Perception-Action Coupling Assessment and Training in ROTC Cadets
Alexis M Williams, MS, ATC; Madeline E Johnson, MS, ATC; Hunter L Amos, MS, ATC; Gary B Wilkerson, EdD, ATC; Shellie N Acoello, PhD, ATC

BACKGROUND AND PURPOSE
- Musculoskeletal injuries are sustained by 600,000 soldiers each year, resulting in >2.2 million medical encounters.
- An estimated 68,000 soldiers per year are unable to deploy as a result of musculoskeletal injuries.
- Force readiness is directly impacted, and consequently, national defense capabilities.
- Perceived-action coupling specifically refers to responsiveness to rapidly changing environmental stimuli.
- Deficiencies in cognitive and visual-motor processes may expose healthy service members to elevated injury risk.
- Dual-task assessment and training appear to offer potential for risk reduction and performance enhancement.
- The purposes of this study were to identify perception-action coupling associations with elite warrior status and sub-elite functional status, and to assess the extent to which visual-motor training could enhance capabilities.

RESULTS
- Prediction of Ranger status from baseline data yielded 3-factor model; p = .001 (Table 2)
- Hosmer & Lemeshow goodness-of-fit F(2) = 17.22; p = .001 (Table 2)
- Prediction of Ranger status from post-training data yielded 2-factor model; F(2) = 14.81; p = .001 (Table 3)
- Hosmer & Lemeshow goodness-of-fit F(2) = 1.63; p = .444 (Table 3)
- Prediction of Optimal Function (SFI > 80; baseline data) yielded 2-factor model; F(2) = 1.64; p = .001 (Table 4)
- Hosmer & Lemeshow goodness-of-fit F(2) = 0.53; p = .767 (Table 4)
- Baseline to post-training change in VMRT-DT depicted for Non-Rangers vs. Non-Rangers (Figures 3 & 4)
- VMRT-DT trials difference: F(1,33) = 52.79; p < .001
- Baseline to post-training change in WBRA-TT depicted for Optimal vs Suboptimal Function (Figure 5)
- WBRA-TT group X trial interaction: F(1,33) = 4.98; p = 0.032

PARTICIPANTS & PROCEDURES
- Baseline testing included different assessments of visual, cognitive, and motor abilities of 42 ROTC cadets
- 5 cases excluded due to incomplete data and 2 cases excluded due to abnormal test results (>2 SD below mean)
- Analysis limited to 35 cases (20.5 ±3.1 yrs; 69.6 ±3.5 cm; 174.0 ±22.2 kg)
- 10-item Sports Fitness Index (SFI) used to obtain self-ratings of persisting effects of previous injuries
- Visual-motor reaction time (VMRT) assessed and trained with Dynavision D2 System™ (West Chester, OH)
- 60-s single-task (ST) test and 60-s dual-task (DT) test (VMRT with simultaneous performance of flanker task)
- Verbal responses to indicate direction of center arrow of 5-arrow flanker displays on LCD screen (Figure 1)
- Whole-body movement (WBRA) assessed by TRAVERSE Simulator (Trajectory Logic, Westerville, OH)
- 20 lateral movements (0.9 m) in response to virtual reality targets (10 in each direction; random order)
- Reaction time (RT) for whole-body target responses; total time (TT) elapsed for test completion (Figure 2)

CLINICAL RELEVANCE
- Screening of perception-action coupling ability is valuable for identification of persisting effects of previous injuries
- WBRA-TT and VMRT-DT demonstrated strongest power for discrimination between low versus high function
- Military personnel are frequently required to perform demanding cognitive and physical tasks simultaneously
- WBRA-TT and VMRT-DT demonstrated strongest power for discrimination between Ranger versus Non-Ranger
- Self-reported low levels of depression, anxiety, and stress provided further characterization of Ranger status
- Dual-task VMRT training clearly resulted in improved perception-action coupling ability, including WBRA-TT
- After training, VMRT-DT and WBRA-TT were strongest discriminators for Ranger versus Non-Ranger status
- Both groups demonstrated substantial improvement in VMRT-DT, but Rangers improved to greater extent
- Low-function cases (SFI ≤ 80) demonstrated major WBRA-TT improvement following VMRT-DT training
- ROTC programs should consider baseline screening and dual-task visual-motor training as a strategy to optimize perception-action capabilities that are highly relevant to both injury prevention and elite military performance

REFERENCES