COMMENTARY

Empirical Characterization of Heterogeneous Posttraumatic Stress Responses Is Necessary to Improve the Science of Posttraumatic Stress

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The concept of posttraumatic stress psychopathology is simple and intuitive: following a highly distressing event, some people develop sustained aversive responses that dominate their lives, causing overwhelming distress and havoc in their emotional, cognitive, behavioral, and interpersonal functioning. Despite the conceptual simplicity of posttraumatic stress, a decisive definition of the concept seems out of reach. The posttraumatic stress disorder (PTSD) diagnosis differs both between international standards (ie, *International Classification of Diseases*) and the US standards (*Diagnostic and Statistical Manual of Mental Disorders* [*DSM*]) and across iterations of these manuals.[1] Further, *DSM-5* offers a total of 6 posttraumatic and stress-related pathologies, including PTSD, PTSD in children under 6 years, reactive attachment disorder, disinhibited social engagement disorder, acute stress disorder, and adjustment disorders, and the inclusion of a seventh (complicated grief) was hotly debated.[2,3] Finally, other disorders such as substance abuse and depression have traditionally been thought of as "comorbidities," but appear to be themselves posttraumatic stress responses.[4]

Why does the divide between conceptual simplicity and working definitions matter? For researchers interested in understanding causes, modifiers, or outcomes associated with a construct, narrow, accurate, and consistent definitions of all variables, including the outcome variable, are necessary. Karl Pearson stated, "Scientific discovery and the accumulation of information about the physical world is one thing; accurate, clear, and coherent summary . . . is quite another."[5] There is a significant lack of coherence in the existing definitions of posttraumatic stress reactions. If we examine the current *DSM-5* chapter "Trauma- and Stressor-Related Disorders," we can easily observe that, in the majority of cases, an individual can have more symptoms than the number required for diagnosis and still not meet diagnostic status because of seemingly arbitrary categorical rules. Even in cases where this is not true, such as acute stress disorder, the difference between health and pathology can be a single symptom (Table 1). One individual can potentially have 3 times the symptoms of someone diagnosed with PTSD and be labeled "healthy." In this framework, the distribution of symptom severity is inconsistent with the distribution of caseness.

Posttraumatic stress is a construct. The clinical validity of this construct is not in dispute, as posttraumatic stress is routinely observed following an infinite number of possible discrete potentially traumatic events. However, the method for *measuring* this construct is intensely debated.[6–11] Latent (not directly observable) variable modeling is a powerful tool for measuring and analyzing constructs by modeling key conceptual characteristics such as the distribution of scores (for example, symptom scores) and their change over time.[12,13] In this framework, populations are characterized by identifying mixture distributions (Figure 1). This approach is of great value, as it can identify existing populations based on shared distributions rather than subpopulations defined by a priori symptom classifications. Latent growth mixture modeling (LGMM), the method used to identify trajectories in Andersen et al,[14] provides a framework for characterizing distinct populations based on their symptom severity over time. Interestingly, when examining different symptom indicators such as depression and anxiety in the same population, there is significant overlap in identified trajectories and membership in those trajectories. Thus, while the variables may be distinct, the populations they are measuring may not be.[15] For example, factor analysis may show that there are distinct PTSD symptom clusters, but individuals who have high scores in 1 cluster tend to have concordantly high scores in the others.

In contrast to the lack of coherence in diagnostic definitions, researchers have identified common patterns of stress response across different indicators using the LGMM approach (ie, PTSD, depression, general distress, functioning) in response to diverse potentially traumatic events[15–34] and even in translational animal models of threat (fear) learning.[35] Across studies, consistent patterns of resilience, recovery, and chronic stress have been identified. The LGMM approach has significant promise for characterizing common clinically relevant, transdiagnostic posttraumatic stress responses. The employment of such methods will most likely have downstream consequences in terms of scientific discovery, as models that better capture the empirical reality provide more accurate and reproducible results compared to noisy, a priori diagnostic categories.

Table 1. Description of Symptom Distributions for *DSM-5* Diagnoses of Trauma- and Stressor-Related Disorders

Diagnosis[a]	Total Possible Symptoms	Minimum No. of Symptoms for Diagnosis	Maximum No. of Symptoms Without Meeting Diagnostic Criteria
Reactive attachment disorder	8	5	6
Disinhibited social engagement disorder	7	3	4
Posttraumatic stress disorder	20	6	18
Posttraumatic stress disorder in children under 6 y	16	4	12
Acute stress disorder	14	9	8
Adjustment disorders	2	1	0

[a]Diagnoses of trauma- and stressor-related disorders in the *Diagnostic and Statistical Manual of Mental Disorders*, Fifth Edition (*DSM-5*).

Figure 1. Example of a Latent Longitudinal Mixture Distribution Underlying an Observed Distribution
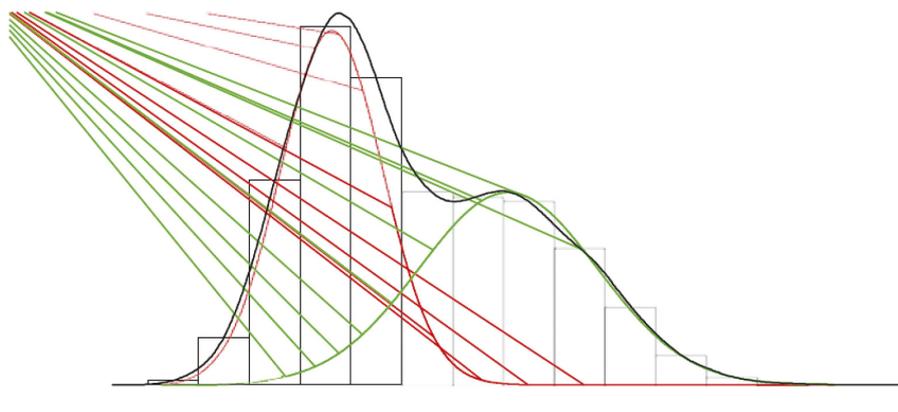
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