

Early Life Adversity and Saccadic Eye Movement Variability in Young Adults with Mild Traumatic Brain Injury: Exploratory Findings



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BACKGROUND

- **Mild traumatic brain injury (mTBI)** can cause persistent cognitive, emotional, and sensorimotor functional impairments (Hungerford et al., 2023, Stuart et al., 2020).
- **Saccadic eye movements** are useful **objective** measures of neurological function, with mTBI linked to altered latency, accuracy, and variability (Cifu et al., 2015; Hunt et al., 2016; Mullen et al., 2014).

Saccadic Measure	Plain-Language Term	What It Represents
Amplitude variability	<i>Movement-distance consistency</i>	How much the distance of eye movements varies from one movement to another
Angular variability	<i>Movement-direction consistency</i>	How much the direction of eye movements varies from the intended horizontal path
Average velocity variability	<i>Average-speed consistency</i>	How much the overall speed of eye movements varies from one movement to another
Peak velocity variability	<i>Peak-speed consistency</i>	How much the fastest speed reached during each eye movement varies from one movement to another

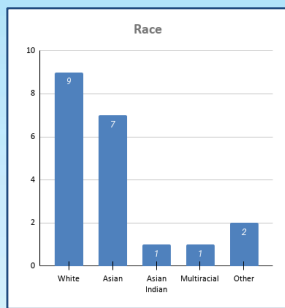
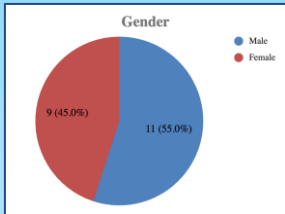
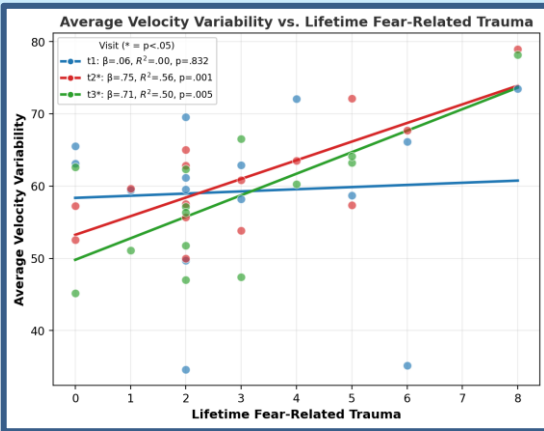
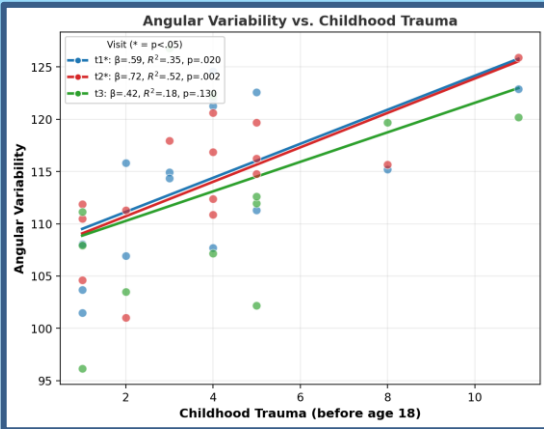
- **Early life adversity (ELA)** may influence recovery following mTBI via stress regulation and neurodevelopment (Hughes et al., 2017; Teicher & Samson, 2016).
- However, the relationship between ELA and saccadic eye movement variability in individuals with mTBI remains poorly understood.

PURPOSE

- To examine whether ELA is associated with saccadic eye movement variability in young adults with mTBI.
- To evaluate oculomotor differences across ELA exposure levels and preliminary changes following a 14-day mobile dual-task exercise intervention, “**Brain & Walk Exercise Every Day (BraW-Day)**” (cognitive activities with walking exercises).



Scan to access 2-min info
YouTube video of BraW-Day App



Age (years)	
Mean	25
Standard Deviation	5.7
Range	18-36

RESULTS

Two saccadic measures - **angular variability** (consistency of eye movement direction) and **velocity variability** (consistency of eye movement speed) - showed significant associations with ELA, with strongest relationships observed **post BraW-Day intervention**.

- Greater childhood trauma was significantly associated with angular variability.
- Fear-related childhood trauma was significantly associated with average velocity variability.
- Both associations remained significant after adjusting for age.
- **Scatterplots (center)** illustrate these relationships, with regression statistics provided for each association.

CONCLUSION

Early life adversity (ELA) may be associated with saccadic eye movement variability in young adults with mTBI.

- Childhood trauma was associated with **greater angular variability** (less consistent movement direction), while fear-related trauma was linked to **greater average velocity variability** (less consistent movement speed).
- These findings suggest that different dimensions of ELA may relate to distinct aspects of oculomotor function.
- Associations were strongest following the 14-day BraW-Day intervention, suggesting that ELA may contribute to individual differences in post-intervention oculomotor trajectories.
- ELA may therefore be an important factor to consider when evaluating heterogeneity in mTBI recovery.
- Larger longitudinal studies are needed to confirm these preliminary findings and determine their clinical significance.

REFERENCES

Here is the QR Code for our references:



METHODS

Study Design: Secondary analysis of a pilot randomized controlled trial for the BraW-Day intervention in individuals aged 18-40 years with mTBI (UNLV IRB #2023-245).

Participants & Measures: Nineteen participants completed EyeLink Plus 1000 saccadic assessments at baseline, post-intervention, and 1-month follow-up. ELA was assessed using the Lifetime Trauma and Victimization History (LTVH) instrument.

Statistical Analysis: Linear regression and Repeated-measures general linear models examined associations and differences in longitudinal saccadic trajectories by ELA, focusing on variability in amplitude, angle, average velocity, and peak velocity.

