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Enhancing Lives via Interdisciplinary Translational Science (EnLITS): A Circumplex Model for the Social-Behavioral- Educational Fields

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The Context for Translation in the Social-Behavioral-Educational (SBE) Sciences

The significance of contemporary societal problems, including those associated with physical and mental illness, delinquency, violence, substance abuse, educational disparities, and school dropout is staggering. The causes of social, behavioral, educational and health challenges, as well as disparities among racial and ethnic groups, are multifactorial, making solutions complex. Indeed, these types of social problems are affected by a range of factors and ecological influences, including those residing at the individual (developmental, physiological, neurological, behavioral), interpersonal, organizational, environmental, relational, societal and political levels.

However, research efforts associated with these challenges are typically fragmented. Common are separate investigations that explore effects of single causal or intervention components such as biological and/or neurological determinants, social correlates, environmental factors, promising intervention techniques, or field-based implementation; few provide integrated and coordinated study of these interrelated processes. The typical model for translational research -- bridging basic research, intervention development, controlled trials, practice investigations, scale-up studies, public awareness and policy initiatives -- requires a lengthy and laborious process that is neither responsive to demands for innovation nor efficient in addressing critical and timely problems. Even in the biomedical community, where efforts at translation have been underway for decades, only one in ten discoveries from basic science is implemented in clinical practice within 20 years (Contopoulos-Ioannidis, Ntzani, & Ioannidis, 2003).

A synergistic approach for the social-behavioral-educational (SBE) sciences that synthesizes a range of research strategies across scientific and translational levels (e.g., laboratory, controlled trials, field application, scale-up, sustainability) in a simultaneous, coordinated manner, and that links individual and community level factors, will be more effective and efficient in uncovering and delivering solutions than typical isolated and siloed approaches. Failure to consider the inter-connections across ecological levels and disciplinary boundaries perpetuates inefficiencies and may reduce the impact of scientific advances. For example, in the area of childhood obesity, an isolated focus on biology, physiology, and nutrition without examining environmental and sociocultural factors may lead to advances in niche areas but will ultimately prolong solutions to a complex problem that must be addressed at multiple levels.

The Translation of Science

According to the National Institutes of Health, "*Translational research* includes ...the process of applying discoveries generated during research in the laboratory, and in preclinical studies, to the development of trials and studies in humans... [and] research aimed at enhancing the adoption of best practices in the community. Cost-effectiveness of

prevention and treatment strategies is also an important part of translational science” (NIH, 2007). Following this tradition, we define translational research in the SBE sciences as *the recursive, bidirectional process of integrating scientific knowledge and research-based discoveries into community and societal practices and policies.*

Translational research is transdisciplinary by nature. In the SBE realm, it is concerned with understanding the efficient and effective integration of scientific efforts as they occur across a continuum from and through interactions across the laboratory to controlled field sites to communities and population centers, with the sole purpose of addressing complex, intractable social, behavioral, mental health and educational problems through practice and policy changes. Beyond the need to bridge discoveries from scientific investigations occurring in a range of settings, translational research is synergistic: It creates the potential for developing new methods of inquiry and even greater efficiencies in the discovery of solutions through permeable, multidirectional inquiry.

Despite its promise, initiating and sustaining translational, transdisciplinary research in the SBE sciences is challenging. To be effective, SBE translational research must address multiple segments across a scientific continuum:

- a) discern the mechanisms that potentially link different determinants of a particular condition or problem as they are studied within and across different developmental periods, ecological contexts and disciplinary realms;
- b) develop prevention or intervention strategies that either target or consider these mechanisms, determinants and contexts to ameliorate social, behavioral, educational, and mental health problems;
- c) experimentally test prevention and intervention efforts within and between settings;
- d) implement effective interventions in different contexts and natural conditions, as well as at scale; and ultimately
- e) inform policy as it relates to enhancing human lives.

A translational approach in SBE fields must account for how proximal (e.g., genetic make-up, biological/pathophysiological factors, family structures) and distal (e.g., social, geographic, economic, policy) factors simultaneously interact to affect individuals and social subgroups in unique ways. By necessity, SBE translational research needs to combine methodologies, including those used in *laboratory settings* (e.g., uncovering biomarkers, analyzing interactions), *highly controlled clinical contexts* (e.g., conducting comparative effectiveness research of variant interventions), *field-based environments* (e.g., employing community-based participants in informing, interpreting, and implementing research and research-informed practices), *communication and outreach channels* (e.g., messaging and dissemination techniques, strategies, and programs resulting in broad accessibility of research findings), and the *policy arena* (e.g., understanding of potential personal, environmental, economic, political, and societal facilitators and barriers to uptake).

Unfortunately, translation in SBE fields is plagued with more rhetoric than real solutions. There is a shortage of investigators who know how (or who are inclined) to transcend their own disciplinary walls, address the challenges, and collaborate in a way that will transform

their own work for the ultimate advancement of ameliorating social problems and enhancing lives. Indeed, traditional researchers are bound not only by tradition, but by structure and design. Disciplinary research methods tend to be inflexible and inefficient, without the ability to generalize beyond individual labs or create real meaning in authentic settings where children, adolescents, adults, and social groups reside. The physical and cultural separation of basic and applied social-behavioral sciences can limit opportunities for researchers to network and interact in a transdisciplinary fashion with researchers who have skills that complement their own. Finally, organizational structures and incentives do not encourage “team science” or long-term, sustained university-community partnerships. Based on the challenges of translating science, more efforts are needed toward understanding the science of translation.

The Science of Translation

Existing programs of transdisciplinary, translational medical and health research (e.g., Indiana Clinical and Translational Sciences Institute, Michigan Institute for Clinical and Health Research, Midwest Area Research Consortium) address health and medical problems from a “bench to bedside” perspective. Advances in the medical field around conditions such as HIV/AIDS (see <http://aidsinstitute.ucla.edu/body.cfm?id=56>) are noteworthy. Unfortunately, similar advances to target and reduce significant *social* problems are less prevalent. There is currently a dearth of empirical understanding associated with the full range of translation for social, behavioral, educational, and mental health problems with an emphasis on “bench to behavior.” Delays in advancing translational research in the SBE sciences may be due in part to (a) a reliance on traditional notions of translation informed heavily by medical rather than transactional or ecological models (Evans, 2012), and (b) fragmented attention on *segments of the translation continuum* (i.e., translation of science) devoid of understanding the *mechanisms and processes underlying effective translation* (i.e., the science of translation).

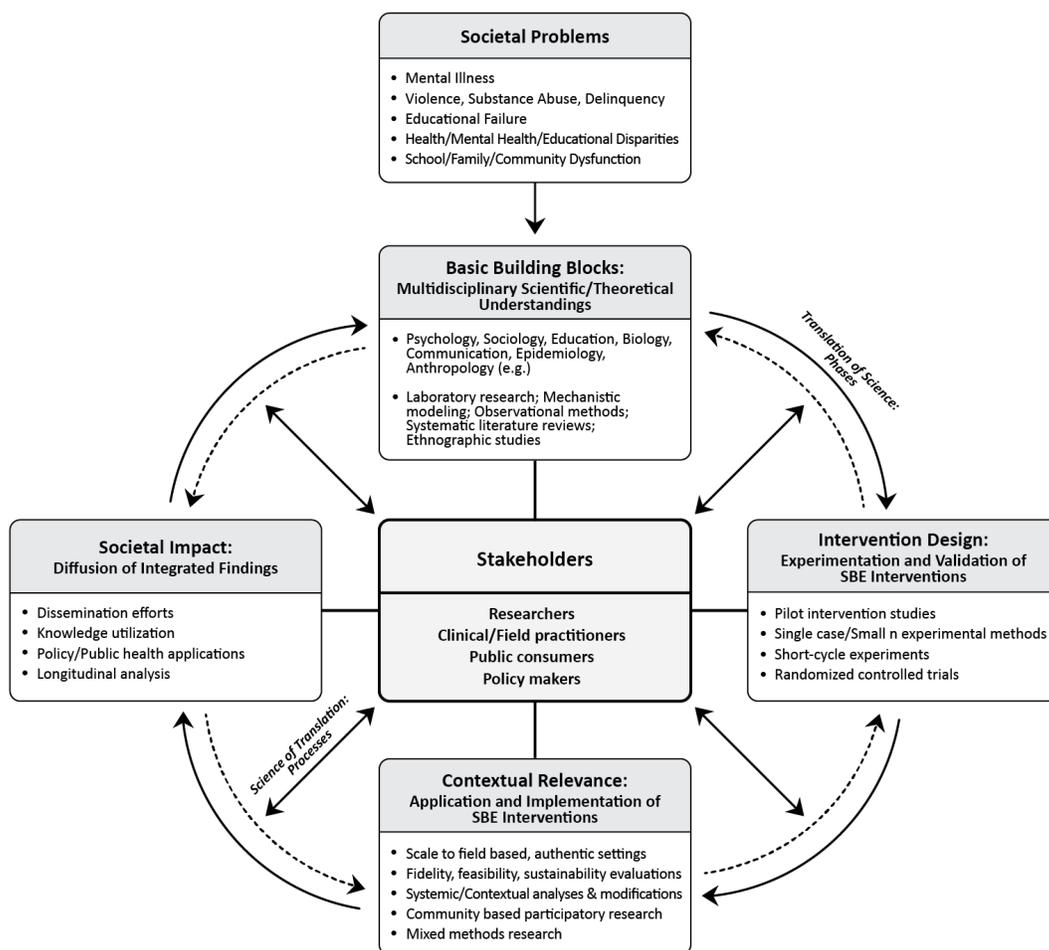
There is a woeful lack of understanding about the *science of translation*, or *how* this very difficult work happens (e.g., what education, training, scientific, and organizational structures are necessary for success). Little is actually known about the strategies, structures, and processes of translational research that influence the capability and probability of diverse researchers from distinct disciplines collaborating effectively to solve significant social, behavioral, educational, and mental health problems. Barriers such as discipline-centric terminologies, traditional methodological approaches, time constraints, and narrowly conceived and executed dissemination strategies are significant.

To accelerate the transmission of knowledge across the spectrum of theory, experimentation, implementation and diffusion, an ***augmented translational research approach*** specific to the SBE sciences is needed. Necessary are fundamental understandings of the science behind translational processes and methods (actions) for optimally linking individual and community level factors and integrating scientific disciplines to inform and be informed by practice and policy (National Research Council, 2012). Core knowledge about methods for developing, implementing, and utilizing findings from transdisciplinary investigations, and an infrastructure where that knowledge is

located, will accelerate efforts to translate findings along the continuum of theoretical or basic research to community-based application in the most feasible and efficient manner. Until we better understand the optimal *processes and conditions* that best facilitate translational research across the SBE sciences, it is unlikely that far-reaching, solution-based translational research within the SBE fields will happen.

A conceptual schemata depicting the relationships between translational processes and actions – and the research needs and opportunities therein – is depicted as a circumplex model in Figure 1. As shown in the box labeled “Societal Problems,” the SBE translational process is driven by a critical need to solve complex social, behavioral, educational and mental health problems that are beyond the means of any single discipline or method to address comprehensively. Collaborative partnerships across social scientists, practitioners, policy makers and other stakeholders may lead to enhanced and multifaceted understanding of underlying social problems, thereby leading to more productive avenues of scientific inquiry. This type of collaboration has the potential to produce more relevant research with more effective and timely impact.

Figure 1
Circumplex Model of Translational Science Processes and Actions



The central role of basic research in the translational approach is reflected in the “Basic Building Blocks” box. This essential work utilizes highly specified experimental methods that can but do not necessarily occur in contrived laboratory settings (e.g., lab studies examining underlying processes, intensive ethnographic and observational methods) and occurs across disciplines that include, but are not limited to, the SBE sciences. Proceeding clockwise in the circumplex figure, the next step, “Intervention Design,” encompasses efforts to validate interventions developed and informed by basic science. These validation efforts may progress in scope and rigor from single subject designs to large-scale randomized controlled trials (RCTs), to establish an evidence base for specific interventions. The “Contextual Relevance” box reflects efforts to move evidence-based prevention and intervention efforts from controlled environments to the ecological settings in which they will ultimately be delivered (e.g., schools, community agencies, clinics). Questions addressed at this stage center on the feasibility, ecological validity, and generalizability of interventions and their outcomes to children, families, and adults in “real world” environments. Building on this, “Societal Impact” captures the work needed to disseminate effective interventions more universally in relevant community and practice contexts. Primary vehicles for accomplishing this include policy and regulatory actions as well as public health initiatives that promote the incorporation of newly validated interventions into routine practice. This approach incorporates communications, policy, and implementation sciences.

At the center of Figure 1 are the myriad “Stakeholders” whose lives and work inform and influence (and are informed and influenced by) the translational process. Chief among these stakeholders are members of the public who are impacted by various social, behavioral, educational and mental health problems within their immediate (personal, family) and distal (community) contexts. Also involved are researchers, practitioners and policy makers, all of whom stand to gain significantly through an effective translational process, thereby heightening the relevance of transactions and relationships (i.e., translational processes) between research and practice. The model portrays an alliance of stakeholders working together to better understand complex social problems, identify relevant research questions and designs pertaining to these problems, and implement real-world solutions that improve the lives of people.

Importantly, our model reflects that translation is not linear, but includes a feedback loop in which findings and information obtained at any stage may lead to changes at other stages (see bidirectional arrows on the perimeter of Figure 1). For instance, if an intervention that is effective when delivered by highly trained professionals in the context of a RCT proves too cumbersome for practitioners in the field, this information can inform the modification and further evaluation of the effectiveness of that intervention. This feedback loop is needed to ensure continual improvement of interventions over time. The *methods* that best foster a bidirectional flow between phases of the translational continuum have not been clearly delineated.

Relatedly, the spoke-like arrows linking translational activities to stakeholders represent the *processes* by which translational science is best conducted (i.e., the science of translation). These arrows are also bi-directional. They reflect the two-way relationship

between the translational phases and stakeholder groups (i.e., public, practice community, policymakers, researchers), and the symbiotic nature of practice-informed research and research-informed practice (Wethington, Herman, & Pillemer, 2012). Here we are also interested in processes associated with “team science,” or how interdisciplinary teams work with each other and with various relevant stakeholders to acquire, contribute, transmit and transform knowledge necessary for full translation. Specification of process variables such as bidirectional communication channels, decision-making processes, and knowledge utilization methods are germane.

Through our initiative we seek to study, understand, and share our knowledge of both translational actions (what) and processes (how) as a means to improve translational research in the SBE sciences. We seek to help researchers from the SBE sciences bridge so-called “translational chasms” (Drolet & Lorenzi, 2011) by identifying strategies to foster an efficient flow of information across the translational cycle, and improving the relevance of scientific information. We aim to do this by investigating simultaneously the specific strategies for moving scientific information and findings across translational phases (i.e., focusing on what is translated) and the mechanisms or processes by which teams and stakeholders coalesce, collaborate and communicate within and across the translational cycle (i.e., how the translation of scientific information and findings occurs).

Need for Translational Science Initiative

There is a ***significant need*** to establish an innovative transdisciplinary, translational research initiative in the SBE sciences. The specific aims of this initiative are two-fold. First, the initiative will ***uncover various aspects (phases and processes) of translation*** that are most effective in addressing a range of significant social, behavioral, educational and mental health challenges plaguing society. Through empirical evaluation of *transdisciplinarity*, we will delineate the essential elements of translational work that break down traditional disciplinary boundaries and promote efficient, effective solutions to complex social, behavioral, educational and mental health problems. With the advent of this comprehensive transdisciplinary translational initiative, we will pioneer new methods for investigating problems and integrating scientific discoveries; facilitate cross-cutting and efficient means for translating, implementing, and sustaining evidence-based prevention and intervention programs in real-world settings; and prepare the next generation of a new type of researcher equipped to effectively foster translation of research findings to applied problems and policies.

Second, we will apply the knowledge gained about the science of translation to ***ameliorate specific social, behavioral, educational, and mental health problems*** by targeting specific substantive issues in these areas that impede individual, familial, social, and societal health. Through advanced understanding of the mechanisms by which meaningful integration of researchers from multiple disciplines and across the basic, applied, community and policy spectrum occurs, translational researchers will provide critical core support to augment the efficient translation around targeted SBE research. Relatedly, structures developed as a product of this initiative will serve as a hub to inform significant training, practice and policy advances among researchers in the SBE sciences, but whose

efforts in this arena may be limited to a narrow disciplinary perspective. This initiative will synergize local translational research, and ultimately will be the foundation for a larger, Great Plains translational research center.

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