

# Enhancing research and treatment of mental disorders with dimensional concepts: toward DSM-V and ICD-11

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*The current versions of the DSM (DSM-IV-TR) and ICD (ICD-10) describe all mental disorders as polythetic-categorical concepts. Lists of symptoms are presented, and diagnostic category labels are assigned to patients based on observing specific patterns of symptoms. A number of notable conceptual problems emerge when using this strictly categorical system in research and in the clinic. When thorough structured diagnostic interviews are used, typical patients meet criteria for more than one specific diagnosis (a phenomenon termed “comorbidity”). In addition, groups of patients with the same putative categorical label are often heterogeneous with respect to key clinical features, such as severity and prognosis, and patients with symptomatology below diagnostic thresholds are often significantly impaired. Although categorical concepts will always be essential in official nosologies (e.g., in providing diagnostic labels for reimbursement purposes), many of the conceptual problems of a strictly categorical diagnostic system can be overcome by enhancing official nosologies with dimensional concepts. Specific dimensional approaches and directions that may be considered for upcoming revisions of both the DSM and ICD are discussed.*

**Key words:** Diagnosis, classification, dimension, category, nosology

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In both DSM and ICD, all mental disorders are *polythetic-categorical* concepts.

Polythetic refers to the fact that specific mental disorders are defined by multiple symptoms, and not all listed symptoms are necessary to consider a mental disorder present in a specific individual. Rather, a specific combination and number of symptoms – less than the total number of symptoms of the disorder – must be observed to consider a diagnosis present.

Categorical refers to the fact that all mental disorders in the DSM/ICD are binary, “either/or” concepts. Disorders are considered present in individuals when the right combination and number of symptoms are present, and absent when those symptoms are not present in the correct combination and number. There are no exceptions, and gradations of present vs. absent are not allowed.

Each and every mental disorder listed in the DSM/ICD is conceptualized as both polythetic and categorical.

## LIMITATIONS OF A STRICTLY POLYTHETIC-CATEGORICAL MODEL OF MENTAL DISORDERS

A number of notable problems emerge when conceptualizing mental disorders as strictly polythetic and categorical, in both research settings and in the clinic. Consider three conceptual problems that vex both research study design and clinical case conceptualization: comorbidity, within-category heterogeneity, and the validity of subthreshold symptomatology.

### Comorbidity

When thorough structured diagnostic interviews are used

in assessment, typical patients meet criteria for more than one specific diagnosis (2-5). This phenomenon is typically termed “comorbidity” (6). Although comorbidity is the typical concept applied to this phenomenon, it is somewhat of a misnomer. “Co-” generally refers to two things, but “multi-morbidity” may actually be more prevalent, and hence, a more accurate term (7).

The terminology used to describe this phenomenon of “extensive putatively distinct mental disorder multi-occurrence” is important, because the phenomenon is an essential empirical finding about what happens when one tries to work with DSM mental disorder concepts. “Multi-morbidity” is frequently encountered and is a potent predictor of overall clinical severity (8). However, many putatively distinct disorders have etiologic factors in common. Key examples include overlapping genetic contributions to major depressive episode and generalized anxiety disorder (9,10), and overlapping genetic contributions to antisocial personality disorder and substance dependence (11,12). Such data bring into question the DSM-driven conceptualization of mental disorders as entirely categorically distinct from each other. The data indicate a lack of categorical boundaries separating disorders, suggesting instead that disorder manifestations blend into each other in a manner not well captured by the idea of polythetic categories.

### Within-category heterogeneity

Another challenging problem that emerges when working with DSM mental disorder concepts is within-category heterogeneity. Consider the DSM-IV-TR personality disorders. A patient needs to meet criteria for only 5 of 9 symp-

toms to receive a diagnosis of schizotypal, borderline, or narcissistic personality disorder. As a result, patients who meet criteria for these disorders could share only one symptom. Obsessive-compulsive personality disorder involves 8 symptoms and a threshold of 4 symptoms for a diagnosis. As a result, two different diagnosed cases of obsessive-compulsive personality disorder could have no symptoms in common. In sum, a strictly polythetic-categorical approach leads to diverse diagnostic and prognostic profiles within groups of persons selected because they meet criteria for a specific mental disorder.

Consider also an illustrative example from research we pursued on DSM defined conduct disorder symptoms (13). We found that ten symptoms common to DSM-III-R and DSM-IV had an empirical structure consisting of two distinguishable dimensions, one consisting more of aggressive behaviors, and the other consisting more of rule-breaking behaviors (14). We also presented evidence that these two dimensions had distinguishable etiologies, with rule-breaking showing a greater relative contribution from the shared family environment, and aggression showing a greater relative contribution from genetic factors. DSM-IV recognizes sub-varieties of conduct disorder based only on age of onset and severity of overall symptoms, and conceptualizes conduct disorder as a polythetic category consisting of 15 symptoms with a threshold of 3 symptoms for a diagnosis. The problem is that, with 15 symptoms and a threshold of 3, persons with diverse symptomatology are considered exemplars of the same, putatively homogeneous, diagnostic category. This conceptualization is incompatible with the data. For example, person A could have 3 aggressive symptoms, person B could have 3 rule-breaking symptoms, and, although the evidence suggests potentially important differences between these two persons in terms of the etiology of their psychopathology, both are considered to have "the same diagnosis".

Finally, consider an example from literature on the treatment of depression. Thase et al conducted a meta-analysis on approximately six-hundred depressed outpatients pooled from six studies (15). All patients were diagnosed with major depressive disorder based on DSM-III and DSM-III-R (16) criteria and were on average 44 years old (31% male) (15). Patients were then stratified into less severe (a score of  $\leq 19$  on the Hamilton Rating Scale for Depression, HRSD (17)), and more severe (a score of  $\geq 20$  on the HRSD) subgroups, and were either given interpersonal psychotherapy alone, or interpersonal psychotherapy plus antidepressants (15). The combination of interpersonal psychotherapy plus antidepressants was significantly better than psychotherapy alone only in the more severe major depression subgroup (15). Thus, within a sample of patients diagnosed with major depressive disorder, there is significant variability in the way they respond to treatment.

In sum, polythetic categorical diagnostic concepts from the DSM show evidence of notable within-category heterogeneity, based on empirical studies. Interestingly, the limitations of a categorical approach, in terms of the heterogeneity

problem, are described and acknowledged in the text of the DSM-IV (p. xxii). The problem is that the DSM does not describe specific strategies or concepts for overcoming the heterogeneity problem.

### Validity of subthreshold symptomatology

In a polythetic-categorical framework, the extent to which a person is below or above the threshold for a diagnosis is deemed irrelevant to the diagnostic construct. Consider for example a diagnosis that consists of 10 symptoms, where the threshold is set at 5 symptoms. In this system, values from 1-4 are converted to "no diagnosis" or zero and values from 5-10 are converted to "diagnosis present" or one. The extent of symptomatology is assumed to lack clinical or public health significance.

Nevertheless, research indicates that valuable information is lost when proximity to a threshold is discarded in favor of conceptualizing disorders solely in terms of whether a threshold has been passed. A compelling example is found in research from the Christchurch Health and Development Study, a study of a longitudinally-followed birth cohort of persons in Christchurch, New Zealand (18). Ferguson et al (18) classified their research participants at ages 17-18 into three groups: asymptomatic, subthreshold (depressed mood or loss of interest for at least two weeks, but falling short of the 5 or more symptom threshold for major depression in DSM-IV) and major depression (full major depression criteria met in the last 12 months). The risk of depression and suicidal behaviors at follow-up (ages 21-25) was similar for both the subthreshold and major depression groups, and the data supported the existence of continuous, linear associations between late-adolescent depression and adverse early adult outcomes, as opposed to abrupt changes in risk at a specific threshold. In general, depression and other common mental disorders (e.g., alcohol dependence) do not appear to be empirically characterized by abrupt thresholds (19-21); these mental disorders are better characterized as continuous phenomena in nature.

### DIMENSIONAL ENHANCEMENT OF MENTAL DISORDER CONCEPTUALIZATION

Future DSMs will likely continue to be framed, at least partially, by categorical mental disorder concepts. Such concepts are important for various practical purposes, such as having specific labels that can be used in facilitating third-party payments. Nevertheless, owing to the clear limitations of an exclusively categorical-polythetic diagnostic system, there is substantial interest in enhancing the next edition of the DSM (DSM-V) with dimensional concepts.

With this interest in mind, and the support of the American Psychiatric Institute for Research and Education (APIRE) and the US National Institutes of Health (NIH), we organized



a meeting to discuss dimensional options for DSM-V (22,23). Here we outline some ideas that emerged from that meeting.

### Some dimensional options for official nosologies

Both categorical and dimensional approaches to diagnoses are critical to both clinicians and researchers, and the most effective classification system would offer both (24). It is also clear that dimensional scales need to reflect categorical definitions and the two must have a clear relationship to one another. Based on categorical definitions, there are numerous ways for creating continuous measures, including number of symptoms, severity of symptoms and level of illness impairment (within diagnostic entities) (24). If dimensional options for categorical diagnoses are adopted, then dimensional approaches that are most appropriate to the diagnoses defined would effectively need to be created (24).

Essentially, certain aspects of any specific disorder may be conceptualized and assessed dimensionally. Take substance use disorders for example: a categorical definition can be created based on prior categorical definitions, which sets the diagnostic threshold (25). Dimensionality can then begin at the symptom level, with each symptom being scored on (at least) a 3-point scale (25). Statistical methodology can be used to identify the dimensional score that most closely resembles the categorical (or diagnostic) threshold originally set forth. This leads to a consistent and clearer relationship between categorical and dimensional definitions (25). This method can essentially be implemented in most (if not all) parts of the DSM (e.g., personality disorders, mood disorders, psychoses, and developmental psychopathology).

The notion of a *cross-cutting* approach also becomes relevant when examining different methods for dimensional assessment. For example, the need to facilitate differential diagnosis forms the basis of grouping anxiety disorders into a single section of the DSM. Yet, symptoms such as panic attacks occur across anxiety and other psychiatric disorders (26). Evidence suggests that panic episodes are a reliable marker for higher illness severity, decreased responsiveness to treatments, and increased suicidality (27,28). Thus, panic may be considered a *cross-cutting* symptom that is defined separately and seen across several disorders (29). Implementing cross-cutting dimensions can potentially be more effective and informative than categorical diagnoses that are kept “artificially dimension-specific” (30). Another instance where a cross-cutting dimensional approach may be an effective way to conceptualize a complex illness is with children who exhibit comorbid symptoms for putatively distinct disorders (e.g., attention-deficit/hyperactivity disorder (ADHD) and oppositional defiant disorder) (31). A cross-cutting dimensional approach may be able to simplify the clinical conceptualization of intricate compound disorders by viewing those disorders as elements within a broader spectrum of interrelated conditions.

Child and adolescent disorders also highlight the need to

consider sources of variance – including gender, age and development – that are generally overlooked in the current edition of DSM (31). Consider for example gender: three to seven times more boys than girls meet DSM diagnostic criteria for ADHD. By adulthood, the disparity in gender is less apparent (32). A categorical approach that fails to take gender norms into consideration may hinder the understanding of these differences. By utilizing a dimensional approach, a systematic method for selecting gender sensitive cut-offs may be put forth (31). Age and development are also sources of variance that DSM criteria do not currently take into account. Sensitivity to developmental stages and individual distinctiveness may be more straightforward with a dimensional approach rather than a categorical one which only defines a single threshold (33). When implementing a supplementary dimensional system, children can be evaluated on dimensional scales that are normed on gender, age, and ethnicity (33).

Finally, DSM has consistently employed a “top-down” approach, where clinicians consult their own expertise as well as the existing literature for a diagnosis. In contrast, a “bottom-up” approach is generally driven by empirical analyses. A large body of symptom data may be collected from the general population to be statistically analyzed in order to determine which symptoms cluster together into syndromes or facets (33). For example, Krueger et al (34) discuss the advantage of comprising core descriptive personality features as part of DSM-V, thus reducing the large number of symptoms found in DSM-IV personality disorders to a set of more manageable facets (34). Thus, one advantageous approach would be to structure the DSM-V in a way that allows the possibility to compare both top-down and bottom-up methods in order to improve the diagnostic validity of the system (33).

### CONCLUSIONS

The DSM-III represented a major advance for psychopathology researchers and clinicians around the world. Clearly worded, observable criteria were presented for numerous categorical and polythetic mental disorder constructs. This clarity has been a boon to empirical research on mental disorders, because it provided consensual target constructs. The conceptual system put in place in DSM-III has essentially continued forward, through DSM-IV, with changes in specific criteria but no change in the basic conceptualization of mental disorders. As a result, extensive data and experience has accumulated regarding the limitations inherent in polythetic categories. The need to evolve our conceptualization, and to move beyond a strictly categorical and polythetic model of all mental disorders, is clear. The challenge now is how to achieve this evolution, in terms of specific strategies and approaches that can be implemented in official nosologies. This is no small task, but it is a critical one if the goal is to keep research and treatment of mental disorders on solid empirical footing.



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