Comparison of Subjects with mTBI and Healthy Control Group in the Development of the POWAR-TOTAL: A Test of Return-to-Duty Readiness Following Concussion

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Introduction

- Following an mTBI, servicemembers present with deficits in dual-tasking activities that prevent an individual servicemember's deployability and overall task-force readiness particularly in combat situations which require cognitive clarity and motor agility.
- The Portable Warrior Test of Tactical Agility (POWAR-TOTAL) is a performance-based, dual-task assessment which requires less time, space, and technology than previous laboratory-based RTD assessments.
- The POWAR-TOTAL demonstrates high external validity, as it is comprised of familiar components to the military population.

Purpose/Objective

- To compare preliminary results of healthy control group vs. mTBI group on the POWAR-TOTAL task to determine differences in performance of motor vs. cognitive components of dual-task assessment.

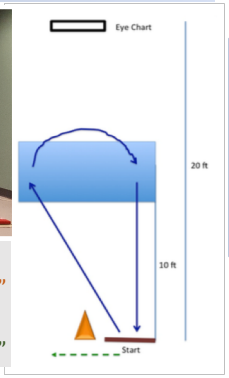
Subjects

- 23 Active-Duty Servicemembers (ADSM) with mTBI and 50 ADSM Health Controls

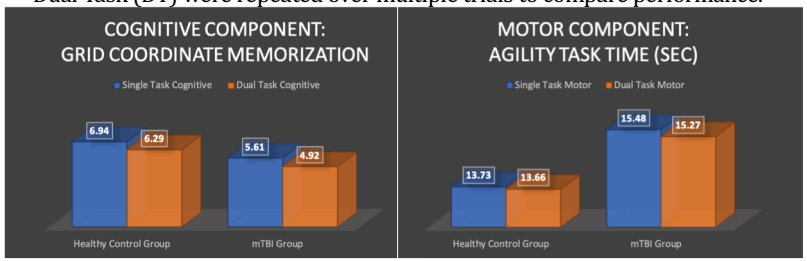
Characteristic	mTBI - Mean (SD)	HC - Mean (SD)
Age	28.6yrs (6.9)	28.4yrs (7.1)
Years of Military Service	7.8yrs (6.1)	7.3yrs (7.2)
Deployments	3.4 tours (2.4)	1.6 tours (2.6)
Self-Reported Number of Concussions	*Median:* 3 *Range:* 1-40	*Median: 1 Range: 0-50*
Chronicity of injury	*Mean:* 5.1mos *Range:* 1-15mos	*N/A (>2yrs)*

Methods

Researcher: Your grid coordinates are
"Delta…Tango…4…9…7…3…9…2…"
After 15sec delay….ADSM: Grid coordinates are
"Delta…Tango…4…9…3…7…9…2…"



- 2 smartphones, attached to head and torso, capturing 26 sensory measurements of 3-axial accelerometers, gyroscopes, gravity, and orientation.
- **Motor/Agility Task:** handling a simulated weapon, rapid prone-to-standing transition, diagonal 10m forward run, combat roll, rapid transition back to standing, and back pedaling to the starting position. Repeated in opposite direction.
- **Cognitive Task:** working memory task (grid coordinate memorization) and repeated back to researcher after 15sec.
- **Dual-Task Activity:** the ADSM is read coordinates, then completes the agility activity, and is then required to repeat the grid coordinates in the proper order.
- The Single-Task Motor (ST-motor), Single Task Cognitive (ST-cognitive), and Dual-Task (DT) were repeated over multiple trials to compare performance.



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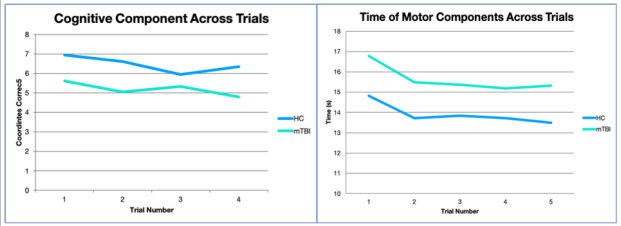
Results

- These findings reflect preliminary analysis of the on-going study.



Trial	HC (n=50), mTBI (n=23)	Mean (S.D.)	T-Test (α=0.05) (p-value)
ST Cognitive (coordinates)	*HC*	6.94 (1.39)	0.001
	mTBI	5.61 (1.53)	
DT Cognitive (coordinates)	*HC*	6.29 (1.48)	0.008
	mTBI	4.92 (2.04)	
DT Cognitive Cost (coordinates)	*HC*	-0.06 (0.28)	0.918
	mTBI	-0.07 (0.45)	
ST Motor (seconds)	*HC*	13.73 (1.96)	0.023
	mTBI	15.48 (3.26)	
DT Motor (seconds)	*HC*	13.66 (2.09)	0.044
	mTBI	15.27 (3.31)	
DT Motor Cost (seconds)	*HC*	0.0041 (0.06)	0.874
	mTBI	0.0003 (0.10)	

Conclusions

- The POWAR-TOTAL was sensitive to detect differences between the mTBI and healthy controls as the mTBI performed significantly lower in the ST-motor task, ST-cognitive task, DT-motor, task and DT-cognitive task.
- While there were no dual task cost differences between the groups, the POWAR-TOTAL observational components can still detect group differences.
- This preliminary analysis supports the need for performance-based measures in RTD assessments.
- The findings also support the need for implementing interventions addressing dual-task needs specific to military occupational demands in preparing for RTD.