

Beyond the boundaries: Transitioning from categorical to dimensional paradigms in mental health diagnostics

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Abstract

Mental health diagnostics is undergoing a transformation, with a shift away from traditional categorical systems like the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), and the International Classification of Diseases, 11th Revision (ICD-11), and toward innovative frameworks like the Hierarchical Taxonomy of Psychopathology (HiTOP) and the Research Domain Criteria (RDoC). These emerging models prioritize dimensional and biobehavioral approaches in order to overcome limitations such as oversimplification, comorbidity and heterogeneity. This editorial explores the challenges of implementing these paradigms, such as the need for empirical validation, interdisciplinary collaboration and clinician training. It highlights the importance of advanced tools, biomarkers and technological integration to improve precision in diagnosis and treatment. Future research directions include creating reliable dimensional assessment methods, conducting longitudinal studies and fostering interdisciplinary networks. By bridging traditional and emerging frameworks, the field can progress toward personalized, biologically informed mental health treatment. This transition necessitates collaboration among researchers, clinicians and policymakers to improve diagnostic accuracy and treatment outcomes for those affected by mental health disorders.

Key words: precision medicine, Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-5), International Classification of Diseases 11th Revision (ICD-11), Hierarchical Taxonomy of Psychopathology (HiTOP), Research Domain Criteria (RDoC)

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Introduction: The established frameworks

The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), and the International Classification of Diseases, 11th Revision (ICD-11), are foundational tools in the field of mental health. Developed through extensive research and international collaboration, these categorical classification systems have provided clinicians with standardized criteria for diagnosing mental disorders.^{1,2} Understanding their historical context and clinical significance sheds light on their pivotal role in shaping contemporary psychiatric practice.^{3,4} One of the key strengths of categorical diagnosis, as embodied by DSM-5 and ICD-11, is the facilitation of clear communication among healthcare professionals. By providing specific diagnostic labels, these manuals help ensure that practitioners across different settings and regions can accurately identify and treat mental health conditions.⁵ This standardization also supports epidemiological studies and informs public health policies by offering consistent data on the prevalence and incidence of disorders⁶ (Table 1^{7–17}).

However, despite their widespread use, DSM-5 and ICD-11 have faced criticism regarding their limitations.¹⁸ The categorical approach can sometimes oversimplify the complexity of mental health by forcing symptoms into rigid boxes, potentially overlooking the nuanced spectrum of individual experiences.¹⁹ Issues such as comorbidity and heterogeneity within diagnostic categories highlight the need for a more dimensional understanding of mental disorders.^{20–23} The DSM-5 has increasingly integrated dimensional information into its traditionally categorical framework, recognizing that personality disorders can be more accurately described along a spectrum of trait dimensions.^{24–26} This includes encouraging clinicians to rate the severity of key symptoms in the schizophrenia spectrum and other psychotic disorders, as well as specifying

dimensional levels of severity for autism spectrum disorders and substance use disorders.^{27–29} In addition, Section III of the DSM-5 features cross-cutting symptom measures and severity rating scales that can be applied across multiple diagnostic categories – enhancing precision and reflecting the manual's broader shift toward spectrum-based approaches.^{30–32} Acknowledging these criticisms and recent trends is essential as the field considers transitioning to new frameworks like the Hierarchical Taxonomy of Psychopathology (HiTOP) and the Research Domain Criteria (RDoC), which aim to address these limitations³³ (Table 1^{7–17}). This editorial seeks to advance beyond existing commentaries by synthesizing cutting-edge dimensional frameworks and established categorical approaches, thereby offering a uniquely comprehensive perspective that not only bridges critical gaps in the literature but also sets a new standard for clinical application and future research.

Emerging paradigms: the Hierarchical Taxonomy of Psychopathology (HiTOP) and the Research Domain Criteria (RDoC)

The HiTOP represents a significant shift from traditional categorical models by adopting a dimensional perspective on mental disorders.^{14,34,35} Rather than viewing mental health conditions as distinct categories, HiTOP organizes psychopathology along a spectrum of symptom dimensions and hierarchical structures.^{12,14,36} This approach acknowledges the overlap and comorbidity often seen in mental health diagnoses, aiming to provide a more nuanced and accurate representation of an individual's psychological functioning.^{14,34,37,38} By focusing on symptom severity and patterns rather than strict diagnostic labels,

Table 1. Summary table of mental disorder classification systems

System	Descriptions	Strengths	Weaknesses	Ref.
DSM-5	Primarily used in the USA for clinical diagnosis and research	Provides detailed criteria for diagnosis, widely used in research settings, and has a long history of use	Criticized for lack of validity, influenced by commercial factors, and slow to incorporate new findings	7–9
ICD-11	Used globally for clinical diagnosis and public health purposes	Harmonized with DSM-5 to some extent, focuses on clinical utility, and is widely accepted internationally	Contains some disorder categories not present in DSM-5, and differences in priorities and uses can lead to inconsistencies	1,10,11
HiTOP	Classify mental disorders based on empirical data and dimensional traits	Integrates maladaptive personality traits into a single system, offers a dimensional approach that may better capture the complexity of mental disorders	Still under development and less widely adopted compared to DSM-5 and ICD-11	12–14
RDoC	Integrate basic behavioral and neuroscience research to understand mental disorders	Focuses on understanding the biological bases of mental disorders, offers a dimensional approach that can enhance research precision	Lacks extensive validation, and its practical application in clinical settings is still limited	15–17

DSM-5 – Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition; ICD-11 – International Classification of Diseases, 11th Revision; HiTOP – Hierarchical Taxonomy of Psychopathology; RDoC – Research Domain Criteria.

HiTOP facilitates personalized assessments and interventions, potentially improving treatment outcomes.^{13,38}

The RDoC initiative, developed by the National Institute of Mental Health (NIMH), seeks to redefine mental health diagnoses through the lens of biobehavioral systems and neurobiological mechanisms.^{15,16,39} It emphasizes the importance of understanding mental disorders based on underlying genetic, neural and behavioral components across 5 domains: negative valence systems, positive valence systems, cognitive systems, social processes, and arousal/regulatory systems.^{40–42} This framework encourages researchers to investigate the fundamental processes that contribute to mental health conditions, promoting a more integrated approach that spans from basic neuroscience to clinical practice.^{16,40,41,43} By aligning diagnostic criteria with biological markers and behavioral indicators, RDoC aims to enhance the precision of mental health assessments and foster the development of targeted treatments.^{39,44–46}

Challenges in transitioning to new frameworks

Transitioning to frameworks like HiTOP and RDoC introduces significant research barriers and methodological challenges. One primary hurdle is the need for extensive empirical validation of these new models across diverse populations.⁴⁷ The dimensional and biobehavioral nature of HiTOP and RDoC requires large-scale, longitudinal studies to establish reliability and validity, which demands considerable time and resources.⁴⁸ Additionally, researchers must develop new assessment tools and metrics that can accurately capture the continuous spectrum of mental health symptoms, moving away from traditional categorical measures.^{49,50} There is also the challenge of integrating biological data with psychological assessments, necessitating interdisciplinary collaboration between neuroscientists, psychologists and psychiatrists.⁵¹ Navigating these methodological complexities is crucial for the successful adoption of these emerging paradigms.⁵²

Implementing HiTOP and RDoC in clinical settings presents challenges related to practitioner training and acceptance. Clinicians are accustomed to the DSM-5 and ICD-11 systems, and shifting to new frameworks requires substantial education and adjustment.⁵³ The dimensional approaches may initially seem abstract or less intuitive compared to categorical diagnoses, potentially leading to resistance among practitioners.⁵³ Training programs must be developed to familiarize clinicians with the new concepts, assessment methods and implications for treatment planning.⁴⁸ Moreover, there is a need to demonstrate the practical benefits of these frameworks in improving patient outcomes to encourage their adoption.^{47,54} Ensuring that clinicians are adequately supported during this transition is essential for the frameworks to gain traction in everyday practice.⁵⁵

Integrating HiTOP and RDoC with existing diagnostic systems poses significant logistical and conceptual challenges.⁵⁵ The current healthcare infrastructure, insurance policies and legal frameworks are deeply intertwined with the DSM and ICD classifications.⁵³ Transitioning to new models requires careful alignment to avoid discrepancies in diagnosis, billing and treatment authorization.³⁸ There is also the risk of fragmentation if some practitioners adopt the new frameworks while others continue with traditional systems.⁵⁶ Developing a coherent strategy that allows for compatibility between old and new models is imperative.⁵⁷ This might involve creating crosswalks between diagnostic criteria or establishing hybrid models that incorporate elements of both categorical and dimensional approaches.⁵⁸ Successfully navigating this integration is key to ensuring a smooth transition without disrupting patient care.⁵⁹

Proposing future research directions

Advancing the implementation of HiTOP and RDoC frameworks hinges on the development of reliable and valid dimensional assessment tools.⁴⁷ Current diagnostic instruments are largely rooted in categorical models, which may not capture the nuanced spectra of mental health symptoms emphasized by HiTOP and RDoC.⁴⁹ Future research should focus on creating and validating tools that measure symptoms along continuous dimensions, allowing for more precise and individualized assessments.⁴⁸ This involves leveraging psychometric techniques to ensure these tools are sensitive to variations across different populations and settings.⁶⁰ Integrating technological advancements such as digital assessments and machine learning algorithms can enhance the accuracy and utility of these instruments in both research and clinical practice.^{61–63} Moreover, harnessing advanced artificial intelligence (AI) tools for predictive modeling, integrating multi-omic datasets (e.g., genomic, proteomic and metabolomic profiles) to identify novel biomarkers,^{64–66} and employing sophisticated human models (such as induced pluripotent stem cells or organ-on-a-chip platforms) can further refine and personalize diagnostic strategies.^{67–69} These approaches not only improve the sensitivity and specificity of assessments but also open avenues for innovative, tailored interventions, ultimately bridging the gap between theoretical constructs and pragmatic clinical solutions.^{70–72}

Longitudinal studies are essential for understanding the developmental trajectories and causal mechanisms underlying mental disorders within the HiTOP and RDoC frameworks.^{47,73} Such studies can illuminate how genetic, environmental and neurobiological factors interact over time to influence psychopathology.^{15,74,75} Future research should prioritize long-term, multi-wave studies that incorporate a variety of biobehavioral measures, including neuroimaging, genetic analyses and physiological

assessments.^{16,76–78} To achieve these goals, researchers can employ advanced data-integration platforms and standardized protocols to streamline participant tracking across multiple time points.^{79,80} Collaborative, multi-site consortiums can leverage pooled datasets to enhance statistical power and cross-validate findings,^{81,82} while novel analytical approaches – such as machine learning, network analyses and Bayesian modeling – can discern subtle patterns of risk and resilience.^{83,84} Additionally, incorporating ecological momentary assessments via mobile devices, collecting wearable sensor data and integrating electronic health records can provide rich, context-sensitive information that complements traditional laboratory-based measures.^{85,86} Such comprehensive, technology-driven methodologies will ultimately enable more nuanced insights into the dynamic interplay of risk factors and resilience processes, paving the way toward more predictive, preventative and personalized mental healthcare.^{87,88} These studies can help identify early biomarkers of mental health conditions, track changes in symptom dimensions and evaluate the effectiveness of interventions over time.^{49,89,90} By embracing a longitudinal approach, researchers can contribute to more dynamic and predictive models of mental health.³⁵

The complexity of mental health necessitates collaboration across multiple disciplines, particularly emphasizing preclinical research.⁹¹ Future research should encourage partnerships between psychologists, psychiatrists, neuroscientists, geneticists, and other related professionals to integrate diverse perspectives and methodologies.⁹² This integrated approach could involve leveraging advanced genomic and neuroimaging techniques, harnessing machine learning analytics, employing preclinical models (such as induced pluripotent stem cells or organoid systems) and fostering multi-institutional collaborations to drive the development of more predictive, preventive and personalized interventions.^{67,88,93–95} Interdisciplinary teams can facilitate the exploration of mental disorders from biological, psychological and social angles, aligning with the comprehensive aims of HiTOP and RDoC.⁹⁶ Establishing collaborative research networks and consortia can enhance data sharing, standardize methodologies and accelerate scientific advancements.⁹⁷ Such cooperation is vital for developing holistic models of psychopathology and translating research findings into practical applications.^{98–100} Preclinical models, including advanced technologies like optogenetics and chemogenetics, are crucial for this integration, as they allow for the exploration of genetic and environmental factors in mental health.^{101–103}


For HiTOP and RDoC to be effectively integrated into clinical practice, concerted efforts are needed to address policy and standardization challenges.^{38,47} Future research should inform policy development by providing evidence on the benefits and feasibility of these new frameworks.¹⁰⁴ Engaging with policymakers, professional organizations and regulatory bodies can facilitate the incorporation

of dimensional and biobehavioral approaches into diagnostic guidelines and reimbursement structures.^{105,106} Additionally, establishing standardized protocols and training programs will ensure consistent application among practitioners.¹⁰⁷ Research should also explore strategies for bridging the gap between existing categorical systems and the new models to ease the transition and minimize disruptions in clinical care.^{48,54,60}

Conclusions

The integration of dimensional, biobehavioral and categorical perspectives heralds a transformative era in mental health diagnostics. By merging the established strengths of frameworks like the DSM-5 and ICD-11 with the transdiagnostic insights of HiTOP and RDoC, the field stands poised to achieve unprecedented diagnostic precision, more personalized treatments and improved clinical outcomes. Emerging empirical evidence – from large-scale, longitudinal studies to compelling case-based examples – further underscores the value of expanding beyond narrow diagnostic boundaries. Realizing the full potential of these approaches, however, will demand concerted efforts on multiple fronts. Researchers must refine and validate comprehensive assessment tools that capture the complexity of psychopathological phenomena, while clinicians require training and resources to confidently apply these methods in diverse settings. Policymakers, educators and professional organizations will play pivotal roles in promoting interdisciplinary collaborations, providing supportive infrastructures and encouraging data sharing across institutions. Such integrative efforts will be bolstered by advanced computational techniques, the establishment of shared data repositories and the embrace of interdisciplinary teams capable of synthesizing varied perspectives. Moreover, global engagement and cross-cultural studies will be critical to ensuring that emerging models are broadly applicable, equitable and culturally sensitive. Although many of these proposals remain conceptual at present, ongoing empirical endeavors promise to anchor them in robust, evidence-based practice. By harmonizing traditional diagnostic schemas with cutting-edge dimensional frameworks, the mental health community can forge a new path – one that better captures individual differences, guides more targeted interventions, reduces stigma, and ultimately improves the lives of individuals affected by mental health disorders worldwide.

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