Defining Dysfunction: Clinical Psychology's New Frontier

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Diagnosing physical ailments used to depend exclusively on symptoms and observations, but a prodigious surge in new technology has provided 21st century medicine with an array of precision diagnostic tools — from biomarkers to genetic testing — that have fueled astounding progress in defining and treating illness.

Over the past decade, comparable breakthroughs in cognitive science, neuroimaging, and genomics have led to unprecedented headway in the understanding of mental illness, but these new biologically based findings do not always fit neatly within the current symptom-based diagnostic categories.

In 2009, the US National Institute of Mental Health (NIMH) initiated an ambitious project to develop the necessary database to derive a new framework for psychopathology research based on behavioral dimensions and neurobiological measures — the Research Domain Criteria Project (RDoC). Where the current standard in diagnostic criteria — the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM*) — relies purely on observable symptoms to classify mental illness, RDoC aims to utilize systematic neuroscience to study psychopathology based on cognitive domains and biological features.

"Unlike our definitions of ischemic heart disease, lymphoma, or AIDS, the *DSM* diagnoses are based on a consensus about clusters of clinical symptoms, not any objective laboratory measure," Thomas R. Insel, the director of NIMH, wrote on his blog. "In the rest of medicine, this would be equivalent to creating diagnostic systems based on the nature of chest pain or the quality of fever."

Six years after the project's debut, presenters at the Society for a Science of Clinical Psychology Symposium at the 2015 APS Annual Convention in New York City addressed the potential risks and rewards of RDoC's growing role in clinical psychological science.

APS Fellow Bruce Cuthbert, director of the new RDoC unit at NIMH, kicked off the symposium with a summary of RDoC's mission and an update on new developments.

One of the key goals of RDoC is to provide a broad framework for conducting research on mental disorders from a wholly new perspective. The RDoC framework can be illustrated by a matrix, in which specified functional dimensions of behavior, "research constructs," form the rows of the matrix. Each these constructs, in turn, is grouped under one of five domains:

- Negative Valence Systems (e.g., fear, loss),
- Positive Valence Systems (e.g., willingness to work, responsiveness to reward),
- Cognitive Systems (e.g. sensory perception, working memory),
- Systems for Social Processes (e.g., facial communication, self-knowledge), or
- Arousal/Regulatory Systems (e.g., circadian rhythms, sleep and wakefulness).

The columns of the matrix are comprised of units of analysis that represent different classes of variables that can be used to study each construct, such as genes, molecules, cells, neural circuits, physiology, behaviors, self-reports, and paradigms.

Rather than constraining research to clusters of symptoms, the goal of the RDoC matrix is to allow researchers the flexibility to craft studies that optimally address their research questions. To foster this new approach, the RDoC unit at NIMH has opened a new online discussion forum, where investigators and clinicians can freely converse and collaborate with each other around the RDoC framework. They are also strongly encouraged to share their data in an RDoC database. As the number of data sets increases, researchers will be able to mine the data to identify patient subgroups and ultimately develop better-tailored treatments.

"The road to better therapeutics starts with better diagnostics, and that's where RDoC comes in," Cuthbert concludes.

Eva Henje Blom (Karolinska Institutet, Sweden, and University of California, San Francisco) is using RDoC to design and implement novel, and hopefully more effective, treatments for adolescent depression. In her work with teenagers, she struggles with the low diagnostic validity of the DSM system and the diversity of symptoms and comorbidities occurring in teenage depression. Depression symptoms often are expressed differently across the lifespan and between genders. Henje Blom's current study, Training for Awareness, Resilience, and Action (TARA), aims to develop and test the feasibility of a novel treatment program using the RDoC-based framework for identifying the symptoms and neuro-circuitry specific to the psychopathology of depression in adolescents.

"We have identified the major RDoC domains of function involved in adolescent depression and organized them in a way that gives priority to domains thought to be driving the psychopathology," she says.

For example, adolescents suffering from major depression consistently show hyperreactivity to emotional stimuli in limbic neural circuits. which is hypothesized to effect brain development and increase their risk for emotional impulsivity and rumination.

Still in the early stages, the TARA intervention is a 12-week program during which teens meet weekly with peers and two teachers, one clinician, and one yoga/mindfulness teacher to learn bottom-up regulation and increase interoceptive awareness. For example, patients learn yoga-inspired breathing techniques to help increase vagal and sensory afference. These practices are designed to reduce limbic hyperactivation, and help the teens find strategies to calm themselves down.

However, not all speakers at the symposium supported RDoC without reservations in its current form. Jerome Wakefield of New York University, concerned about RDoC's approach to identifying mental disorders, invoked the famous words of Ludwig Wittgenstein: "In psychology there are experimental methods and conceptual confusion … The existence of the experimental method makes us think we have the means of solving the problems that trouble us; though problem and method pass one another by."

Wakefield critiques RDoC for lacking any serious conceptual component that might effectively connect its ambitious empiricism with the conceptual problems of diagnosis it aims to resolve.

RDoC, Wakefield said, is based on the assumption that because all mental processes take place in brain tissue, therefore all mental disorders must be brain disorders. To illustrate the invalidity of this inference, Wakefield uses the analogy of computers: All software runs in hardware, but not all software malfunctions are hardware malfunctions.

"It's taking place in brain tissue, but may be no brain disorder. What's disordered may be taking place strictly at the psychological level," Wakefield explains. "Slapping down criteria based on circuit activation does not make something a disorder."

Some have voiced similar concerns that the RDoC framework is too reductionist, with an overemphasis on neural circuits and genetics. However, in her presentation, Joan Kaufman (Yale School of Medicine, the Kennedy Krieger Institute, and Johns Hopkins) argued that emerging findings on neuroplasticity and epigenetics counter this argument.

"Old dichotomies of nature versus nurture are obsolete. The dynamic interactions among genes and environment, experience, and the brain, are innumerable," she said. "Understanding these dynamic interactions is at the core of the RDoC mission."

For example, there is wide agreement that the effects of severe stress are mediated by changes in brain structure and function. However, the clinical significance of these brain changes is not understood — and the nature of the gene–environment interactions fueling these brain changes continues to be elusive.

Kaufman has been using the RDoC in her own research on maltreated children and cites several advantages to this framework over *DSM* for her field of research. Children who experience maltreatment are at high risk for developing a wide range of psychiatric problems, including post-traumatic stress disorder, depression, and substance use disorders. These various conditions frequently co-occur and often persist into adulthood. Anxiety, mood, and substance use disorders are associated with alterations in interlocking brain circuits, with each of these brain circuits included in the RDoC matrix.

"The brain is not organized according to the *DSM*," Kaufman remarked. But integrating multiple units of analysis will shift progress forward in optimizing treatments for mental illness.

Reference

Insel, T. (29 April, 2013). Director's blog: Transforming Diagnosis. Retrieved from http://www.nimh.nih.gov/about/director/2013/transforming-diagnosis.shtml