The Role Of Dual-Task Training and Assessment in the Clearance Process For Tactical Athletes Post-Concussion

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Objectives

At the end of this presentation learners will:

1. Describe the impact of concussion on brain functions that affect motor performance.
2. Recognize the difference in recovery timelines between neuropsychological assessments and symptoms resolution vs dual task function
3. Identify reasons for concern in returning SM's to duty or athletes to play before dual-task abilities are normalized.
4. Describe ways to assess dual-task function in the clinic.
5. List 3 dual task interventions for tactical athletes that could be used in clinical practice.
6. Explain the key factors that should be considered when making return to sport/duty decisions.

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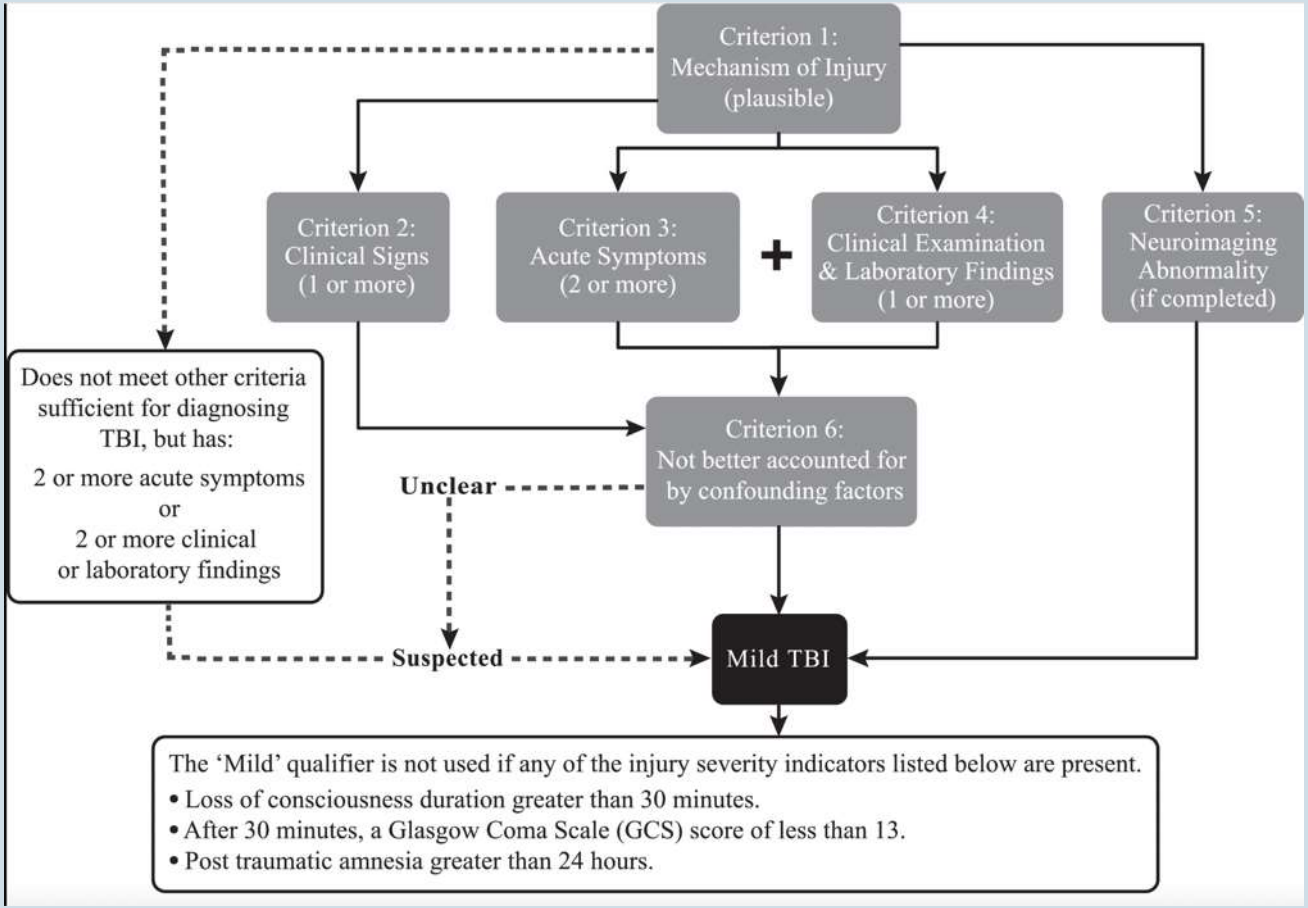
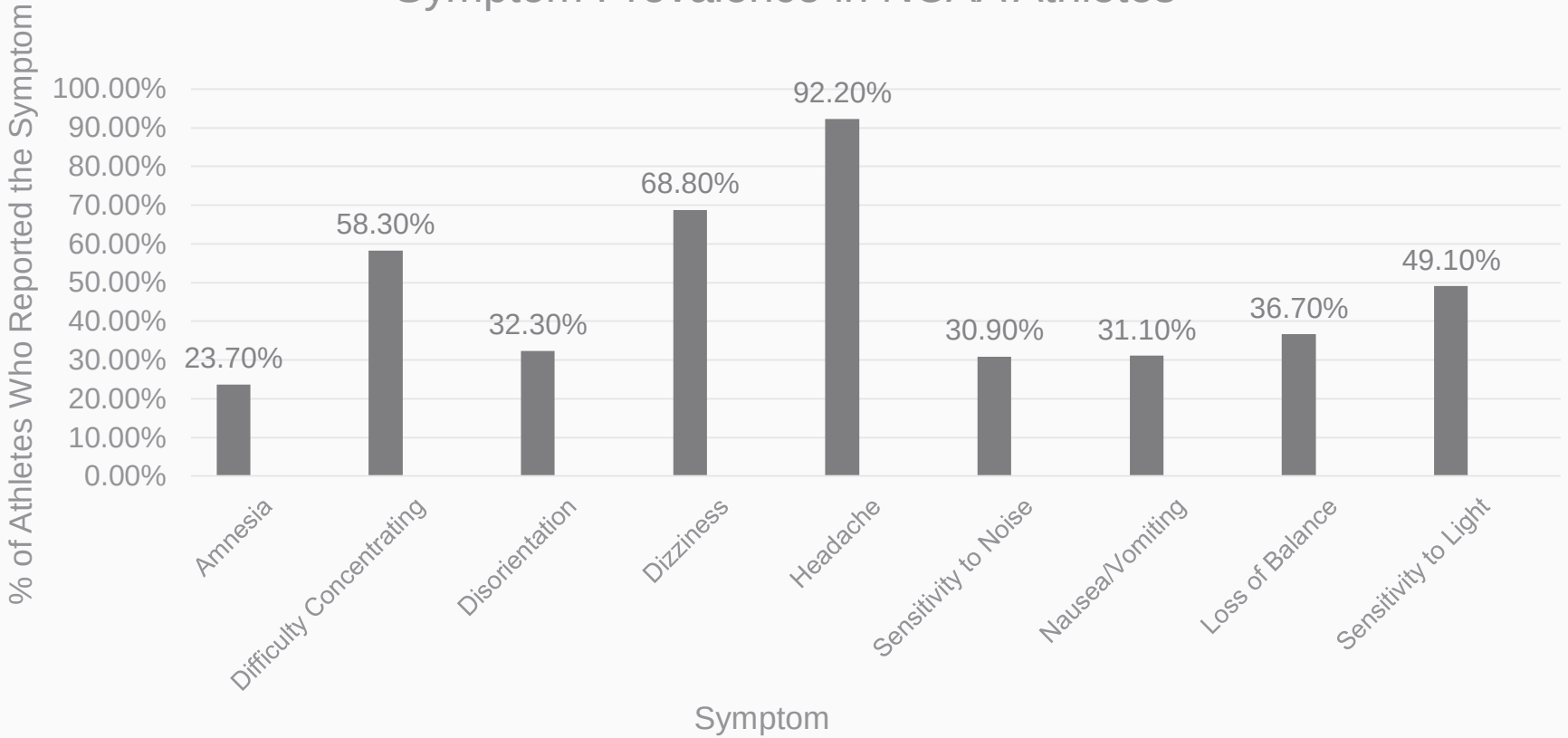
01 Concussion Overview



Concussion Diagnosis Criteria – ACRM[1]

Symptom Prevalence in NCAA Athletes[2]



How Common are Concussions in Tactical Athletes?

Athletes

4.18 per 1000 athlete exposures leading to 450k hospital visits each year[3]

Military Personnel

315,592 Department of Defense service members suffered an mTBI between 2000 and 2019[4]

02 Concussions' Impact

How can Concussion Impact Brain Function?

1. Diminished neural networking efficiency[5,6]
2. Decreased motor cortex function[7]
3. Impacts of mTBI increase risk for brain re-injury[6]

Decreased function, efficiency and impacts of mTBI have been shown to persist LONGER than clinical symptom resolution.[3,7]

Concussions Impact of Functional Measures

Gait Velocity/Dual Task

- Decreased in individuals with concussion[5,8,9]
- Impairments up to a year post-injury[5,8,9]
- Adults > Adolescents[5,8]

COP Deficits/Dual Task

- Increased M/L displacement up to 2 months post-injury[5]
- Increase in COP movement when visual field motion occurs for up to 30 days post-injury[6]

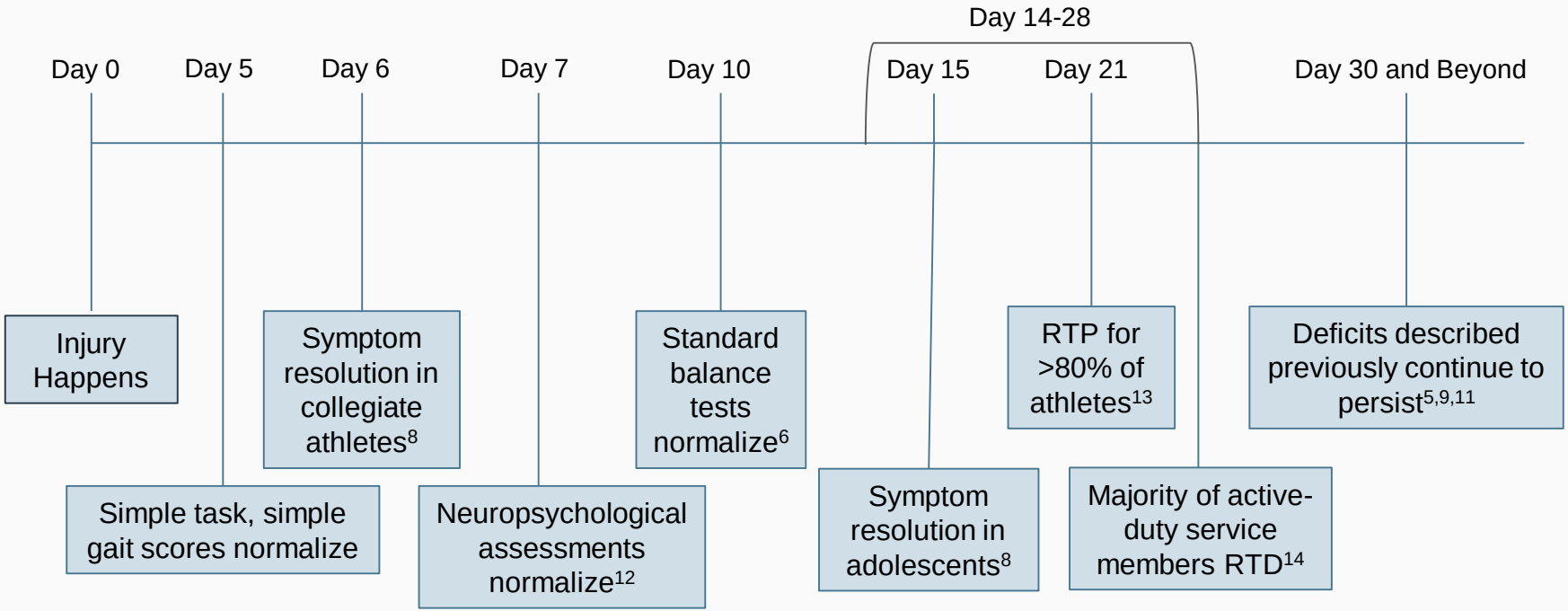
Concussions Impact of Functional Measures

Cognition/Dual Task

- Cog. performance persisting for 5-12 months[3,5,10]
- Increased difficulty dividing attention between visual and auditory stimuli[10]

https://ndupress.ndu.edu/Media/News/News-Article-View/Article/1681855/beyond-the-gray-zone-special-operations-in-multidomain-battle/

How Do These Timelines Compare to Neuropsychological Tests and Post-concussion Symptom Scales?



03 Concussion & Injury

Increase Risk of Lower Extremity Musculoskeletal (LEMSK) Injuries

Within one year after concussion, athletes are at an increased risk of a LEMSK injury….

1.34x the risk of a LEMSK injury[15]	2.5x the risk of a LEMSK injury[15]	2.2x the risk of a LEMSK injury[15]
High School Athlete	Collegiate Athlete	Professional Athlete

Post-Concussion Injury Risk: Differences Between Athletes Who Reinjure vs. Those Who Don't

1. **Decreased average walking speed during dual task activity**[11,15]

   How to assess: 10 MWT

2. **Significantly increased dual task cost**[15,16]

   How to assess: Motor + cognitive assessment to determine cognitive accuracy and physical function

3. **Decreased gait stability in the frontal plane**[7]

   How to assess: Motion capture data, tandem gait, lateral loss of balance

Athletes who are returned prematurely may be highly susceptible to future brain and musculoskeletal injury.[6,11]

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04 Outcome Measures

How Can We Evaluate Dual Task Deficits?

- Virtual Reality[6]
- TUG with mini mental style questions[17,18,20]
- Dual task tandem gait tasks > Single task tandem gait[18-20]
  - Higher sensitivity and specificity than other postural stability tests[18]
  - Can serve as a proxy to more sophisticated dual task gait exams[18]
- Both TUG and dual task tandem continued to see deficits at 3 weeks[18]
- POWAR-TOTAL – a measure specifically for SM's

TUG + Auditory Pure Switch Task[21]

How to Perform: Patient completes TUG while being asked if a given number is even or odd. Once the patient answers, a new number is immediately called out.

How To Measure:
TUG: Time to completion
APST Response Rate =
# of total responses/20 seconds

How to Interpret: Little information has been provided regarding normative values for tactical athletes – consider 23.5 seconds

Dual-Task Tandem Gait[22]

How to Perform: Walk along a 3-meter piece of sports tape approx. 38mm wide with a tandem gait pattern. Combine with different cognitive task for 3 trials.

How To Measure:
Time to completion
**Should also make note of cognitive accuracy*

How to Interpret: Cutoff score of 14 seconds for male collegiate athletes. Will differ based on foot length, level of athletic performance, age and sex.

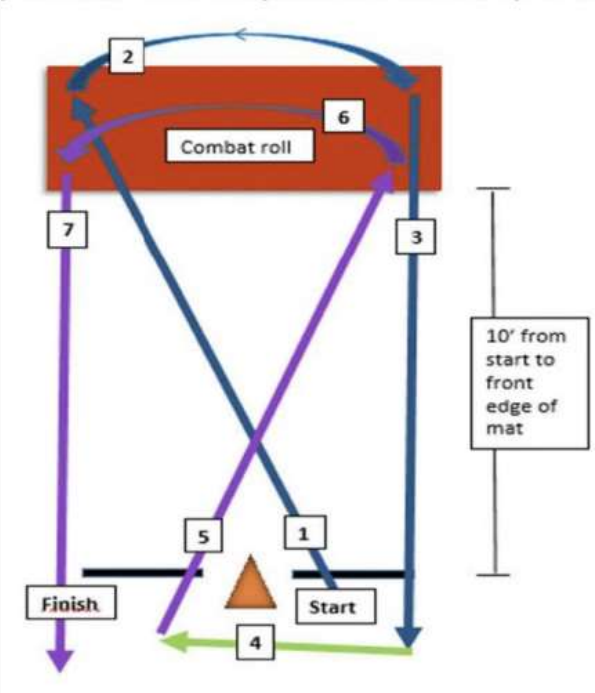
Potential Concerns – *Increased Errors*

- Cognitive or physical
  - Accuracy issues, increased response time
  - Stumble, abd/flex of hip, step out of correct positioning
- Often physical function is sacrificed for cognitive accuracy[16]
  - Difficulty dividing attention
- Is there a drastic difference in physical function when a cognitive task is added?
- Currently no norms so must use clinical judgement

Potential Concerns – *Changes in Tandem Gait*

- Cadence[19]
  - Decreased w concussion
  - Potential guideline: 132 steps/min
- Displacement
  - M/L displacement through motion capture or visible lateral LOB
- Velocity[19]
  - 0.56 m/s vs 0.74 m/s @ 2-month mark
  - Encompassed in total tandem gait time

POWAR-TOTAL



How to Perform:[24]

Visual Acuity Test: Binocular visual acuity w Snellen Eye Chart.

Cognitive Task (Single): SM's recall an 8-item grid coordinate.

Motor task:

1: Standing and diagonal run (10m)
2: L to R combat roll to standing
3: Backwards run (10m)
4: Lateral shuffle
5: Diagonal run (10m)
6: R to L combat roll to standing
7: Backward run (10m)

POWAR-TOTAL Dual Task[24]

How does the POWAR-TOTAL incorporate dual task?

- Motor task + cognitive task
- SM is given coordinates, asked to perform the motor task, then recall the coordinates

Stopping the test:

- Allow rest in between trials if needed
- Halt all trials if symptoms do not resolve quickly or there are safety concerns

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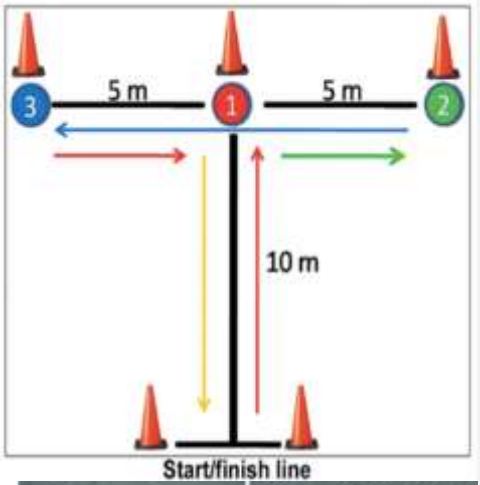
05 Interventions

Physical

Cognitive

- Generate a list
- Reciting the alphabet in reverse
- Mental Math
- Decision Drill



Physical

Cognitive

- Clearing room drill
- Identify threats based on images
- Recall instructions/orders
- Red light, green light

06 Conclusion

Key Recommendations

Evaluation

Preliminary knowledge for ensure thorough assessment of deficits

Impact on functional tasks:

- Decreased gait speed
- Decreased stability
- Decreased cog. performance
- Increased dual task cost
- Increased risk of injury

Assessment

Utilize outcome measures designed to assess dual task deficits

Outcome Measures:

- Tandem gait with cognitive task (spelling backwards, serial subtraction, reciting months backwards)
- TUG with Auditory Switch Task
- POWAR-TOTAL

Interventions

Utilize dual-task activities that will simulate either sport or duty

Example Interventions

- Clearing drill
- Agility with callouts
- Recall drills
- Threat identification

Thank You!

Do you have any questions?

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Post-Presentation Links

Quiz Time!

Presentation Evaluation

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