

# Research Center for Injury Prevention and Human Performance



University of Pittsburgh  
US Army 101st Airborne Division (Air Assault)  
Ft. Campbell, KY

*Research to Mitigate Warrior Injury,  
Optimize Physical Capacity, and  
Improve Overall Well-Being and Readiness of the Force*

University of Pittsburgh—101<sup>st</sup> Research Center for  
Injury Prevention and Human Performance

5th Special Forces  
Group



101st Airborne Division  
(Air Assault)



Blanchfield Army Community Hospital:  
Warrior Transition Unit



Soldier and Family  
Based  
Nutrition and Education

Injury Prevention and  
Performance Optimization  
(ETAP)

Ongoing Research  
Based on Current and  
Future Force Needs

## Description of Research Center for Injury Prevention and Human Performance

- Research began by developing and validating the *Eagle Tactical Athlete Program (ETAP)* using scientifically-driven, Soldier-specific activities to prevent injuries and improve tactical physical readiness based on our four phase model of injury prevention and performance optimization (see Page 2)
- The injury prevention and performance optimization research will continue as part of the Research Center for Injury Prevention and Human Performance with development of enhanced screening models for injury and performance predictors and development of nutritional programs focused on Soldier wellness and education
- Research will expand to other populations at Ft. Campbell including Special Forces and the injured warriors of the Warrior Transition Battalion (see Page 3)
- The Research Center for Injury Prevention and Human Performance will be dynamic and responsive to the needs of the US Army through ongoing and future research to mitigate injury resiliency and enhance Force readiness



# Eagle Tactical Athlete Program (ETAP)

## Phase I: Injury Surveillance and Task/Demand Analyses

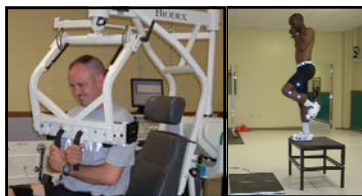
- Determined the scope and magnitude of unintentional musculoskeletal injuries in the 101st Airborne Division Soldier



- Identified the unique physical and physiological demands during injurious tasks and performance of specific work functions

## Phase II: Predictors of Injury and Optimal Performance

- Conducted biomechanical analyses during replicated field tasks in the laboratory and examined modifiable physical and physiological characteristics that predict injury and suboptimal physiological development



- Laboratory data revealed the following percentage of 460 Soldiers with suboptimal characteristics:
  - Strength: knee (62%), ankle (23%), and torso (32%)
  - Flexibility: hamstrings (62%), calf (28%), and hip flexors (32%)
  - Balance: eyes open (30%) and visually obstructed (26%)
  - Body fat (72%), anaerobic power (61%), anaerobic capacity (74%), and lactate threshold (62%)
  - Inefficient landing mechanics (60%)
  - Inadequate macro-nutrient distribution for optimal readiness

## Phase III: ETAP Design and Validation

- Designed an intervention program to modify the suboptimal biomechanical, musculoskeletal, and physiological characteristics identified in Phase II
- Validated during an 8-week randomized controlled trial to modify the suboptimal characteristics
- Compared to the control group, Soldiers performing ETAP demonstrated significant improvements in laboratory variables and Army Physical Fitness Test



## Phase IV: ETAP Division Implementation and Monitoring

- Division implementation and validation of ETAP to reduce unintentional musculoskeletal injuries required a three step approach involving the Division, G3, and University of Pittsburgh: Instructor Certification School, Implementation, and Monitoring

### 1. Instructor Certification School (ICS)

- Non-Commissioned Officers (NCOs) are enrolled in a 4-day physical training school designed to teach the theory and practical application of ETAP
- The ICS curriculum includes design and implementation, proper exercise selection and technique, progression, basic exercise physiology, and nutrition



necessary for effective delivery of ETAP

- To date, 928 NCOs have been certified to implement ETAP



### 2. Implementation

- 101st Airborne Division through G3 assumed ownership of ETAP
- Certified NCOs deliver ETAP at the platoon level
- Each NCO is provided with an ETAP Training Kit and exercise instructions
- To date, approximately 18,620 Soldiers have been exposed to ETAP at the platoon level
- Quality control audits are performed to confirm successful implementation of ETAP, appropriate exercise performance, and accountability



### 3. ETAP Monitoring

- Continuous monitoring to test the effectiveness of the intervention through garrison and deployment injury tracking with 1st BCT and 3rd BCT and performance analysis of changes in laboratory variables with 159CAB

## Current Research

### Post-Deployment Testing

- This research evaluates the impact of deployment and deployment location on physical and physiological characteristics
- Post-deployment testing will compare biomechanical, musculoskeletal, physiological, and nutritional characteristics to pre-deployment data to identify physical readiness maintenance and optimize training needs for future deployment
- To date, 63 post-deployment tests have been completed

### Monitoring/Longitudinal Testing

- To date, monitoring of unintentional musculoskeletal injuries is being performed on 1478 Soldiers to test effects of ETAP to mitigate injuries
- Soldiers of the 159CAB will perform laboratory testing to confirm knowledge transfer and compliance, progression, and establish long term effects of ETAP on performance
- To date, 51 Soldiers have performed baseline testing following ICS implementation and will perform interval testing through next deployment/redeployment cycle

### UPitt-Med

- University of Pittsburgh Military Epidemiological Database is a relational system designed to collect and store demographic, medical, physiological, musculoskeletal, biomechanical, and nutritional data
- UPitt-Med facilitates the analysis of factors associated with performance, injury, and disability

### MOS-Specific ETAP

- This research will modify ETAP to include MOS-specific testing and training to address varying tactical demands
- MOS-specific training will focus on adjunct activities to ETAP with additional training modalities to meet the physical and physiological demands between Soldier MOS

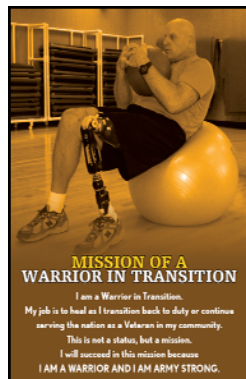


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## Future Research

### Warrior Transition Unit

- Fort Campbell's WTU houses nearly 550 Wounded Warriors who have suffered combat or line of duty injuries
- This research will expand the capabilities of the current Human Performance Research Laboratory to test nutrition and exercise protocols and intervention strategies tailored to address the specific and unique needs of the Soldiers of the Warrior Transition Unit



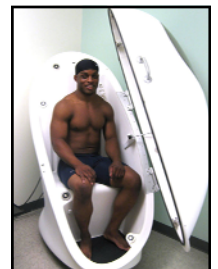
### Special Forces (USASOC)

- The 5th Special Forces Group (Airborne) perform missions in varied locations that span the scope of operations
- This research will identify task-and-demand specific needs and injury risk factors of the 5th SFG.



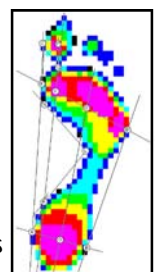
### Weight Management/Performance Optimization Initiative

- Based on the data collected during the first 2 years with the 101st Airborne (Air Assault) 27% of Soldiers did not meet the Army Weight Screening Table and Maximal Allowable Body Fat Standards for gender and age
- This project will address the specific nutritional needs of the overweight/obese 101st Soldier with a comprehensive weight management and performance optimization initiative
- Includes innovative feeding strategies that merge weight management techniques with performance optimization, motivational interviewing/counseling, and nutrition and dietary supplement education for the Soldier and family



### Novel Research

- Barefoot and in-shoe examination of foot and plantar pressure characteristics during training and simulated tasks
- This research will identify appropriate footwear and modifiable characteristics to decrease risk of lower extremity overuse injuries



## Department of Defense—Selected Publications and Presentations

- Sell TC, Chu Y, Abt JP, Nagai T, Deluzio JB, McGrail M, Rowe R, Lephart SM. Additional Weight of Body Armor Alters Air Assault Soldiers' Landing Biomechanics. *Military Medicine*. 2010; 175, 41-7.
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- Lephart SM, Sell TC, Abt JP, Crawford AK, Lovalekar M, Nagai T, Deluzio JB, Smalley BW, McGrail MA, Rowe RS. Military Model for Injury Prevention and Performance Optimization: Eagle Tactical Athlete Program (ETAP) Part 2. *Military Medicine*. In Preparation.
- Fleishman K, Crawford K, Abt J, Sell T, Lovalekar M, Nagai T, Deluzio J, Rowe R, McGrail M, Lephart S. Optimal Body Composition for Performance of 101<sup>st</sup> Airborne (Air Assault) Soldiers. *Medicine and Science in Sports and Exercise*. 42 (5) Suppl 1: 622, 2010.
- House AJ, Nagai T, Deluzio JB, Sell TC, Abt JP, Lovalekar MT, Smalley BW, Lephart SM. Landing Impact, Hip Kinematics, and Hip Strength Predict Dynamic Postural Stability in Army 101<sup>st</sup> Airborne. *Medicine and Science in Sports and Exercise*. 42 (5) Suppl 1: 286, 2010.
- Nagai T, Sell TC, House AJ, Deluzio JB, Abt JP, Lovalekar M, T, Smalley BW, Lephart SM. Shoulder Flexibility and Strength Predict Dynamic Pushup Ratio in the 101<sup>st</sup> Airborne Division Soldiers. *Medicine and Science in Sports and Exercise*. 42 (5) Suppl 1: 287, 2010.
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- Abt JP, Sell TC, Nagai T, Deluzio JB, Keenan K, Rowe R, McGrail MA, Cardin S, Lephart SM. Relationship between the Army Physical Fitness Test and Laboratory-Based Physiological and Musculoskeletal Assessments. *Medicine and Science in Sport and Exercise*. 41(5) Suppl 1: 51, 2009.
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- Crawford K, Abt JP, Sell TC, Nagai T, Deluzio J, Rowe R, McGrail M, Lephart SM. Lower Body Fat Improves Physical and Physiological Performance in Army Soldiers. *Medicine and Science in Sports and Exercise*. 41(5) Suppl 1: 49-50, 2009.
- Abt JP, Sell TC, Nagai T, House AJ, Rowe R, McGrail M, Lephart SM. Field and Laboratory Testing Variance and Application to Daily Physical Training. *Journal of Athletic Training*. 44(3) Suppl: S-116, 2009.
- Abt JP, Lephart SM, Sell TC, Nagai T, Rowe R, McGrail M. Kinematic Adaptations With Interceptor Body Armor in Soldiers of the Army 101<sup>st</sup>. *Journal of Athletic Training*. 43(4) Suppl: S-96, 2008.

## Research Center for Injury Prevention and Human Performance



Top Row (L to R): ETAP—IBA Workout, Change of Command Ceremony, Laboratory Testing—Maximal Oxygen Uptake  
 Bottom Row (L to R): Laboratory Testing—Drop Landing with Body Armor, ETAP—Agility Drills, ETAP—ICS School