Disquiet in Nosology: A Primer on an Emerging, Empirically Based Approach to Classifying Mental Illness and Implications for Training

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Prevailing Mental Health Nosologies: A Caution

Paul Meehl (1986) warned more than 30 years ago of a “scientific malignancy” worth recalling: the tendency by some to reify diagnoses, as though the criteria that operationalize a disorder in the Diagnostic and Statistical Manual of Mental Disorders (DSM; APA, 2013) describe its essence. Diagnoses, instead, are open constructs.1 Most of us, when pressed, easily acknowledge the difference. The core motivation behind the National Institute of Mental Health’s Research Domain Criteria (Cuthbert & Insel, 2013) underscores this point. Yet when not pressed, too often the criteria can slip into becoming the disorder. It would be unfair to blame DSM for this habit (cf. Kraemer, Kupfer, Clarke, Narrow, & Regier, 2012), yet its operationalization of criteria risks making us forget that articulating a useful mental health nosology remains ongoing.

Prevailing classification approaches have other problems. Disorders are presumed distinct, yet the predominance of comorbidity raises obvious questions about the validity of their borders (e.g., Brown, Campbell, Lehman, Grisham, & Mancill, 2001; Kessler, Chiu, Demler, & Meehl, 2015; Rutter, 1987). Categories can have marked heterogeneity, such that two individuals with the same diagnosis have entirely different sets of symptoms (Clark, Watson, & Reynolds, 1995; Hasler, Drevets, Manji, & Charney, 2004; Zimmerman, Ellison, Young, Chelminski, & Dalrymple, 2015). Reliability is often too low (Chmielewski, Clark, Bagby, & Watson, 2015; Regier et al., 2013), and evidence overwhelmingly suggests psychopathology falls along a continuum, with no clear zones of rarity (Wright et al., 2013). Finally, it is not always clear from surveys how clinically useful clinicians find the prevailing nosology beyond its relevance for billing (First et al., 2018).

Despite these concerns, nosology remains foundational for anyone whose work intersects with mental health (Blashfield & Burgess, 2007). At minimum, it gives us a lingua franca to talk about symptoms and how they present. But ideally it would do so much more: it would guide our treatments, forecast the course of illness, and create a foundation for research into the causes of illness (Mullins-Sweatt, Lengel & DeShong, 2016). For students in training, DSM’s lexicon, and the assumptions behind it, get woven into their curriculum and shape conceptualizations of psychopathology (e.g., Amazon ranks DSM second in psychology reference books, only behind the American Psychological Association’s style manual).

Next-Generation Approach

DSM’s hegemony over classification has overshadowed an accelerating body of research happening in the wings of mental health, largely driven by psychologists: quantitative nosology. At its core, this approach creates a data-driven, empirically based classification. It starts with diverse arrays of highly homogenous signs and symptoms of mental health problems (e.g., dysphoric mood). Statistical procedures like factor analyses and hierarchical agglomerative clustering are then used to organize elements into increasingly more heterogeneous, higher-order constructs based on patterns of association.

This method is hardly new: Thomas Moore in the 1930s analyzed the intercorrelations among 32 signs and symptoms related to psychosis to understand how they could be more parsimoniously grouped into higher-order factors. Many others, notably Achenbach and colleagues (Achenbach, 1966; Achenbach, Ivanova, & Rescorla, 2017), followed suit with increasing sophistication and precision (Kotov, 2016).

The most recent large-scale effort in this movement toward empirically based classification emerged in the spring of 2015. Forty scholars working in the area of quantitative nosology started a consortium (now close to 100 members) devoted to articulating an empirically based quantitative nosology of mental illness. Their initial proposed model—the Hierarchical Taxonomy of Psychopathology (HiTOP; Kotov et al., 2017)—provides a marked departure from nosology systems like DSM.

HiTOP: A Primer

HiTOP’s empirically based model remains a work in progress (remember Meehl’s admonitions!) and the consortium is actively working to revise the model as new evidence emerges (Krueger et al., 2018), but major, replicated contours of this nosology are already clear. The model is hierarchical, with homogenous signs, symptoms, and traits at the bottom. There are over 100 of these dimensions, and they consist of symptom components, such as insomnia, and traits, such as submissiveness. These are organized into higher-order components that are increasingly broad until one reaches what is called the spectra level—of which there are six (i.e., Internalizing, Somatoform, Thought Disorder, Disinhibited Externalizing, Antagonistic Externalizing, and Detachment). Above this, one can aggregate higher all the way up to a general factor (i.e., so-called “p-factor;” Caspi et al., 2014). Figure 1 presents portions of the model, reprinted and revised with permission.

How does this differ from the DSM? With traditional nosology, symptoms related to depression, generalized anxiety disorder, and social phobia, to take one example, constitute three putatively distinct categories of mental illness. In contrast, with HiTOP they all fall under the rubric of an internalizing spectrum. A provider can focus on this higher-level spectrum, recognizing that all three syn-

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1This can be debated, of course (see Wakefield, 2004).
dromes share elements. Or, one can cascade down the model, with, for example, depression and generalized anxiety symptoms coalescing under a "distress" subfactor and social phobia hewing more closely to a "fear" subfactor. Or one can cascade even further down, focusing on highly homogenous symptoms or traits, such as suicidality.

Unlike DSM, HiTOP does not delineate a "one size fits all" boundary between "illness" and "not illness," a feature supported by years of taxometric research (Haslam, Holland & Kuppens, 2012). Rather, clinical decisions are guided by ranges of severity on each dimension of the model. Until work validates these in different populations, they can remain statistical (e.g., 2 SD below the mean), such as with intelligence testing, or can be tailored to the needs and resources available within a given setting or population. Kotov et al. (2017) reviews evidence supporting the model, while Ruggero et al. (2018) provides a description of its integration into clinical care.

**HiTOP May Advance Research and Treatment**

HiTOP proposes to accelerate mental health research (Conway et al., 2019). Use of continuous dimensions, as opposed to categories, has well-known benefits for statistical power of research to detect effects (Cohen, 1983). Compared to categorical phenotypes, dimensional ones double the power to predict a variety of clinical outcomes (Kotov et al., 2019) and produce more "hits" in genetic research (Otowa et al., 2016), for example.

But the hierarchical structure in and of itself provides a novel framework for pursuing pathophysiology. Mechanisms, or outcomes, may operate at different levels of this mental illness hierarchy, from broad and diffuse effects to more narrow and specific ones. HiTOP's hierarchy provides one map to different levels that may be relevant, and at minimum new phenotypic targets on which to test proposed mechanisms. Already, work in genetics, neurobiology, and psychosocial contexts point to how recent findings in these fields may better align with models like HiTOP compared to traditional nosology (Conway et al., 2019).

HiTOP also proposes potentially greater clinically utility (Ruggero et al., 2018). Dimensions are more reliable than traditional categories (e.g., 15% increased reliability in meta-analyses; Markon, Chmielewski, & Miller, 2011) and may be preferred over categories by clinicians (Morey, Skodol, & Oldham, 2014). Moreover, HiTOP higher-level spectra may have increased diagnostic power, for example predicting suicide attempts, future psychopathology and other clinical outcomes more than disorder-specific variation alone (Eaton et al., 2013; Kim & Eaton, 2015). HiTOP may also better align with treatment planning. Early evidence suggests clinician-prescribing practices track more closely to a HiTOP-based model compared to a DSM one (Waszczuk et al., 2017). Similarly, emerging transdiagnostic approaches to the treatment of mental health (e.g., Barlow et al., 2017) align well with HiTOP’s conceptualization of upper-level spectra that share features and potential etiologies. Finally, HiTOP provides flexibility to adapt clinical ranges based on their purpose,

![HiTOP model](image-url)

*Fig. 1. HiTOP model (reformatted and revised with permission from Kotov et al., 2017). Note. Not all of the model components, traits and related disorders are presented.*
rather than requiring one-size-fits-all cut-offs common to DSM, removing from nosology their reification that are not empirically based (e.g., five of nine symptoms because five is more than half). None of these advantages guarantee HiTOP’s clinical utility, but they provide impetus for testing its utility and tackling the major challenge of training students on this new nosology.

Training Implications

A caution against casually introducing any new nosology, particularly one based on dimensions, would be its implications and cost for training given the major investment already made in the use of DSM (First et al., 2005). Although a major concern for fields less accustomed to dimensional models (e.g., psychiatry), students in psychology are already well-trained in working with conceptualizations and measures consistent with HiTOP (e.g., MMPI-2-RF, NEO-PI-3, PAI; Ben-Porath & Tellegen, 2008/2011; Costa & McCrae, 2010; Morey, 2007). Nevertheless, a shift toward HiTOP would impact courses related to foundational knowledge (i.e., psychopathology, assessment, and treatment planning), as well as functional competencies in the application of HiTOP via practicum and internship or residency experiences.

We field tested training in HiTOP at one of the author’s (JLC) own universities to better appreciate the feasibility of weaving HiTOP into foundational parts of a curriculum. An assessment instructor (JLC) spoke with two members from the HiTOP consortium (RK and CJR) about the model. They provided training material, including slides for instruction. The instructor then developed curricular components for the three foundational knowledge areas. During the psychopathology component, the HiTOP model was briefly reviewed, again drawing some content from the expert slides, before engaging in hypothetical clinical decision-making exercises (e.g., using the HiTOP framework to identify the salient spectra that will become the focus of a transdiagnostic treatment; e.g., Barlow et al., 2017; Lundhal, Kunz, Brownell, Tollefson, & Burke, 2010).

Integration of HiTOP into these training components was seamless from the instructor’s perspective and end-of-course satisfaction evaluations suggest the material was well-received by students. Foundational HiTOP knowledge was assessed as part of the midterm exam in the assessment course with all students meeting the threshold for at least adequate accuracy (70% or greater). Sequencing of HiTOP’s introduction (first psychopathology, then assessment, and finally treatment planning) flowed intuitively and was consistent with the larger curriculum. Given that the model includes many DSM-like constructs, albeit broken into smaller (symptom component) or larger (spectra) units in a hierarchical fashion, it was feasible to teach students the DSM categories for practical and perhaps temporary purposes, while familiarizing them as well with evidence-based hierarchical models.

Finally, it is common for students to learn how to apply cut scores along recognized continua, such as with IQ or use of T-scores common to many measures. Thus, students were taught to think about diagnostic cut scores for psychopathology diagnosis in the same way: diagnostic thresholds are indicators not of people who can be classified as qualitatively different from the healthy, but of relative severity on continua that suggest varying need for treatment. These experiences remain anecdotal, but they demonstrate the feasibility of weaving HiTOP training into existing psychology program curriculums. Importantly, this exercise found that HiTOP training could be integrated without major cost (from additional texts or new measures) and without radical changes to the core curriculum.

Conclusions

How we classify mental illness is foundational for psychologists, carrying profound implications for the research and treatment of mental illness, as well as training of future psychologists. Prevailing approaches lack the empirical support often called for (Krueger et al., 2018) and suffer shortcomings, including reification, less than desired reliability, and questions about the validity of proposed categories. Quantitative nosology generally, and HiTOP as the latest synthesis of these models in particular, offers a departure from prevailing nosologies, with arguably more empirical support. Dimensions, not categories, are organized hierarchically. This new model’s flexibility provides novel targets and a powerful framework for research, and may better align with treatment. Training remains a challenge for the broader mental health field, but HiTOP can already be integrated intuitively into psychology training curriculum.

References


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*It is with sadness* that we inform you that David Teisler, our Director of Communications and Deputy Director, lost his wife, Mary Anne, to cancer August 6. We know that many of you have worked with David in the past and thought you might be interested to know that friends have established a [GoFundMe](https://www.gofundme.com/teislerfund) account. If you are so inclined to make a donation, here is the link: [GoFundMe](https://www.gofundme.com/teislerfund)