Research Domain Criteria: cognitive systems, neural circuits, and dimensions of behavior

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Current diagnostic systems for mental disorders were established before the tools of neuroscience were available, and although they have improved the reliability of psychiatric classification, progress toward the discovery of disease etiologies and novel approaches to treatment and prevention may benefit from alternative conceptualizations of mental disorders. The Research Domain Criteria (RDoC) initiative is the centerpiece of NIMH's effort to achieve its strategic goal of developing new methods to classify mental disorders for research purposes. The RDoC matrix provides a research framework that encourages investigators to reorient their research perspective by taking a dimensional approach to the study of the genetic, neural, and behavioral features of mental disorders. RDoC's integrative approach includes cognition along with social processes, arousal/regulatory systems, and negative and positive valence systems as the major domains, because these neurobehavioral systems have all evolved to serve the motivational and adaptive needs of the organism. With its focus on neural circuits informed by the growing evidence of the neurodevelopmental nature of many disorders and its capacity to capture the patterns of co-occurrence of behaviors and symptoms, the RDoC approach holds promise to advance our understanding of the nature of mental disorders.

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Introduction

Although many important discoveries have been made in the study of cognition, neuroscience, and mental illness, there is growing frustration with the rate of translation of these efforts into understanding of etiological foundations and new treatments. One important contributing factor to the slow rate of progress is the widespread reliance of research projects on categorical, symptom-based diagnostic systems such as the *Diagnostic and Statistical Manual of Mental Disorders (DSM)* and the *International Classification of Diseases (ICD)*. Although these systems have contributed greatly to the reliability of psychiatric diagnoses made for research and clinical purposes, their categories and criteria were formulated before modern neuroscience, and the validity of the diagnoses is accordingly questionable. Progress toward understanding and treating mental illness has been hindered by the scientific focus on diagnoses that do not reflect the organization of neural circuits and their associated behaviors. For cognitive processes, as with other areas of research on mental disorders, burgeoning knowledge about fundamental programs of behavior, and their implementing neurobiological circuitry, mandates a shift in thinking about the classification of psychiatric disorders.

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The Research Domain Criteria project

To encourage scientists to break free of categorical diagnostic constraints and realign mental illness research with the knowledge gained from the accelerating pace of findings regarding the relationship of genetic and neural factors to behavior, the National Institute of Mental Health has initiated the Research Domain Criteria (RDoC) project. This initiative represents the implementation of Strategy 1.4 of the NIMH Strategic Plan, to "Develop, for research purposes, new ways of classifying mental disorders based on dimensions of observable behavior and neurobiological measures.[1]" The long-term goals of the project are to validate tasks for use in clinical trials, identify new targets for treatment development, define meaningful clinical subgroups for the purpose of treatment selection, and provide a pathway by which research findings can be translated into changes in clinical decision making. In the near term, efforts under the RDoC initiative will focus on identifying broad domains of functioning and their constituent dimensional constructs, developing reliable and valid measures across a range of units of analysis for each construct, and supporting studies to determine the full range of variation present in clinical and nonclinical populations with respect to the various domains. As discussed in more detail below, the RDoC organization has been represented as a two-dimensional matrix with domains (and constituent constructs) as the rows, and the various units of analysis as the columns.

Two developments in recent years helped to "set the stage" for the RDoC project to germinate and gain momentum. First, the revision of the *DSM* in preparation for the publication of the fifth edition stimulated discussions about the role of neuroscience in disease classification and the various reasons why neuroscience has not yielded progress commensurate with the promise of new technologies for understanding brain function.[2] The concern was raised that perhaps, through decades of focus on refinement, revision, and expansion of *DSM* diagnoses, diagnostic categories that precede modern neuroscience have become reified; in turn, this situation has impeded progress in the search for behavioral, neural, and genetic signals that will allow an understanding of etiology and guide the development of novel treatments.[3] These discussions provided a backdrop for the consideration of alternative systems for classifying mental disorders.

Secondly, the conceptualization and implementation of RDoC was influenced by the NIMH's Measurement and Treatment Research to Improve Cognition in Schizophrenia (MATRICS) initiative. The primary goals of the MATRICS project were to develop a consensus battery for measuring cognition in schizophrenia, to develop guidelines for the design of trials investigating cognition-enhancing medications based on consensus among the pharmaceutical industry, academia, NIMH, and the US Food and Drug Administration, and to assist NIMH in shaping its research priorities in this area.[4] A related project, the Cognitive Neuroscience Treatment Research to Improve Cognition in Schizophrenia (CNTRICS) initiative, grew out of the "New Approaches to Cognition" meeting conducted under MATRICS. CNTRICS was focused on translating the knowledge and methods of cognitive, social, and affective neuroscience into a set of cognitive systems and processes to be targeted for treatment and measurement using standardized, psychometrically sound measures in behavioral as well as neuroimaging studies.[5] Although both MATRICS and CNTRICS focused on one clinical concern (cognition in schizophrenia), their rigorous focus and collaborative process—distilling a large and nuanced literature to a manageable number of well-defined domains, followed by standardization of measurement—provided a template for the processes by which RDoC has advanced. In a parallel but more comprehensive initiative, RDoC aims to define major domains for the study of mental illness and validate them using optimal genetic, neuroscientific, physiological, behavioral, and self-report measures.

The RDoC matrix

The RDoC scheme can be represented as a two-dimensional matrix *(Table I)*. The rows represent the "dimensions of observable behavior and neurobiological measures" specified in Goal 1.4 of the NIMH Strategic Plan. These dimensions are referred to as "constructs" to represent their status as concepts regarding brain organization and functioning that evolve with advances in research. In turn, constructs are grouped under five superordinate domains of activity, which reflect a conceptual typology of functions as well as empirical relationships among activity in related brain circuits.

The columns of the matrix represent various units (or levels) of analysis that can be used to measure the var-

ious constructs, with the former term preferred to emphasize the integrative approach. The units of analysis are as follows: genes, molecules, cells, circuits, physiology, behavior, and self-report. Genes, molecules, and cells are self-apparent (although in many cases, direct assessment of molecules and cells in functioning humans remains problematic). The "Circuits" unit of analysis refers to measures that can index the activity of neural circuits, either through functional neuroimaging or through recordings previously validated as circuit indices (eg, fear-potentiated startle). "Physiology" refers to well-established measures that have been validated in assessing various constructs, but that do not measure circuit activity directly (eg, heart rate, cortisol). "Behavior" may refer either to systematically observed behavior or to performance on a behavioral task such as working memory. There is also a separate column for paradigms, in which scientific tasks that are especially useful for the study of the construct are noted.

	Units of analysis							
Domains/constructs	**Genes**	**Molecules**	**Cells**	**Circuits**	**Physiology**	**Behavior**	**Self-reports**	**Paradigms**
Negative valence systems								
Active threat ("fear")								
Potential threat ("anxiety")								
Sustained threat								
Loss								
Frustrative nonreward								
Positive valence systems								
Approach motivation								
Initial responsiveness to reward								
Sustained responsiveness to reward								
Reward learning								
Habit								
Cognitive systems								
Attention								
Perception								
Working memory								
Declarative memory								
Language behavior								
Cognitive (effortful) control								
Systems for social processes								
Imitation, theory of mind								
Social dominance								
Facial expression identification								
Attachment/separation fear								
Self-representation areas								
Arousal/regulatory systems								
Arousal and regulation (multiple)								
Resting state activity								

Table I. Research Domain Criteria Matrix. "Circuits" can refer to measurements of particular circuits as studied by neuroimaging techniques, and/or other measures validated by animal models or functional neuroimaging (eg, emotion-modulated startle, event-related potentials). "Physiology" refers to measures that are well-established indices of certain constructs, but that do necessarily not tap circuits directly (eg, heart rate, event-related potentials). "Behavior" can refer variously to behavioral tasks (eg, a working memory task), or to behavioral observations. "Self-reports" refer to interview scales, questionnaires, or other instruments that may encompass normal-range and/or abnormal aspects of the dimension of interest. It should be noted that the constructs for the cognitive systems domain were adapted from those identified through the CNTRICS effort. The Systems for Social Processes and Arousal/Regulatory domains and associated constructs are considered to be in draft form pending the workshops to be completed in 2012.

The cells at the intersections of constructs and columns are populated by research findings. Overall, the RDoC matrix structure is intended to facilitate integration of existing research findings and foster the identification of gaps in the knowledge base that represent promising areas for integrative research.

How will the RDoC matrix actually function as a classification system for experimental purposes? For perspective, it may be pointed out that the current system imposes three constraints upon the independent variable (ie, group classification) in psychiatric studies: first, symptoms are the unit of analysis that must be utilized; second, particular constellations of symptoms must be employed (ie, the *DSM* polythetic criteria or their *ICD* equivalents); and third, the symptoms must be employed (with rare exceptions) simply to render a binary, diagnosis present/absent decision rather than being quantified in any way. RDoC is intended to free investigators from these constraints. An element from any unit of analysis may be the independent variable. In a study of working memory, performance on a working memory task could be the independent variable (possibly stratified by particular genetic polymorphisms), and activation of relevant working memory areas (as measured by fMRI) and real-world functional capacity might be dependent variables. As another example, patients presenting with internalizing (mood or anxiety) disorders might be classified along a dimension of their overall symptom reports of distress (but independent of *DSM* diagnosis), and fear circuit activation in some relevant task (eg, imagery, film clips) might be assessed in order to test the hypotheses that increasing severity and/or chronicity of distress are associated with hyporeactivity in fear activation circuits. In each case, the independent variable cannot be assigned until after the experimental procedures are conducted; because the independent variable is dimensional, however, this does not necessarily pose problems in statistical power or matching subjects in groups. As these examples imply, the choice of which units of analysis to use as independent and dependent variables depends upon the research question.

Particularly in the early phases of studies using the RDoC approach, it may be heuristic for investigators to report the number of participants in study samples who meet diagnostic criteria for various *DSM* primary diagnoses in order to facilitate comparisons with traditional and RDoC classification. However, it should be noted that one major emphasis of Strategic Aim 1.4 is to delineate the entire range of a particular dimension, notably including patients who fall short of traditional diagnostic criteria or who may have an NOS (Not Otherwise Specified) diagnosis. Thus, including only those subjects who meet criteria for designated *DSM/ICD* disorders (even if more than one) is not a wholly satisfactory approach in the RDoC perspective. One of the inherent problems with the categorical approach is that, in spite of the acknowledged heterogeneity that is apparent in virtually all clinical diagnoses, the consequent analysis implicitly involves the notion of a unitary entity that has a "point" Expected Value and "normal" variance on any given measure. Findings of group differences then imply that all patients are impaired compared with normal control subjects on some measure—doubly misleading in that: (i) at least some patients are not so impaired, and it would be important to know why; and (ii) impairment in patients with NOS or forme fruste conditions may be proportionately smaller and/or less severe, and excluding these patients obscures an explication of potentially relevant dimensions and also obviates attention to clinically relevant dysfunction.

A commonly asked question is whether including patients from widely disparate diagnoses (eg, a working memory study including patients with primary diagnoses of psychotic disorders, internalizing disorders, and externalizing disorders) would result in such excessive variance as to be meaningless. Initially, at least, this appears to be a legitimate concern. The typical situation would be that patients presenting for treatment at a given type of clinic—psychotic disorders, anxiety/mood disorders—would represent the sampling frame for a given study, thus maximizing relevant variance while avoiding "apples versus oranges" comparisons. Eventually, as the circuits and measurements are better understood, it may be productive to make these kinds of comparisons. For instance, in recent years it has become common to consider whether clinical depression is present as a comorbid syndrome in schizophrenia, for example.[6] Using symptom-based criteria, it is difficult to know whether such symptoms are due to "depression" pathology or to "schizophrenia" pathology. However, measures that have been validated to assess relevant circuit functions (whether in cognition, reward circuit activity, or arousal systems) may provide a heuristic to move forward in addressing such important clinical questions.

The RDoC approach: assumptions and principles

The RDoC framework has its foundation in three postulates.[7] First, mental illnesses are presumed to be disorders of brain circuits. Secondly, it is assumed that the tools of clinical neuroscience, including functional neuroimaging, electrophysiology, and new methods for measuring neural connections can be used to identify dysfunction in neural circuits. Third, the RDoC approach presumes that data from genetics research and clinical neuroscience will yield biosignatures that will augment clinical signs and symptoms for the purposes of clinical intervention and management.

The RDoC conceptualization includes developmental processes and interactions with the environment as orthogonal dimensions that should inform hypotheses and conclusions derived from the RDoC organizational structure. Their absence from the matrix is due only to the limitations of two-dimensional representation and should not be misinterpreted as indicating that these important considerations are not relevant to the RDoC research framework. The importance of developmental factors (both pre- and postnatal) is elaborated below, and recent advances demonstrating the impact of the environment on phenotype via epigenetic changes[8] promise new breakthroughs in our understanding of brain disorders.

With regard to its role relative to the existing diagnostic systems, RDoC is a research framework and is not intended to displace the *DSM* or *ICD*. It is agnostic regarding current diagnostic categories and—in contrast to these established diagnostic systems which are, by necessity, comprehensive and inclusive of a large range of disorders for which individuals may seek professional attention—RDoC is not intended to "cover the waterfront" of symptoms and illnesses. Although relevance to psychopathology was a criterion for selection of constructs, the RDoC framework is intended to be circumscribed and sparse so that the most important domains can be identified without generating a multitude of constructs that have diminishing utility. As a research framework, RDoC will incorporate procedures for regular updates to the constructs and their defining elements resulting from ongoing research.

Current status of the RDoC initiative

The NIMH RDoC workgroup is currently in the process of conducting a series of workshops for the purpose of defining the initial specifications for each of the proposed constructs. Each workshop is focused on one domain, and is preceded by a survey of scientists with research expertise related to the domain in order to obtain a broad sample of opinions regarding the domain and its related constructs. At the workshops, invited experts from various areas that span the units of analysis are tasked with: (i) determining the relevant constructs for the domain; (ii) developing a definition for each construct within the domain; and (iii) identifying empirically based elements to populate the cells of the matrix. Following each workshop, the proceedings are posted on the NIMH RDoC Web site. Continuing commentary and suggestions are welcome. As of November 2011, the workshops for the cognitive systems, negative valence systems, and positive valence systems constructs have been completed; the workshops for the remaining constructs will be completed by summer, 2012. In addition, interim guidance for applicants planning to propose studies incorporating the dimensional approach was released in March 2011, a Request for Information to elicit feedback and commentary regarding both general and specific aspects of the RDoC approach was released in May 2011, and a Request for Applications to encourage studies of mechanisms that may cut across multiple traditional diagnostic categories and evaluate the construct validity of the RDoC domains was issued by NIMH in August 2011. These documents and additional information regarding RDoC (including the proceedings of past workshops) can be viewed at http://www.nimh.nih.gov/research-funding/rdoc/index.shtml.

It should be clear from this description that the RDoC initiative is a long-term and evolving project. It is expected that the initial framework will be largely in place by 2012, but the iterative process of evaluating and refining the constructs will likely occur over a 5- to 10-year timeframe, followed by ongoing modification based on new scientific discoveries. As indicated above, a key goal of the project is to foster development of validated tasks that are feasible for use in assessing the constructs in clinical trials or in practical clinical use. This process may be expected to proceed gradually over a series of years; tasks for some constructs may be available in the near future, while measures for others may require a longer period of exploratory research and validation.

An integrative approach

Despite its roots in the study of cognition in schizophrenia, RDoC incorporates a broad view in which cognition is not considered to be "special" or distinct from other functions, such as affective and social processes, that are served by the brain. Similar to the concerns about the consequences of scientific hyper-focus on categorical diagnoses, similar unintended consequences have followed the "cognitive revolution," including reification of conceptual categories (eg, cognitive, affective, social) that have "no discrete reality in the brain".[9] Cromwell and Panksepp identify the "potentially invidious consequences" of this overuse of cognition ("cognitivism"), such as the tendency for "cognition" to be "widely used as a moniker for practically all the interesting functions the brain performs to facilitate behavioral adaptations and survival" (p 2027).

RDoC's integrative approach includes cognition as part of a conceptual framework that incorporates social processes, arousal/regulatory systems, and negative and positive valence systems as the major superordinate domains, because these behavioral systems and the neural circuits that implement them have all evolved to serve the motivational and adaptive needs of the organism. The scientific basis for drawing brain-based boundaries among these domains is evolving. As the identification of elements in the RDoC matrix proceeds and the patterns of overlap among and specificity within different domains become apparent, the behavioral and neural networks with selective specialization and those with highly integrated activities will become clearer. This has become apparent in the early stages of the RDoC process, as certain neural circuits have been included in the matrix because of their specific importance to a single construct and others (eg, circuits involving the amygdala, basal ganglia) because of their involvement across multiple constructs.

An example of how an approach consistent with the RDoC matrix may advance research regarding cognitive functioning in psychotic spectrum disorders is provided in a recent paper examining a large Finnish cohort involving probands with a schizophrenia diagnosis and family members.[10] An unsupervised cluster analysis of a large number of symptoms and neurocognitive measures yielded three major clusters, which appeared to represent: (i) unaffected family members; (ii) individuals with core schizophrenia features; and (iii) those with psychotic spectrum disorder involving mood symptoms (though over half the latter cluster were diagnosed with schizophrenia or schizoaffective disorder). Individuals in cluster 2 were markedly impaired on all neurocognitive measures, while those in cluster 3 were intermediate between cluster 2 and unaffected family members. Further, an association analysis indicated a significant association between membership in cluster 2 and the DTNBP1 gene (dysbindin), and also an association between cluster 3 membership and the disrupted in schizophrenia gene, *DISC1*. Thus, this study exemplifies one method of approaching psychotic-spectrum disorders, transcending traditional diagnostic categories to examine empirically determined differences in cognitive functioning and their relationship to genetic risk architectures.

Neurodevelopment and comorbidity

By focusing on the various neural systems that serve the adaptive needs of humans and the ways in which the functioning of these systems can be disrupted, the promise and potential of RDoC is to reorient the study of mental disorders and push past the impasse that has developed in research using more typical *DSM*-based approaches.

This brain-based approach is informed by, and promises to advance, our understanding of the neurodevelopmental origins of psychiatric illness. For example, there is increasing evidence that schizophrenia, rather than resulting from a specific set of genetic causes and neural consequences, is instead one of several neurodevelopmental disorders (including bipolar disorder, autism, attention-deficit/hyperactivity disorder, and intellectual impairment) that have overlapping genetic contributions.[11] The impacts of these neurodevelopmental anomalies are not limited to cognitive systems, but rather affect widely distributed neural networks involved in a broad range of behaviors and mental processes. One of the important implications of this conceptualization is that efforts to search for discrete etiologies for categorical disorders are misguided. With its focus on neural circuits, RDoC will facilitate the examination of the hypothesis that the phenotypic differences observed among neurodevelopmental disorders can be accounted for by variations in the nature and degree of damage to neural circuits as well as related questions about the ways in which developmental, compensatory, environ-

mental, and epigenetic factors modify the effects of neural circuit disruptions.[12]

Related to the increased emphasis on neurodevelopmental underpinnings of diverse illness manifestations, the RDoC framework encourages investigators to think differently about comorbidity. The co-occurrence of disorders and symptoms has been the focus of extensive empirical study; however, due to the long-standing use of categorical diagnostic distinctions in psychiatry research, comorbidity among psychiatric disorders and among psychiatric disorders and other types of disorders has often been treated as experimental "noise" and nuisance. A psychometric perspective on diagnosis and comorbidity[13-15] can yield new insights. Diagnoses can be thought of as latent constructs and although the constructs have some internal validity,[16] this does not necessarily mean that the latent construct is unidimensional. Psychiatric diagnoses do not have explanatory power and do not capture the complex causal relationships within and between the genetic, neurophysiological, and behavioral features that characterize mental illness.[13] The overlap in symptoms between diagnoses and the co-occurrence of disorders suggest that there are "non-symptom causal processes" (such as homeostasis) that may, in part, explain these relationships.[14] Rather than searching for common causes that account for the heterogeneous features of a categorical diagnosis, the RDoC framework encourages investigators to consider comorbidity from a multidimensional, empirical perspective that can point to new ways of understanding the neural and genetic underpinnings of illness.

The primary goal of RDoC's dimensional approach and incorporation of a range of units of analysis is not to disassemble the traditional diagnostic categories, but rather to improve our understanding of how the organization and functioning of neural circuits result in certain behaviors and symptoms that naturally co-occur and to point to new discoveries about their causal relationships. Recent research using optogenetic approaches,[17] although presently limited to animal studies, exemplifies this approach by demonstrating specific, causal relationships linking the effects of disease-related genes on neural circuits and behavior. Such efforts hold promise for the type of integrative work that will allow the field to see a return on the investment in studies that have demonstrated innumerable genetic, neural, and behavioral differences between diagnostic groups but have yielded few major breakthroughs in our understanding of the causes and treatments of mental illness.

Concluding comments

The current diagnostic framework, established with the *DSM-III* in 1980, has ably served both research and clinical practice in the three decades that have elapsed since its inception. It is difficult to imagine anything like the advances that have occurred over that time without having a common language and set of diagnostic referents. As diagnosis across all areas of medicine accelerates into an age of genetics and microbiology for understanding disease trajectories, the very success of the *DSM/ICD* approach is perhaps the major obstacle to considering substantive changes. The system is completely integrated into diagnostic codes for practice, insurance reimbursements, disability judgments, clinical trials, regulatory agency guidelines, and—particularly in the research perspective—grant applications and journal publications. It is a dilemma that marked change cannot occur until a database is available to offer new perspectives based on genetics and neuroscience, yet such a database cannot be built until research is conducted to explore mechanisms that are independent of current categories. Such a construction project is the goal of RDoC. If the project is successful, future versions of the *DSM* and *ICD*—perhaps not even *DSM-6*, but *DSM-7*—will be informed by the findings that emerge from RDoC-guided research. The process will not be easy or short, but already the Institute has seen an accelerating number of RDoC-themed grant applications. Time will tell whether such interest is the harbinger of a paradigm shift in how the research and practice community conceptualizes mental disorders, but at the least, the RDoC project seems likely to generate new perspectives regarding the relationships of brain and behavior with respect to mental illness. ❑

The authors report no financial conflicts of interest.

Research Domain Criteria: sistemas cognitivos, circuitos neurales y dimensiones de la conducta

Los actuales sistemas diagnósticos para los trastornos mentales se establecieron antes de que estuvieran disponibles las herramientas de las neurociencias y aunque ellos han mejorado la confiabilidad de la clasificación psiquiátrica, el progreso orientado al descubrimiento de las etiologías de las enfermedades y de nuevas opciones terapéuticas y de prevención puede beneficiarse a partir de otras conceptualizaciones de los trastornos mentales. El proyecto Research Domain Criteria (RDoC) es el eje central del esfuerzo del NIMH para alcanzar su objetivo estratégico de desarrollar nuevos métodos de clasificación de los trastornos mentales para propósitos de investigación. La matriz del RDoC proporciona una estructura de investigación que favorece la reorientación de las perspectivas de los investigadores de acuerdo con una aproximación dimensional en el estudio de las características genéticas, neurales y conductuales de los trastornos mentales. El enfoque integrador del RDoC incluye como áreas principales la cognición junto con los procesos sociales, los sistemas de alerta/regulación, y los sistemas de valencia negativa y positiva, dado que todos estos sistemas neuroconductuales han evolucionado para servir a las necesidades de motivación y de adaptación del organismo. El enfoque del RDoC promete avanzar en la comprensión de la naturaleza de los trastornos mentales al centrar la atención en los circuitos neurales teniendo en cuenta la evidencia creciente acerca de la alteración del neurodesarrollo en muchos trastornos y su capacidad para captar los patrones de co-ocurrencia de conductas y síntomas.

Les critères de définition des domaines de recherche : systèmes cognitifs, circuits neuronaux et dimensions comportementales

Les systèmes actuels de diagnostic des troubles mentaux ont été établis avant la mise en place des outils des neurosciences. Bien qu'ils aient amélioré la fiabilité de la classification psychiatrique, les progrès relatifs à la découverte de l'étiologie de la maladie et les nouvelles approches du traitement et de la prévention peuvent bénéficier d'autres conceptualisations de ces troubles. Le principe des critères de définition des domaines de recherche (RDoC) est le cœur des efforts du NIMH pour parvenir à son but stratégique de développement de nouvelles méthodes de classement des troubles mentaux à des fins de recherche. La matrice des RDoC fournit un cadre qui encourage les chercheurs à réorienter leur perspective de recherche selon une approche dimensionnelle de l'étude des caractéristiques génétiques, neurales et comportementales des troubles mentaux. L'approche intégrative des RDoC comprend la cognition accompagnée des processus sociaux, des systèmes excitation/régulation et des systèmes de valeur positive et négative en tant que domaines principaux, car ces systèmes neurocomportementaux servent tous aux besoins adaptatifs et motivationnels de l'organisme. En s'intéressant aux circuits neuronaux reposant sur la preuve croissante de la nature neurodéveloppementale de nombreux troubles et par sa capacité à capturer les schémas de survenue concomitante des comportements et des symptômes, l'approche des RDoC tient ses promesses de faire progresser notre compréhension de la nature des troubles mentaux.

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