Empirical classification of mental disorders: Improving evidence and reducing stigma

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Empirical modeling of personality and psychopathology identifies coherent groupings or “spectra”

These spectra transcend constructs traditionally conceptualized as “personality” vs. “psychopathology”

The resulting model is fundamentally
- dimensional
- and hierarchical

Progress in understanding etiology and pathophysiology involves interweaving with the empirically-derived phenotypic hierarchical structure

This can help with issues of stigma by relying on evidence as opposed to putative medical authority
**DSM categorical model:**

**Structural problems and little empirical support**

- **Comorbidity**
  - Typical patient who meets criteria for at least one mental disorder also meets criteria for other mental disorders

- **Arbitrary thresholds**
  - The threshold for a diagnosis is often the presence of more than half of the criteria
    - Lacks an empirical basis

- **Heterogeneity within categories**
  - Extensive diversity of presentation within putatively coherent groups
Not Elsewhere Classified (NEC) is often the correct diagnosis
   Because patients tend not to fit into one and only one type

Discrete *manifest* representations of psychopathology variables greatly reduce reliability and validity
   Markon et al 2011 *Psych Bulletin* meta-analysis

No evidence for discrete *latent* distributions either
   Underlying variation is empirically continuous

Can dimensional alternatives lead us where we want to go?
Hierarchical Taxonomy of Psychopathology (HiTOP) Consortium
- Formed recently to organize efforts to pursue mental disorder taxonomy based on evidence

Two historical approaches (Blashfield)
- Based on authority (Neo-Kraepelinian)
- Based on evidence (Quantitative)

HiTOP exists to promote an approach based on evidence
HiTOP Participation

- **HiTOP principles**
  - The HiTOP aims to address limitations of traditional nosologies, such as the DSM-5 and ICD-10, including arbitrary boundaries between psychopathology and normality, often unclear boundaries between disorders, frequent disorder co-occurrence, heterogeneity within disorders, and diagnostic instability.

- **HiTOP is growing continuously**
  - Founded by Kotov, Krueger, Watson
  - Nearly 200 members currently
  - If you are interested in joining please email Roman Kotov at roman.kotov@stonybrook.edu

- **HiTOP aims to be interdisciplinary**
  - Currently involves a number of prominent psychiatrists
  - E.g.: Carpenter, First, Regier, Skodol on byline of recent *World Psychiatry* paper
1. Identify relevant HiTOP constructs and appropriate measures.

2. Assess in representative population, potentially oversampling from range of maximal clinical relevance.

3. Test hypotheses about associations of HiTOP dimensions with neurobiological variables.
How does problem gambling fit?

- King et al. (2020):
  - In 24 year old twins, problem gambling loaded more on externalizing than on internalizing

- Oleski et al. (2011):
  - DSM defined pathological gambling loaded more on externalizing in NESARC
    - Secondary loading on internalizing (distress subfactor) in women

- Might this partly reflect the externalizing flavor of the criteria?
  - Craving, lying, excitement seeking
Empirical evidence on continuity

- **Taxometrics**
  - Originated in the writings of Paul Meehl
  - Evaluates if a set of manifest indicators delineates a single latent dichotomy (taxon)
  - Comprehensive reviews yield evidence for continuity
    - Little evidence for taxa in the domain of psychopathology

- **Model-based approaches**
  - Latent variable modeling can also accommodate discrete and continuous variables
    - At both the manifest and latent levels
  - Latent continuity is routinely observed in psychopathology data
Empirical evidence on continuity

- **Implications**
  - Authoritative classifications delineating arbitrary manifest categorical dichotomies are dramatically out of sync with a substantial scientific literature
  - Also places psychiatry out of sync with the rest of medicine

- **Dimensional information is readily translated into applications with clinical utility**
  - Clinically relevant thresholds
  - Multidimensional case conceptualization
Empirical evidence on hierarchy

- How many dimensions and what are they?
  - A key lesson from studying individual differences is that this question is somewhat misleading

- Individual differences can be conceptualized at continuously-varying levels of breadth vs. specificity

- The hierarchy of psychopathology itself is a construct
Shared variance is fundamental

- Recent interest in specific types of “network models” of psychopathology
- Popular approaches model associations among pairs of manifest indicators (edges) net of shared variance
  - Typically in cross sectional data
- This specific approach derives from a questionable ontology
  - The assumption that a latent variable implies an ontological unity
  - Evidence for both shared and distinguishable variation is abundant
    - And is better accommodated by hierarchy
  - Effective modeling accommodates both shared and specific features
Shared Variance Models (e.g., LVM; Association Networks)

Variance used to derive focal parameter estimates

Variance used from the relationship between A and B to estimate the A—B association (edge)

Variance from A used to estimate parameters

Conditional Independence Networks
The role of hierarchy in an empirical approach to classical constructs

- Construct hierarchy might be a continuous variable
- Rather than seeking to determine the optimal level, the unfolding of levels might be continuous and systematic
- Understanding patterning may be helpful in understanding “comorbidity” among classical DSM constructs
- This could help delineate the *meta-structure* of psychopathology
Rhode Island Hospital Data
(Forbes, Kotov, Ruggero, Watson, Zimmerman, & Krueger, 2017)

- Rhode Island Methods to Improve Diagnostic Assessment and Services project
- N = 2900
  - Participants presenting at a community-based outpatient psychiatric practice
  - Diagnosed via SCID and SIDP
- 24 (0,1) DSM-IV-derived indicators of Mental Disorder
  - Covering both Axis I and II
- Sex
  - Male 1132 (39.0%)
  - Female 1768 (61.0%)
- Educational level
  - High school 267 (9.2%)
  - Graduated high school 1813 (62.5%)
  - Graduated college or more 820 (28.3%)
- Marital status
  - Married/cohabitating 1359 (46.9%)
  - Formerly married 631 (21.8%)
  - Never married 910 (31.4%)
- Race
  - White 2538 (87.5%)
  - Black 128 (4.4%)
  - Other 234 (8.1%)
**Bottom-up:**

Agglomerative hierarchical cluster analysis

- Groups objects that are associated with each other
  - In this case, association = correlations among disorders

- Analytic method
  - Ward’s hierarchical agglomerative cluster analysis
  - Association matrix was smoothed $r_{(tetrachoric)}$ via psych package in R
    - $r_{(tetrachoric)}$ appropriate for dichotomous indicators
  - Distance matrix = dissimilarity, computed as: $1 - |r|$
Cluster analysis
Disinhibition

Antagonism

Somatoform

Thought Disorder

Detachment

Internalizing

7 clusters

OCD-related
5 clusters

- Disinhibition
  - AUD
  - SUD
  - HPD
  - NPD
  - ASPD
  - PPD
  - BPD
  - MAN
  - PSY
  - SCH
  - SCHY
  - PAIN

- Antagonism
  - SOM
  - HYP
  - EDs
  - OCD
  - OCPD
  - PTSD

- Somatoform
  - MDE
  - DPD
  - SOC/A PD
  - SPE
  - PD
  - GAD

- Internalizing

- Thought Disorder
4 clusters

Somatoform

Externalizing

Thought Disorder

Internalizing
3 clusters

Internalizing

EDs
OCD
OCPD
PTSD
GAD

Thought Disorder
SOM
HYP
EDs
OCD
OCPD
PTSD

Externalizing
PSY
SCH
SCHY
PAIN

AUD
SUD
HPD
NPD
ASPD
PPD

BPD
MAN
PSY
SCH
SCHY
PAIN

MDE
DPD
SOC/A PD
SPE
PD
GAD
2 clusters

- MDE
- DPD
- SOC/A PD
- SPE
- PD
- GAD

Not Externalizing

Externalizing

AUD, SUD, HPD, NPD, ASPD, PPD, BPD, MAN, PSY, SCH, SCHY, PAIN, SOM, HYP, EDs, OCD, OCPD, PTSD, MDE, DPD, SOC/A PD, SPE, PD, GAD
AUD  SUD  HPD  NPD  ASPD  PPD
BPD  MAN  PSY  SCH  SCHY  PAIN
SOM  HYP  EDs  OCD  OCPD  PTSD
MDE  DPD  SOC/A PD  SPE  PD  GAD

General Psychopathology

1 cluster
Summary and Conclusions

- Hierarchy itself is a meaningful construct in understanding psychopathology structure.
- Current HiTOP directions focus on utility:
  - Articulate clinical and research strategies encompassing dimensionality and hierarchy
    - Telescoping for specialty vs. generalist care
    - Understanding biological correlates at differing levels of generality vs. specificity
- Stigma is reduced through a dimensional approach:
  - Reduces emphasis on an inflexible categorical label
- How are “externalizing problems” experienced by the individual?
  - Consider the possibility of distress to the individual