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ABSTRACT

Using Dimensionality Reduction to Decode the Cognitive Correlates of Psychological Trauma in Patients with Post-Traumatic Stress Disorder

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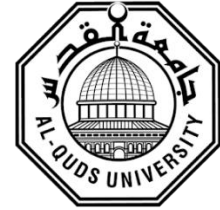
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Background: Exposure to psychological trauma usually marks monumental changes in an individual's clinical features, cognitive function, and underlying neural circuitry. A fraction of exposed individuals will develop subsequent post-traumatic stress disorder (PTSD). To date, there is no clear understanding of the cognitive consequences of exposure to psychological trauma, especially that which is related to PTSD. This could be attributed to the use of generic constructs to describe clinical features and cognitive function.

Objectives: In this study, we aimed to distinguish the cognitive effects of psychological trauma in healthy subjects and patients with PTSD. We also evaluated a trauma-unexposed healthy group.



Methods: All subjects completed a well-validated cognitive paradigm that dissociates associative learning, retention of learning, and generalization of the learned rules. Using feature extraction and data structuring, we created a novel system for scoring cognitive performance and PTSD, depression, and anxiety clinical features. Based on their performance, each subject obtained a three-dimensional score composed of efficiency throughputs for associative learning, retention, and generalization.

Results: Patients with PTSD were significantly different than both trauma-exposed and trauma-unexposed healthy subjects in their associative learning efficiency throughput. Examination of PTSD, depression, and anxiety scores revealed a significant correlation between re-experiencing and associative learning efficiency throughput only in trauma-exposed healthy subjects. In patients with PTSD, only anxiety scores correlated with retention efficiency throughput.

Conclusion: These results suggest that the cognitive deficit in PTSD is driven by a failure to form associations. This could be initiated upon exposure to trauma as evident in the trauma-exposed healthy subjects. Beyond that, the cognitive correlates of PTSD could be an outcome of anxiety rather than the trauma. Our findings highlight the cognitive underpinnings of PTSD while controlling for the effects of trauma. This could guide the development of data-driven criteria for assessing the risk for developing PTSD after exposure to psychological trauma.

Research Keywords: Learning and generalization, psychological trauma, post-traumatic stress disorder, feature engineering, dimensionality reduction.