Injury Prevention Strategies That Work

Diana Settles Strock, MAT, ATC
Navy & Marine Corps Public Health Center
Center for Personal & Professional Development
Objectives

Identify the impact of injuries on readiness.

Identify the structure of DoD governance on efforts to reduce preventable injuries and mishaps.

Discuss available resources for evidence-based injury prevention strategies:


Identify DoD best practices in injury prevention.
Injury Impact

Injuries impose a greater ongoing negative impact on the health and readiness of the U.S. Armed Forces than any other category of medical complaint during peacetime & combat.

Number of Hospital Discharges (Inpatient, MTF), SIDR 2007
Major Disease and Injury Categories*, Active Duty - Navy & Marine Corps

- Diseases of the blood and blood-forming organs: Navy 58, Marines 80
- Poisoning: Navy 64, Marines 115
- Endocrine, nutritional and metabolic diseases, and immunity disorders: Navy 120, Marines 162
- Infectious and parasitic diseases: Navy 152, Marines 248
- Diseases of the nervous system and sense organs: Navy 248, Marines 314
- Diseases of the circulatory system: Navy 357, Marines 400
- Neoplasms (Malicious & Benign): Navy 391, Marines 405
- Diseases of the genitourinary system: Navy 243, Marines 400
- Diseases of the digestive system: Navy 405, Marines 634
- Diseases of the skin and subcutaneous tissue: Navy 334, Marines 1,068
- Diseases of the respiratory system: Navy 86, Marines 1,101
- Neoplasms (Malicious & Benign): Navy 90, Marines 1,348
- Injury & diseases of the musculoskeletal system & connective tissue: Navy 30, Marines 1,787

* Major Disease and Injury Categories include total discharges.
Navy Injuries by Type from Medical Encounter Data
(Inpatient and Outpatient) - FY2007 (N = 130,470)

Note: 111,423 of the 130,470 were acute outpatient.
NMCPHC Data Epidemiology Center
The Defense Safety Oversight Council (DSOC)

Provides governance on DoD-wide efforts to reduce preventable injuries and mishaps.

- Established: ALNAV 057/03, 19 May 2003 (Dep.SECDEF)
- Chaired by the Under Secretary of Defense (P&R)
- Navy POC: Mr. Tom Rollow, Safety ASN (I&E)
The DSOC chartered nine task forces to develop recommendations for policies, programs, and other investments to reduce preventable injuries and accidents.

Military Training Task Force (MTTF) was chartered to support the Secretary of Defense’s accident and injury prevention mandate with focus in the realm of interventions that relate to aspects of military training.

From an operational standpoint, what is hurting us?

MTTF Emphasis:
vehicle, sports, physical training, recreational injury
- break away bases, ankle braces
Integrating individual professional expertise with the best available external evidence from systematic research to determine the most effective course of action.

**Literature reviews** combined with **data collection and analysis** are primary ingredients required for making evidence-based decisions.

(Modified / Evidence-based Medicine: How to Practice and Teach EBM, 1997).
Leading Injuries, Causes, & Mitigation Recommendations

- Overseen by the DSOC – 2006.

- Describes the DMIPPWG’s process for establishing an evidence-based ranking of DoD prevention priorities.

- Presents a DoD-wide process for analysis.

- Provides recommendations for intervention initiatives.
The past decade has witnessed growing recognition that injuries are a leading cause of morbidity and mortality for the U.S. Military, eroding combat readiness more than any other single disease or health condition in this generally healthy and physically active population, which is relatively free of competing causes of death and severe illness.

DSOC: DoD Military Injury Prevention Priorities Work Group
White Paper: Leading Injuries, Causes, & Mitigation Recommendations
February 2006
Physical training and sports injuries are of particular concern. Based on the likelihood of success in decreasing injuries having the greatest impact on military readiness, the Defense Safety Oversight Council (DSOC) recommends that the greatest reduction of lost duty days due to injuries across DoD may be achieved via mitigation efforts focused specifically on sports-and physical training related injuries.

Joint Services Physical Training Injury Prevention Work Group (JSPTIPWG)

JSPTIPWG established: (Feb 2005)

Subject matter experts in the field of physical performance and surveillance /prevention of musculoskeletal injuries have evaluated military physical training injury prevention programs, policies, and research for cross-service recommendations to reduce physical training related injuries in and beyond initial entry training.
Navy/USMC Personnel:
PT, ATC, CSCS, Kinesiologist, PhD, epidemiology
NMCPHC, NHRC, NSTC, TECOM, ODU, MCRDPI

- Injury prevention literature was analyzed and prioritized.
- This includes reviewing available literature on intervention studies and risk factors / cause of injury studies.
- The review of literature serves as an evidence-based tool to assist the DSOC in identifying what REALLY works to prevent training related injuries throughout the DoD.

• Essential components of an injury prevention program.

• Recommended interventions (based on sufficient scientific evidence).

• Interventions NOT recommended (due to evidence of ineffectiveness or harm).

• Interventions without a completed review.
#1: Prevent overtraining (strongly recommended)

#2: Perform multiaxial, neuromuscular, proprioceptive & agility training.
Both military and civilian research identifies that **high running volume** significantly increases the risk for lower extremity injury.

During initial military training about 25 percent of men and about 50 percent of women incur one or more physical training-related injuries.

About 80 percent of these injuries are in the lower extremities and are of the overuse type—a condition brought about by physical training volume overload (generally excessive running).


<table>
<thead>
<tr>
<th>Mileage</th>
<th>% stress fx</th>
<th>3 mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>3.7</td>
<td>20:20</td>
</tr>
<tr>
<td>41</td>
<td>2.7</td>
<td>20:44</td>
</tr>
<tr>
<td>33</td>
<td>1.7</td>
<td>20:53</td>
</tr>
</tbody>
</table>

(More is not necessarily better.)
Body
Movement
Skills
Balance
Agility
Coordination
Kinesthetic
Awareness

USS DEVASTATOR (MCM-6)
• Training Module Developed by a DoD working group.

• Background:
  ❖ Funded by DSOC – 2007 (60k)
  ❖ Managed by the Army (CHPPM)
  ❖ Completed FY 09.
  ❖ Implement? – MAB discussion

• Intended for leaders who are responsible for developing and oversight of training regimens.

• Review CD available.
DoD OUSD(P&R) 2008 Survey Status of the Forces

- Survey administered 2008. Report obtained this week.

- NMCPHC/CPPD (NAVY) assisted in question development – Led by Army.

- 2005 sample consisted of 36,567 nonproportional stratified random sampling procedures were used amongst active duty personnel.

**INJURIES:**
- 137: During past 12 months, how many different injuries did you have for which you sought medical care from military or civilian medical providers?
United States Air Force
Best Practice
• Descriptive Epidemiology of USAF Lost Workday Injuries, 3/07 – 3/08: A historical comparison to FY93 – FY02 – Air Force Safety Center (Air Force Safety Automated System)

• “Golden evidence-based tool” for injury prevention interventionist.
  ✓ Type of injury: industrial, sports/rec, etc.
  ✓ On duty (more controllable) v/s off duty
  ✓ Rank of activity causing injury
  ✓ Injury location
  ✓ Specific prevention strategies
www.afhsc.mil

STANAG Reports
Installation level report
All services
Identifies cause category

Drawback: SIDR (hospitalized) injuries
– doesn’t capture class C/D mishaps.
Completed Basketball ankle brace demonstration project at 2 bases – starting 3rd at a deployed location

- First project successful.
- Main lesson learned: provide players with a choice to increase acceptance.

Completed non-slip footwear in Northerly bases to prevent slips, trips, and falls.

- Outcome: Although it did reduce falls, compliance was the issue --- less controlled than in a gym.

Distributing injury prevention course for leaders

Dr. Bruce Burnham, Chief, Epidemiology Branch, HQ Air Force Safety Center
United States Army
Best Practices
Injuries & injury risk factors in

- BCT
- AIT (medic & ordnance)
- Army War College Students
- MPs
- Infantry
- Army band
- Military parachuting
- Marine Corp Officer Basic
- Road Marching

Interventions/ Program Evaluations

- Physical training (3 projects)
- Running Shoes assigned on the basis of foot arch height
- Mouthguards in BCT
- Parachute Ankle Brace
- Preconditioning prior to BCT
- Antiperspirants to reduce blister incidence
- Hydrophobic socks to reduce blister incidence
- Rest from running during BCT to reduce injuries (doesn’t work)

Miscellaneous

- Ambulatory activity in BCT (pedometers)
- Risk factors for discharge (injuries are among these)
- Temporal changes in fitness of new Army recruits
- Seasonal variations in injury rates
Army Current Practices

- Fall related injuries / analysis of Army Safety Center Data – article to be released next month (Michelle Chervak)

- Evaluate whether prescribing a running shoe for basic trainees based on the shape of the plantar foot surface.

- Temporal changes in infantry fitness (important because fitness is an independent injury risk factor).

- Comparative injury rates and injury risk factors across the services (Army, Air Force, Marines)

- Injuries & injury risk factors in FBI new agent trainees. (Interagency)
Interest is focused on Soldiers carrying very heavy loads on patrols in Afghanistan. WRAMC gait lab currently researching the impact of wearing a rucksack on gait both in abled bodied soldier & those w/h limb loss. (LTC Paul Pasquino)

Causes of injury for non-battle injuries that require air evacuation from theatre. Part of project was DSOC funded and looked at data from the Air Force, Navy, and Marines. (Keith Hauret)
- Draft report was submitted to the DSOC last month.

Injuries & fitness before & after deployment. Result: Injuries go up post deployment. (Joe Knapik)
United States Marine Corps
Best Practice
Injuries (Sept – Oct 04)

1. Determine the existence and size of the problem
2. Identify causes of the problem
Proportion of SMIP Reports by Precipitating Event:
MCRD Parris Island, September 2004
(N=72)

1. Determine the existence and size of the problem
1. Determine the existence and size of the problem
Body Hardening

- What is Body Hardening?
- Correct way to perform technique?
- How are they paired up?
- Level of supervision?
- What is rep count for hitting certain area?
- Strike intensity?
- How is it used throughout their time in the Marine Corps?

3. Determine what prevents the problem
Ladies and Gentlemen:

I would like your assistance in addressing a new issue regarding the body hardening portions of MCMAP. I was briefed by the RTR-wide ATCs that some of our techniques are causing Myositis Osificans and Rhabdomyolysis. Both of these conditions are very bad. These, basically, are the rupturing of muscles to send muscle fiber into the blood stream (not a medical definition, but it is close enough for the discussion).

I think some of the problem is caused by the high motivation levels of some of the well-intentioned DIs. They unintentionally get the recruits to pound on each other too hard. I think we can make a minor systemic change that will avoid the problem. If you have any other suggestions, please let me know so I can brief my Battalion Commander and we can continue to march.

I suggest that:

1) Only SDIs and above be allowed in the immediate training area when body hardening is being done. This will give the instructor better control on the "motivation level."

4. Implement prevention strategies and programs
5. Continue surveillance and monitor effectiveness of prevention efforts
Naval Health Research Center
http://www.nhrc.navy.mil

- Efficacy Review - SMART Center
- Military training injuries
- Blisters & injuries
- Gender differences in injury rates
- Foot structure and range of motion on injuries
- Epidemiology of injury among females
- Use of physical activity to predict stress fx.
- Epidemiological pattern of injuries and physical training
SMART Centers & Musculoskeletal Centers

- Close proximity to Sailor/Marine. Pearl Harbor = 15 yds.
- Accurate and Timely Diagnosis.
- Aggressive Reconditioning & Education.
- Accelerated Return to Duty.
SMART Proven Impact

• MCRD, SAN DIEGO, 1990-1994
  – 50% reduction in Medical Rehab Platoon (MRP) Population

• MCRD, PARRIS ISLAND, 1998-2000
  – 49% reduction in medical attrition over 2 YEARS

• TBS QUANTICO, 1999 - 2001
  – 22% reduction in lost training days

• PEARL HARBOR, 2002
  – 11% reduction in LIMDU’s, and 28% reduction in physical evaluation boards (PEBs)
Naval Special Warfare
“Best Practice” Model

Assessment of Military Physical Performance and Injury Risk
Naval Special Warfare Development Group

8-week Comparison of Two Physical Training Programs
(Cross Fit v/s SPEARED)
Old Dominion University

Assessment of Body Armour on Functional Performance
Office of Naval Research

Modeling & Validation of an Orthotic Knee
Brace system for Use on High Speed Boats
ODU Multidisciplinary Seed Funding

Motion Induced Fatigue on High-Speed Boats
Computer Sciences Corporation; Carderock Division Combatant Craft Dept (CCD)

Program Evaluation – NSW Group 2
University of Pittsburgh

NSW Advisory Capacity: Old Dominion University; University of Connecticut;
University of North Carolina; University of Delaware; University of Kentucky
NSW Physical Readiness Model

Candidate Selection
SCREEN-OP

“HPO” Optimize
Performance Enhancement
Execute Missions

INJURY
“TAC” Diagnose
Injury Diagnosis
Rehabilitate

BRIDGE
Performance Enhancement

“Retire” MAINTAIN QUALITY of LIFE
Risk Assessment Components

- Medical History
- Initial Screening (FMS)
- Operator Readiness
- Group Readiness
- Orthopedic Clinical Assessment
- Performance Baseline
PREVENTION
Screening and Evaluation

• Identify at risk operators
• Establish Baselines
• Identify “weak links”
• Clinical/Performance
• Prescribe Corrective Strategies
• Risk Factor Classification
PREVENTION: Screening and Evaluation

Clinical Evaluation

- Medical Hx Review
- Orthopedic Assessment
- Functional Movement Screen
- Star Excursion Test
- Body Composition
- Grip Strength
- Postural Assessment
PREVENTION: Screening & Evaluation

Performance Measurements

• Strength Assessment
• VO2 Max
• Agility
• Vertical Jump
• Anaerobic Threshold
• Rope Pull
• Swim/Ladder Climb
## Risk Factor Continuum

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medical Failure</strong></td>
<td><strong>Significant Risk</strong></td>
<td><strong>Moderate Risk</strong></td>
<td><strong>Minimal Risk</strong></td>
<td><strong>No Risk</strong></td>
<td><strong>Medical Recheck</strong></td>
</tr>
<tr>
<td>- Orthopedic / Medical condition that warrants disqualification due to career ending potential.</td>
<td>Orthopedic / Medical condition that needs to be monitored on a routine basis. Chronic condition that may be exacerbated by high demand evolutions.</td>
<td>Orthopedic / Medical Condition no significant consequence minimal risk in regards to longevity or time loss to Command</td>
<td>Normal exam no medical concerns.</td>
<td>- Current or significant current problems that requires advanced special testing (X-rays, MRI, etc). Final grade assignment pending special testing results</td>
<td></td>
</tr>
</tbody>
</table>
Specificity of Training - Resiliency
Functional Movement for Performance & IP
“A bad program done well is better than a good program done poorly”
Functional Training Instructor (NSWG-4)

Complete 3 phased Education Process
1) National Accredited Certification
2) Specialized Training
3) In-House Education

Upon Completion of JQR FTI will receive Letter of Designation from CO

- Liaison between Training and HP
- Daily Coaching and Instruction
- Assist in Program Design
- Education of DET Coaches
- Motivator
Navy Operational Fitness & Fueling Series

Improving the Operational Performance of Sailors

LIFT – PUSH – PULL – CARRY

Movement Preparation, Multidirectional Movement Training, Strength Training, Cardiovascular Training, Recovery Training & Nutritional Fueling Strategies
Operational Performance

Does the workout or activity relate to the demands on the job?

**SPECIFICITY:**
Physical training movements that mimic actual job related movements.
NOFFS: The Product

• Over 750 Sailors from 2nd & 3rd fleet assisted with development.

• Baseline Assessment:
  • Confined space issue
  • Equipment availability
  • Provides a “logic engine” for PT
  • “Eliminates the guesswork”

• Specialized Series For:
  ➢ Submarines
  ➢ Surface Ships
  ➢ Large Decks
  ➢ Group Physical Training
To provide the Navy with a foundational and evidence-based performance training resource:

Focus of the product is
1: Improving operational performance (not just the PRT)
2: Decreasing the incidence/severity of musculoskeletal injuries
3: Foundational nutrition – the basics

Goal is to provide a complete physical training program that will "eliminate the guesswork" for the
1: Individual Sailor that is participating in his/her personal exercise and nutrition program
2: Tool for the Navy health and fitness professional
Physical training and sports injuries are of particular concern. Based on the likelihood of success in decreasing injuries having the greatest impact on military readiness, the Defense Safety Oversight Council (DSOC) recommends that the greatest reduction of lost duty days due to injuries across DoD may be achieved via mitigation efforts focused specifically on **sports-and physical training related injuries**.

Number of Hospital Discharges (Inpatient, MTF), SIDR 2007
Major Disease and Injury Categories*, Active Duty - Navy & Marine Corps

- Diseases of the blood and blood-forming organs
- Poisoning
- Endocrine, nutritional and metabolic diseases, and immunity disorders
- Infectious and parasitic diseases
- Diseases of the nervous system and sense organs
- Diseases of the circulatory system
- Neoplasms (Malicious & Benign)
- Diseases of the genitourinary system
- Diseases of the respiratory system
- Diseases of the skin and subcutaneous tissue
- Diseases of the digestive system
- Mental disorders
- Injury & diseases of the musculoskeletal system & connective tissue

Total discharges:
- Navy: 1,787
- Marines: 1,348

Diseases of the musculoskeletal system & connective tissue:
- Navy: 1,787
- Marines: 2,181
API Partnership

- Athletes Performance Institute (API) = Professional Sports Model = Human Performance & Injury Prevention = winning record
- Trains over 1000 professional athletes.
- Trained last 4 NFL #1 draft picks.
- Affiliated with The Andrews Institute – Dr. James Andrews (Ortho for Redskins)
- Working with Navy - over 7 years.
Project Fitness & Nutrition Experts

Sailors – Over 750 Shore-based & Deployed

Training
“Human Performance”
CPPD, RTC, TSC-GL, CLS, NSTC

Medical
BUMED, NMCPHC, MTF HP & Medical Center Programs

Athletes’ Performance Institute

Personnel & Policy
“Qualifications” OPNAV 135

CNIC
Waterfront Fitness
Operational Nutrition
MWR Fitness
FITBOSS

NAVSUP
Nutrition

Safety
Human Performance Advisors - TYCOM

Focus Groups:
- E-3 – E – 6
- E-7 – E-9
- Officer
- FEP

Chief of the Boat
CMDCM

Executive Officer
Commanding Officer
FORCMS – TYCOM
FLTCMS, MCPON

Culinary Specialist
Command Fitness Leader
Health Promotion Coordinator
Physical Therapist – large deck
FITBOSS
Fleet Waterfront Fitness
Independent Duty Corpsmen
Leading Chief Petty Officer - Medical
Diana Settles Strock, MAT, ATC

Navy & Marine Corps Public Health Center
Program Manager, Injury Prevention & Physical Fitness
Diana.settles@med.navy.mil

Center for Personal & Professional Development
Senior Advisor, Health & Fitness
Diana.settles@navy.mil