Cognitive Readiness Following Traumatic Brain Injury

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Disclosures & Disclaimer

Presenter has nothing to disclose

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Objectives

1. To define the cognitive demands of the warfighter across the military and describe standards of practice currently employed for determining cognitive readiness.

2. Detail how cognitive testing routinely completed in research and clinical practice can be used to inform decisions about an individual's readiness for world-wide deployability.

3. Identify new measures that can be used to improve our assessment of the most relevant cognitive abilities to optimize research designs and clinical assessments related to cognitive readiness of the warfighter.

4. Provide a review of treatment options that can have the potential to improve cognitive readiness after a traumatic brain injury.

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TBI and Cognition

- Traumatic Brain Injury is very common in military personnel
  - Approximately 380,000 individual SM diagnosed between 2000-2017
- TBI in the military is associated with Persistent Problems
  - Mood Disorders: Anxiety, Depression, PTSD
  - Cognitive Problems: Memory
  - Physical Symptoms: Headaches, Migraines, Sleep Difficulties
  - Poor life satisfaction

- From a medical standpoint, how do we help determine if these symptoms are impacting our service member’s ability to perform their job?

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Military Readiness

Military Readiness refers to the likelihood that a military unit or service member to perform well in combat or in other military operations (e.g., training)

- Commonly conceptualized as physical readiness:
  - General Navy Physical Readiness Test:
    - 1.5 Mile Run, Sit-up (2 minutes), Push-Up (2 minutes)
    - Sailor needs to be “Satisfactory” based on average of the 3 tests
  - Navy SEAL Physical Readiness Test:
    - Swim 500 yards, Sit-Ups, Pull-ups, 1.5 Mile
    - Specific minimums are required for each test

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Cognitive Readiness (Grier, 2012)

- An estimate of how a service member will perform mentally (cognitive and psychological) in military operations
- Requires that service member function in complex, demanding, and stressful environments
  - Cognition is central but also personality, resilience, and motivation
- Cognitive readiness is dynamic and includes multiple aspects of the service members duties
  - A service member can have cognitive readiness for one of their responsibilities but not another aspect of their duties

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Assessment of Cognitive Readiness

Cognitive readiness is typically assessed

- Selection/Recruitment
- Deployment Preparedness

Military medicine may be engaged after an injury, such as TBI, or when military leaders raise concern about a Service Member’s performance due to mental mistakes or abnormal behavior

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Differentiating Impairment versus Deficit?

- Impairment: refers to a decline in performance relative to an expected level of performance (e.g., baseline)
  - An ability to learn words is lower than what would be expected based on normative data

- Deficit: describes if there is a lacking in ability that is essential to completing a task
  - An ability to learn a list of words is lower than what would be expected for a pilot to safely fly a plane

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Military clinicians can identify risk factors that could potentially impact a service member's ability to complete their duties:

- This is distinct from judgments pertaining to the service member's knowledge, skills, and ability to perform their duties.
- If a medical condition increases a risk for cognitive issues, even mild, due diligence to assess for military relevant concerns.
What does a warfighter have to do?

- Basic visual attention
What does a warfighter have to do?

- Executive Functioning
  - Knowing when a threat demand action
    - Having the restraint to not take aggressive action under stress
  - Attending to mission critical tasks simultaneously
    - Watching potentially hostile individuals
    - Tracking and communicating with other service members
    - Monitoring your position and navigating routes
  - This is performed in typically sub-optimal conditions
    - Fatigue, physical exertion, chaotic environments
What does a warfighter have to do?

- Varied based on occupational specialty
  - Infantry
  - Aviator
  - Transportation
  - Special Operations
  - High Level Leadership

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Assessment of Cognitive Readiness

Do existing measures of cognitive function widely used in the military have value for informing cognitive readiness?
Simulators and training may mask deficits

- Want overlearned for safety but may mask deficits that would be vulnerable in combat
Military Acute Concussion Evaluation 2 (MACE 2)

- Acute clinical assessment tool to diagnose a concussion
- Provides a screening for changes in cognitive functioning associated with confusion and disorientation
  - Memory, attention, oculomotor function
- MACE2 is not a measure of cognitive impairment it is a diagnostic tool
- Has potential to identify a brain injury that may impact warfighter readiness
Automated Neuropsychological Assessment Metrics (ANAM)

- Computer-based cognitive assessment
- Measures speed and accuracy of attention, memory, and thinking ability
- Routinely administered prior to deployment and can be used to identify changes in function
- Since 05/28/2008, mandatory for Service Member to complete within 12 months before deployment
- Measure of impairment based on individual baseline pre-injury
  - No known relationship to service member functioning or ability to perform duties
  - May have the potential as a screening tool to identify individuals with deficits

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Neuropsychological assessments are a comprehensive method to identify psychological and cognitive changes from a brain injury.

- Use of standardized tests that have well validated tests to detect impairments from psychiatric and neurological conditions.
Neuropsychological Assessment

Cognitive & Emotional Health

- Intelligence
- Attention/Concentration
- Working memory
- Learning
- Memory
- Visuospatial Perception
- Problem Solving
- Inhibition
- Depression
- Anxiety
- Paranoia
- Hallucinations
- Hypervigilance
- Suicidality

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Neuropsychological assessments are commonly used in the evaluation of deficiency in other professions:

- Aviation
- Physicians
- Also, used to help inform Medical Evaluation Board (MEB) and Physical Evaluation Board (PEB) in the military
How do we know what is a deficiency?

- Lessons learned from the Federal Aviation Administration
  - After “high risk” condition (e.g., TBI) pilots are unable to fly until they get neuropsychological testing
  - Aviation there is use of “pilot specific” normative data
  - There is research connecting cognitive tests performance of pilots to occupationally relevant performance
- Can the same standards be applied across the military?

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Next Steps....

- Need for specific normative data on cognitive test for specific MOS
  - Sniper: Inhibition? Visual Attention?
  - Command: Language? Judgement? Problem Solving?

- Relating cognitive test performance to performance in military tasks
  - What is the threshold for concern? Does it vary for different specialties?
Remediation of cognitive readiness?

- Traditional cognitive rehabilitation is focused on impairments
- Shown to only be minimal effective in mTBI for military
- Traditional cognitive rehabilitation is not relevant to military operational tasks

Treatments

- Must be related to dynamic and efficient thinking needed for the warfighter
  - Strategic Memory Advanced Reasoning Training (SMART)
Summary

- Service members are exposed to psychological and neurological events that compromise cognitive readiness
- Military medicine is in a position to help inform decisions about readiness but we have to appreciate what are the demands of this job
- Current clinical tools such as the ANAM and neuropsychological assessments are available to aid in these assessments
Questions?

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