

Non-negative matrix factorization

Mild Traumatic brain injury (mTBI) is a signature wound in **military** personnel, and repetitive mTBI has been linked to age-related **neurodegenerative diseases** that affect **white matter** (WM) in the **brain**. However, findings of **injury** to specific **white matter tracts** have been variable and inconsistent. This may be due to the heterogeneity of mechanisms, **etiology**, and comorbid disorders related to mTBI. **Non-negative matrix factorization** (NMF) is a data-driven approach that detects covarying patterns (components) within high-dimensional data. Bouchard et al. applied NMF to **Diffusion-weighted magnetic resonance imaging** data from military **Veterans** with and without a self-reported TBI history. NMF identified 12 independent components derived from **fractional anisotropy** (FA) in a large **dataset** (n = 1,475) gathered through the ENIGMA (Enhancing Neuroimaging Genetics through Meta-Analysis) Military Brain Injury working group. Regressions were used to examine TBI- and mTBI-related associations in NMF-derived components while adjusting for age, sex, post-traumatic stress disorder, depression, and data acquisition site/scanner. They found significantly stronger age-dependent effects of lower FA in Veterans with TBI than Veterans without in four components ($q < 0.05$), which are spatially unconstrained by traditionally defined WM tracts. One component, occupying the most peripheral location, exhibited significantly stronger age-dependent differences in Veterans with mTBI. They found NMF to be powerful and effective in detecting covarying patterns of FA associated with mTBI by applying standard parametric regression modeling. The results highlight patterns of WM alteration that are differentially affected by TBI and mTBI in younger compared to older military Veterans ¹⁾.

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Bouchard HC, Sun D, Dennis EL, Newsome MR, Disner SG, Elman J, Silva A, Velez C, Irimia A, Davenport ND, Sponheim SR, Franz CE, Kremen WS, Coleman MJ, Williams MW, Geuze E, Koerte IK, Shenton ME, Adamson MM, Coimbra R, Grant G, Shutter L, George MS, Zafonte RD, McAllister TW, Stein MB, Thompson PM, Wilde EA, Tate DF, Sotiras A, Morey RA. **Age-dependent white matter disruptions after military traumatic brain injury: Multivariate analysis results from ENIGMA brain injury**. Hum Brain Mapp. 2022 Mar 15. doi: 10.1002/hbm.25811. Epub ahead of print. PMID: 35289463.

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Last update: **2025/04/29 20:23**

