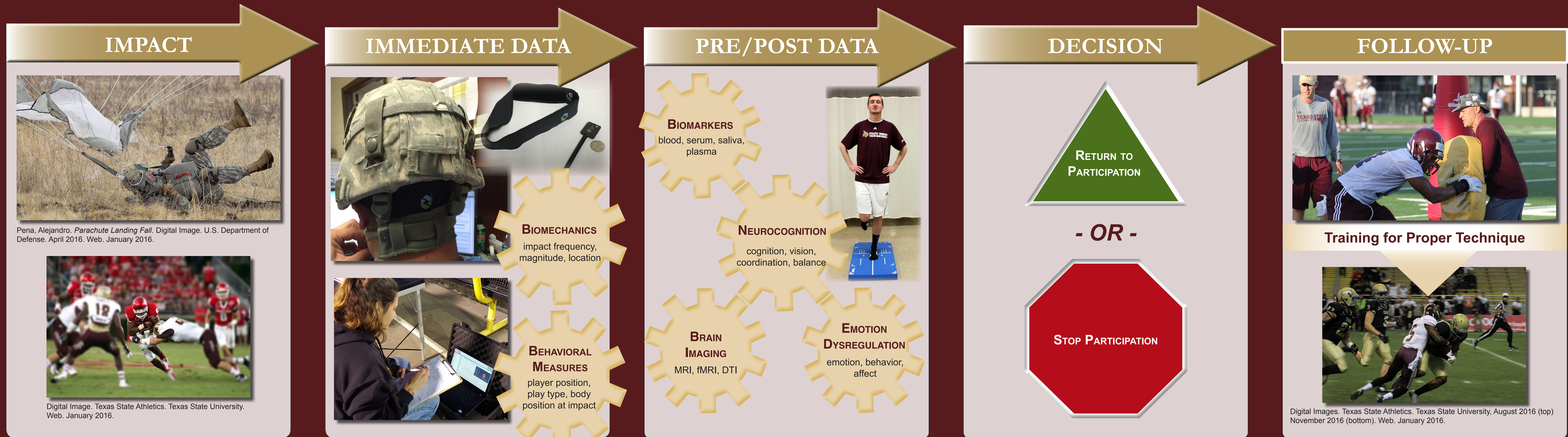


Full Impact: Physical, Cognitive, Behavioral, and Emotional Measures to Predict and Prevent Concussion and Traumatic Brain Injury (TBI)

Research Goals: Evaluate head impacts by integrating biomechanics and biomarkers measures with post-impact/longitudinal analysis of physical, cognitive, behavioral, and emotional measures to develop (1) predictive models of concussion and TBI risk; (2) prevention protocols; and (3) statistical relationships between head impact and brain disease/impairment across the lifespan.



Current Research

Paratroopers

Assess impact attenuation characteristics of protective equipment to prevent concussion and TBI

Establish methodology for field-based head impact detection in U.S. Army Paratroopers (Texas and Georgia Army National Guards)

Provide real-time head impact data to assist U.S. Army Aeromedical Research Laboratory in mathematical modeling for protective gear to mitigate head movement experienced by paratroopers

Athletes

Study head impact biomechanics in martial arts training and competition

Evaluate associations among sport-related concussions, head impact biomechanics, sex, contact level (high, low, no), concussion history, and emotional dysregulation in athletes

Research Resources

Currently Utilized Resources

Biomechanics

- 100 Triax Technologies SIM-G
- NOCSAE “drop tester” to assess impact attenuation abilities of protective helmets
- Custom material tensile testing apparatus
- Low and high velocity air-pressured rifles used for body armor and helmet ballistic impact testing

Neurocognition

- Validated neuropsychological paper/pencil assessments
- CNS VitalSigns, ImPACT, BESS, NeuroCom and Biodex Balance System, Senaptec Sensory Station

Emotion Dysregulation

- PHQ-9, GAD-7, STAI-Y, BIS-11, BPAQ, I-PANAS-SF, SWLS, LOT, ABQ, SF-36, MIAMS

Needed Resources & Collaborators

Biomechanics

- Head Impact Telemetry (HIT) System™
- X2 Xpatch

Neurocognition

- Collaborators to develop new measures for longitudinal study

Behavior

- Video equipment and recurring video capture program licenses
- Graduate students for data collection and analysis

Biomarkers

- Testing, analysis/interpretation, and storage

Brain Imaging

- Imaging and analysis/interpretation

Epidemiologist(s)/Public Health Experts



Gabriel Fife, PhD, ATC, LAT
Assistant Professor
Athletic Training



Scan for Contact Info



Missy Fraser, PhD, ATC
Assistant Professor
Athletic Training



Scan for Contact Info

Research Significance

Paratroopers

Improve accuracy in detecting potential training-related head impact injuries suffered by military paratroopers, resulting in better instruction on proper landing skills and more effective protective head gear

Athletes

Development of an emotion dysregulation-based injury prediction model for athletes that will allow coaches and healthcare providers to implement safety interventions to reduce injury incidence

Application of these measures in post-injury and return to play assessments to: (1) improve short- and long-term health outcomes for athletes; (2) reduce the risk of returning athletes too early; and (3) assist in medical disqualifications for athletes when necessary

Integration of emotion dysregulation measures, accelerometers and video assessments to improve player safety in the short- and long-term through identification and safe technique training of at risk players

Future Research

Paratroopers

Head impact magnitude characteristics of paratroopers and related improvements in protective helmet design

Integration of appropriate field-based concussion and TBI detection protocols into military medical education programs

Association between head impact magnitudes and other field-based physiological measures (e.g., eye tracking behavior)

Athletes

Relationships among accelerometer, head impact biomechanics, clinical measures, and behavior changes in 50 instrumented Texas State football players involving evaluation of videos with ~10,000 impacts (practices, games) and requiring over 1,000 research hours

Causative associations between and among head impact, concussion, TBI, cognitive functioning, emotional response, and brain disease/impairment (e.g., dementia, Alzheimer's, CTE) in a large sample of individuals followed from age 6 to death