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PREVENTION OF TRAUMATIC DISEASES

Abstrakt: Post-traumatic stress disorder (PTSD) is a frequent, tenacious, and disabling consequence of traumatic events. The disorder's identifiable onset and early symptoms provide opportunities for early detection and prevention. Empirical findings and theoretical models have outlined specific risk factors and pathogenic processes leading to PTSD.

Keywords: Post-traumatic stress disorder, Prevention, Early treatment, Cognitive behavioral therapy, Pharmacotherapy, Targeted intervention

The psychological effects of wars, disasters, terror, and other traumatic life events, can be deleterious and far-reaching. Post-traumatic stress disorder (PTSD) is the most widely researched consequence of traumatic events and as such epitomizes post-traumatic psychopathology. The clinical features comprising PTSD are event-related symptoms (intrusive recall of aspects of the event, avoidance of reminders, hyper-vigilance) along with dysphoria, hyperarousal, or anhedonia. PTSD is a prevalent consequence of both mundane traumatic events, such as road traffic accidents (7 to 26 %) [1] and protracted exposures to threat, such as wars (8 to 12.7 % among warzone-exposed US military personnel) [2].

PTSD may persist, unremitting, for years and decades in a subset of trauma-exposed survivors. The second wave of data collection (2013) of the nationally representative National Vietnam Veterans Readjustment Study (NVVRS, 1985), showed little improvement and frequent deteriorations of participants with PTSD [3]. Chronic PTSD is associated with poor physical health, inferior well-being, and unemployment [4]. The disorder is often comorbid with mood, anxiety, and substance use disorders [5, 6]. Co-occurring mental disorders worsen affected survivors' outcome and increase the burden on public health.

Unlike other mental disorders, PTSD follows a distinct triggering event and has a clear onset point. Early PTSD symptoms develop within days of trauma exposure.

Many trauma-exposed individuals are brought to the attention of emergency care services and helpers. These conditions create unique opportunities for detecting survivors at risk and providing preventive interventions. Conceptual models of PTSD's pathogenesis, discussed below, have informed most early prevention techniques [7-9]. Despite these favorable attributes of PTSD, its systematic prevention is elusive at this point, and the disorder's prevalence in the last four decades is remarkably stable, in both military personnel and civilians [10].

The reasons that stagnate prevention of PTSD have not been fully elucidated, but several possibilities have been identified. Current preventive interventions were derived from evidence in chronic PTSD and may not properly engage the disorder's pathogenesis. Efficient interventions have not been implemented on a large scale. Risk detection is imperfect. Service delivery is difficult when hostilities continue (e.g., during wars, mass relocation, protracted abuse). Studies have documented barriers to seeking help among symptomatic survivors. Community resources might not suffice for intense individual interventions.

Nonetheless, a rapidly growing body of work better informs our understanding of post-traumatic psychopathology, its neurobiological mechanisms, the resulting symptom trajectories, and putative trajectory moderators. This review outlines the better-researched theoretical models of PTSD and related interventions and discusses directions for future research and individual-specific prevention.

Individuals' reactions to traumatic events follow diverging trajectories. From quasi-universal disarray and distress, shortly after exposure, some survivors develop very few symptoms; others show transient and reversible initial symptoms, and a substantial minority keeps expressing severe non-remitting symptoms. These findings define two primary goals for early interventions: Firstly, to mitigate the development of early symptoms, and secondly, to increase the likelihood of remission in those who develop symptoms (with special focus on the non-remitting subgroup). Interventions addressing the first goal include attempts to reduce the stressfulness of the traumatic event (e.g., 'stress management,' 'need-based

assistance'), and interventions meant to reduce participants' initial responses to the event or its encoding in memory. Studies addressing the second goal include specific intervention protocols delivered at different time intervals from the traumatic event to survivors identified as being at high risk for PTSD. The efficacy of the latter, therefore, hinges on proper risk detection at the early aftermath of trauma exposure. Individual risk prediction, however, is currently far from perfect.

Empirically identified risk factors for PTSD are abundant. These can be temporally classified into pre-exposure 'vulnerability' factors, peri-traumatic factors and reactions directly related to the event, and post-exposure adversities. Pre-existing vulnerability factors range from neurobiological factors, such as genetic endowment and epigenetic regulation, through environmental factors, such as prior trauma exposure, family and personal psychiatric history, lower education, and stressful, resourceless living conditions, to behavioral factors, such as impaired executive function and higher emotional reactivity. Peri-traumatic factors include trauma intensity and type (e.g., intentional vs. unintentional), peri-traumatic symptoms, physiological arousal (e.g., heart rate) and gene expression. Post-exposure factors encompass social support (a protective factor), and 'secondary' stressors (e.g. unemployment as a result of the event).

Despite such an abundance of potential risk indicators, this knowledge has not yet been translated into individual risk prediction. One shortcoming of research to date is the use of statistical modeling that does not properly account for within-group heterogeneities. Studies universally use central tendency statistics, thereby implying that groups studied (e.g., rape victims, accident victims) are inherently homogeneous. However, trauma-exposed individuals are inherently heterogeneous, each bringing to the event his or her own array of vulnerability factors, environmental pressures (and provisions), psychological outfit and subjective appraisal of the traumatic event. Recent studies have used advanced analytic methods to define within - individual (as opposed to group average) symptom trajectories as the outcome of interest, and used machine-learning algorithms to

make risk predictions. Several interchangeable sets of early risk indicators have been described including combinations of initial distress, early symptoms, injury severity, head injury, and subjective need for help, allowing more versatile individual prediction. Current studies are exploring the clinical utility of such algorithmic solutions for calculating individual risk and predicting the need for intervention. Most preventive studies to date are theory-informed. Figure presents the main theoretical models of PTSD pathogenesis, linking each model with specific interventions. The figure posits a progression from genetics and epigenetic vulnerability factors, childhood experience to peri-traumatic distress, and to specific pathogenic mechanisms operating during trauma exposure and its aftermath. The latter include psychological (appraisal of trauma, recovery environment) and putative neurobiological mechanisms underlying the pathogenesis of PTSD. The current review will only focus on secondary and tertiary prevention, which target the progression of psychopathology after the traumatic event. Interventions targeting elements in that progression (e.g., fear conditioning, emotion processing, initial neuroendocrine response) are associated with each element. Considering such a progression shows that interventions' timing and window of opportunity may be crucial for affecting relevant pathogenic mechanisms. For example, trauma memories may consolidate within hours of trauma, or during the first night sleep such that interventions designed to disrupt initial memory consolidation (pharmacological or psychological) must be provided within such timeframe. Other mechanisms in posttraumatic psychopathology, such as changes in memory, context processing, and nociceptive circuits may also occur within a currently unmapped time frame, calling for time-dependent intervention delivery.

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