Science of Behavior Change[6], and Translating I Science Disc to Reduce Ol improve info basic and ap science resea researchers c and that appl intervention

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COMMENTARY

Behavioral and Social Sciences at the National Institutes of Health: Methods, Measures, and Data Infrastructures as a Scientific Priority

William T. Riley
National Institutes of Health, Bethesda, Maryland

The National Institutes of Health Office of Behavioral and Social Sciences Research (OBSSR) recently released its strategic plan for 2017-2021. This plan focuses on three equally important strategic priorities: 1) improve the synergy of basic and applied behavioral and social sciences research, 2) enhance and promote the research infrastructure, methods, and measures needed to support a more cumulative and integrated approach to behavioral and social sciences research, and 3) facilitate the adoption of behavioral and social sciences research findings in health research and in practice. This commentary focuses on scientific priority two and future directions in measurement science, technology, data infrastructure, behavioral ontologies, and big data methods and analytics that have the potential to transform the behavioral and social sciences into more cumulative, data rich sciences that more efficiently build on prior research.

TBM PRACTICE AND PUBLIC HEALTH POLICIES

Behavioral and Social Sciences at the National Institutes of Health: adoption of research findings in health research and practice as a scientific priority

William T. Riley, PhD

Office of Behavioral and Social Sciences Research, National Institutes of Health, Bethesda, MD, USA
Correspondence to: W Riley
wriley@mail.nih.gov

Abstract
The National Institutes of Health's Office of Behavioral and Social Sciences Research (OBSSR) recently released its Strategic Plan for 2017 to 2021. This plan highlights three scientific priorities: (1) improve the synergy of basic and applied behavioral and social sciences research, (2) enhance and promote the research infrastructure, methods, and measures needed to support a more cumulative and integrated approach to behavioral and social sciences research, and (3) facilitate the adoption of behavioral and social sciences research findings in health research and in practice. This commentary focuses on the challenges and opportunities to facilitate the adoption of research findings in health research and in practice. In addition to the ongoing NIH support for dissemination and implementation (D&I) research, we must address transformative challenges and opportunities such as better disseminating and implementing D&I research, merging research and practice, adopting more rigorous and diverse methods and measures for both D&I and clinical trials research, evaluating technological-based delivery of interventions, and transitioning from minimally adaptable intervention packages to planned adaptations rooted in behavior change principles. Beyond translation into practice and policy, the OBSSR Strategic Plan also highlights the need for translation of behavioral and social science findings into the broader biomedical research enterprise.

Implications

Practice: Transformational opportunities such as the merging of research into practice and planned adaptations of evidence-based interventions should provide practitioners with greater flexibility to adapt evidence based interventions to the population, context, and resource constraints of the settings.

Policy: More rapid and readily available research findings from questions generated by policymakers and other research stakeholders should make behavioral and social sciences research more responsive to policy needs.

Research: The National Institutes of Health and the Office of Behavioral and Social Sciences research support for more rigorous and diverse methods and measures, for research designs more readily translated into practice and for continued dissemination and implementation research should facilitate the adoption of behavioral and social sciences research into practice, policy, and the broader biomedical research enterprise.

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