

The Complex Assessment of Military Performance for mTBI Assessment: Patrol Exertion Task Test-Retest Reliability



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Background

The Complex Assessment of Military Performance (CAMP) test battery was developed for active-duty military service members (ADSM) after mTBI to assess the readiness to return to duties that require high levels of mobility, endurance, and skill. After mTBI ADSM may not be able to resume duties, as symptoms such as exertional headache, dizziness, and cognitive impairment may negatively affect exercise tolerance, reaction-time, memory and recall. The Patrol Exertion Task or PET is the 3rd task in the CAMP test battery and is a 10-minute stepping task while carrying a simulated weapon and watching a virtual foot patrol. A 12" aerobic step is used to induce moderate intensity exercise with HR targets 65-85% of age adjusted max HR. The task includes reaction time, visual scanning, and working memory challenges. Heart rate, perceived exertion, and presence and intensity of symptoms are recorded throughout the task. Test-retest reliability of the PET is an important psychometric property that will allow test interpretation in clinical use.

Objectives

- To describe characteristics of healthy control ADSM performing the PET and examine test-retest reliability and possible practice/learning effects of the Patrol Exertion Task.

Methods

- Participants: 14 ADSM (11 Army, 2 Marines, and 1 Navy), 13 male participated. Average age was 28 years. Most indicated some college as highest level of education, 3 indicating high school and 1 Bachelor's degree. Number of deployments ranged from 0-5.
- PET includes 2 test sessions at least 1 month apart. One of two virtual videos is used at each session.
- HR is continuously monitored using Polar H10 monitor, with symptoms and RPE assessed before and after task.
- Test involves the subject carrying a simulated weapon that has a reaction time button to be pressed when an audible tone is heard.
- SM perform two working memory tasks :
 - count (visual attention and search) and remember (working memory) the total number of black flags observed during the video, ignoring flags that are foils
 - identify direction they are facing at the end of the virtual foot patrol (compass position shown at start of video)
- Reaction time is tested first in standing, when beginning stepping up/down a 12-inch step repeatedly, and 12 random times throughout the 10-minute video.
- Mean scores were examined to assess consistency of variables in HC volunteers

Patrol Exertion Task (PET)

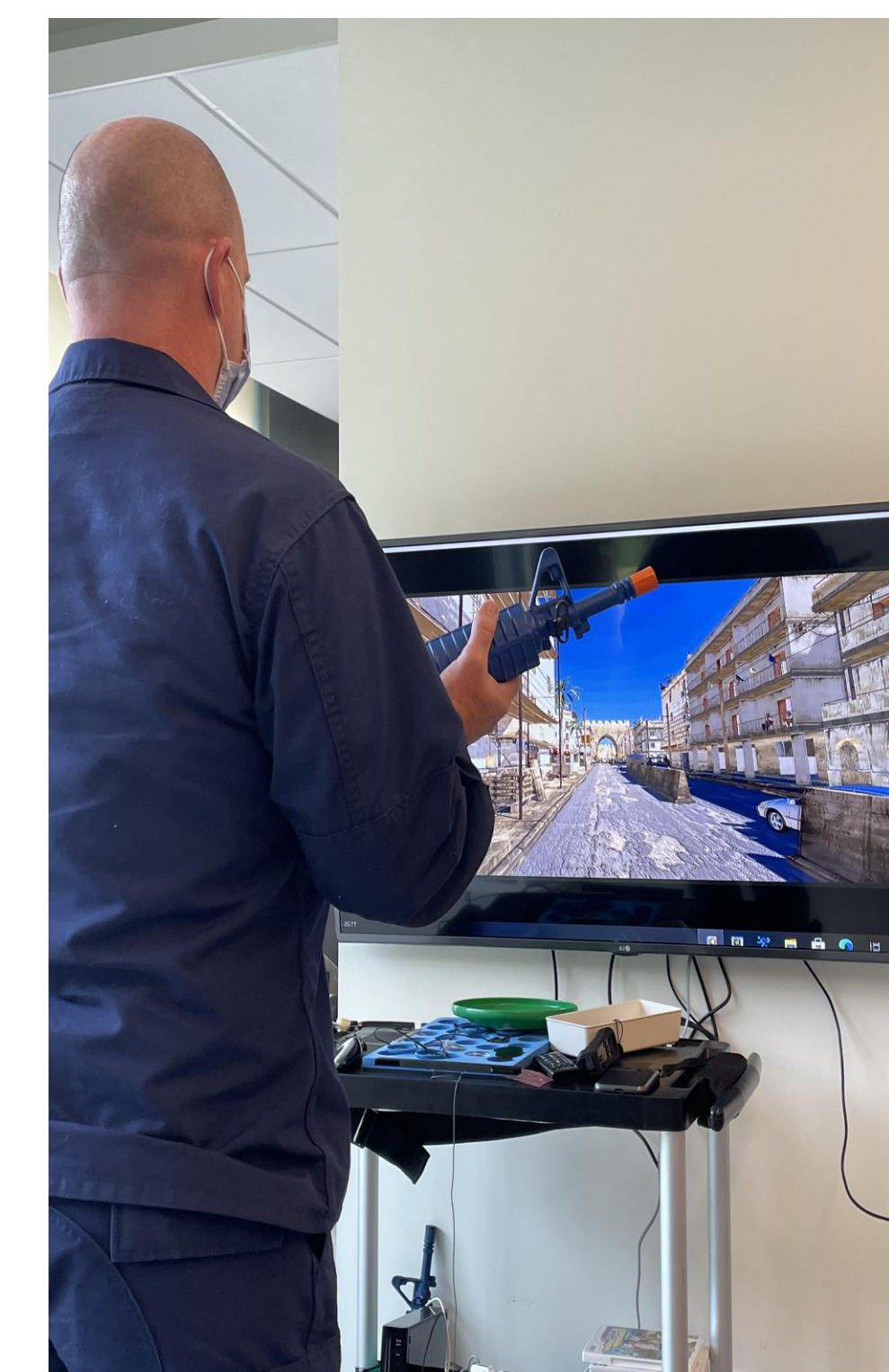
During the PET participants look for black flags as signs of "enemy presence", listen for and respond to auditory reaction time stimuli, and report direction they are facing at video end.



Compass provides direction at video start.



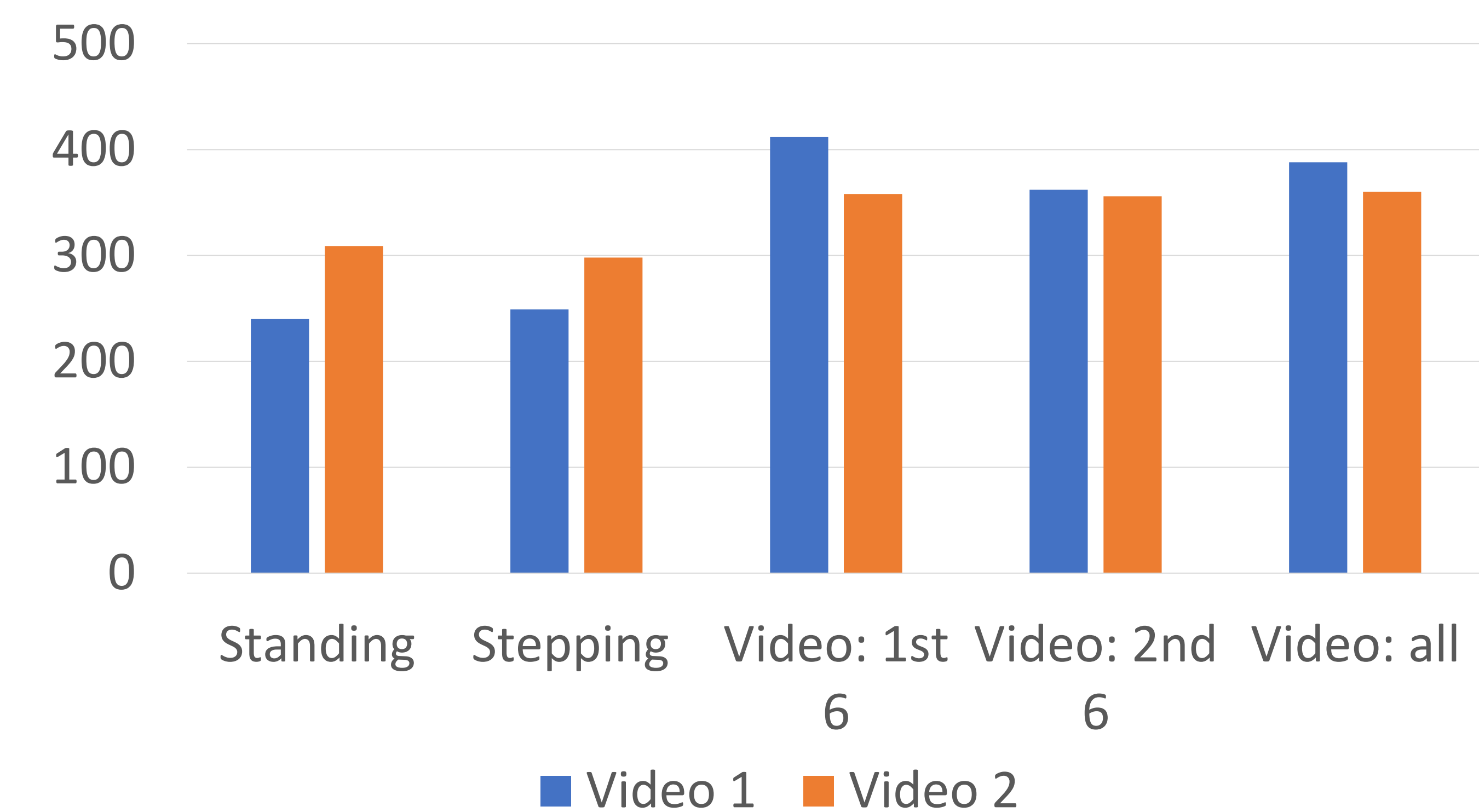
A black flag signifying "enemy presence".



A healthy control participant performing the PET, stepping onto the 12-inch step, holding the simulated weapon, while viewing the video.

Diagrams

Patrol Exertion Task Mean Reaction Times (msec) in Response to Auditory Stimuli



Reaction time:

Mean RTs for the first 6 stimuli during the initial trial (412ms) were slower than later 6 stimuli averages (362, 358, 359 ms) for video1 and 2. On average, participants were 99% accurate identifying stimuli during video1, but 93% accurate in video2, suggesting lack of equivalence between the two videos or lower attention to reaction time stimuli once the test is familiar.

Results

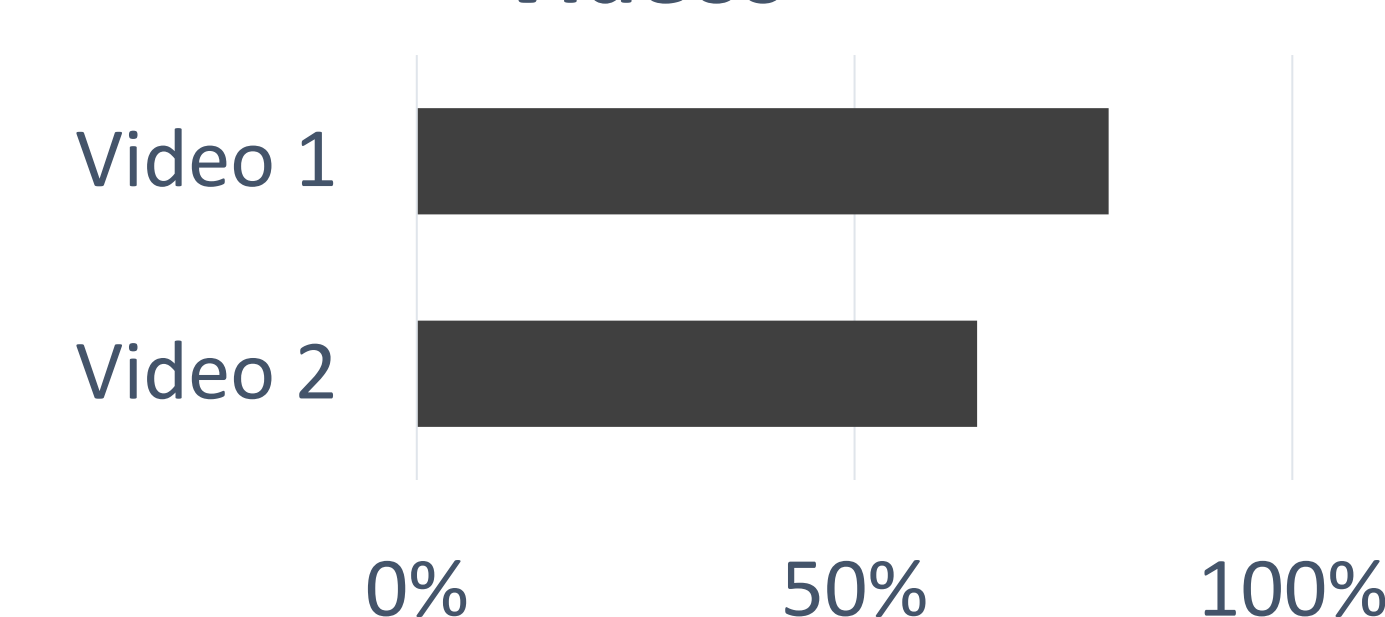
Heart Rate and RPE	Video 1	Video 2
Baseline HR	87 bpm	83 bpm
Mean Standing RPE	8	7
Mean Stepping RPE	8.6	8.8 (very light level of exertion)
Mean Exercise HR	139 bpm	135 bpm
Mean End RPE	11	10.9 (light level exertion)

No subjects reported any symptoms throughout the task.

Cognitive Tasks:

- On average, participants were 79% accurate in identifying targets in video1 and 64% accurate in video2.
- For video1, 50% of subjects identified the correct direction facing at the end of the video, while 57% were correct for video2.

Target Identification Accuracy Between Videos



Conclusions

The Patrol Exertion task increases exercise HR levels to the low end of the desired range without apparent practice effects. Reaction time responses were slower on average in the first part of the first test than those in the later half of the test or in the retest, suggesting responses improve after familiarization with the test requirements.

Only half of the subjects were able to correctly identify direction during the 1st test, and this improved only slightly in the 2nd test. The ability to track direction in the virtual scene is challenging even for healthy subjects, a skill that is emphasized in military training. Accuracy of identification of signs of enemy presence were not 100%. The reasons for lack of consistent accuracy with these cognitive tasks is not clear. Reaction time measures may ultimately be of more value than these simple cognitive tasks that may serve as distracters.

This ecologically valid test can be conducted in typical clinical space to challenge ADSM exertion ability and provide cognitive challenges that are pertinent to active-duty roles.