Exploring Neuroplasticity in Acute Mild Traumatic Brain Injury
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BACKGROUND
- mTBI: affects mental state and possibly consciousness level
- often underdiagnosed and untreated because of
- lack of apparent external injuries and clear pathological findings
- need for sensitive and objective test
- EEG:
  - noninvasive, readily available, and sensitive to brain function
  - may provide tests to detect mTBI
- N-back paradigm: behavioral task to measure working memory (WM).
- fMRI findings: WM impaired in mTBI patients.

METHODS
- Study participants: 13 acute mTBI patients and 7 controls (non-head-trauma patients) recruited from the emergency department of Huntington Memorial Hospital in Pasadena, CA.
- Control and mTBI subjects matched on age, sex, education, and body mass index (BMI).
- Three repeat sessions: within 1 week of injury, 14 days, and 30 days after injury.

OBJECTIVE
Identify changes in evoked and induced alpha EEG activity in a visual n-back WM paradigm and compare the mTBI patients with controls.

RESULTS
- Alpha power:
  - increased work load associated with greater alpha desynchronization
  - Alpha power includes total power (Tp), non-phase-locked (NPp), and phase-locked (evoked) power (Pp)
  - induced alpha increases during internally directed attention

- EEG data recorded using dry electrode headset (Guerar Wearable Sensing, DSI-24).
- Time-Frequency Power Analysis: EEG preprocessing included bandpass filtering (0.1-30 Hz), segmentation, and independent component analysis to remove “noisy” trials using Matlab, EEGlab, and in-house developed software.

- Individual trials were decomposed into their time-frequency representation via wavelet convolution performed in the frequency domain.
- Power values were normalized to the average prestimulus baseline power at each frequency band.
- The alpha power (8-15Hz) in the interval 200-800ms poststimulus was computed for all subjects, including Tp, NPp, and Pp.

- Statistics: used the student t-test to compare the two groups, unless otherwise stated.

SUMMARY & DISCUSSION
- mTBI: affects mental state and possibly consciousness level.
- Often underdiagnosed and untreated because of the lack of apparent external injuries and clear pathological findings.
- Need for sensitive and objective test.
- EEG: noninvasive, readily available, and sensitive to brain function. May provide tests to detect mTBI.
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REFERENCES

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