

# **Strains, Sprains, & Pains: Ergonomic Injury Prevention for Commercial Fishermen**



## **Section A- Introduction & Back Issues**

[www.amsea.org](http://www.amsea.org)

photo credits in this presentation: Don Bloswick, NIOSH & AMSEA

# Susan Harwood project

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**Whistleblower regs: “Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees.”**

## **Employees have the right to:**

1. Working conditions that do not pose a risk of serious harm.
2. Receive information and training (in a language workers can understand) about hazards, prevention, and OSHA standards that apply to their workplace.
3. Review records of work-related injuries and illnesses.
4. Get copies of test results done to find and measure hazards in the workplace.
5. File a complaint asking OSHA to inspect their workplace if they believe there is a serious hazard or that their employer is not following OSHA rules. When requested, OSHA will keep all identities confidential.
6. Use their rights under the law without retaliation or discrimination. If an employee is fired, demoted, transferred or discriminated against in any way for using their rights under the law, they can file a complaint with OSHA. This complaint must be filed within 30 days of the alleged discrimination.

Go to [www.whistleblowers.gov](http://www.whistleblowers.gov) for more information

# Ergonomics

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**The science of adapting workspace, tools, equipment, and work methods for more efficient, comfortable, and error-free use.**



# Commercial Fishing is Hard Physical Work!



- Moving deck
- Confined space
- Obstacles
- Cold/heat/wet
- Long hours
- Poor diet/sleep
- Work is home

**A challenging ergonomic environment!**



# ...plus fishermen need to work on...

- Electrical systems
- Engine mechanics
- Hull maintenance
- Refrigeration
- Fishing gear
- Hydraulics
- Carpentry
- Plumbing
- Hand/power tools
- Welding....and more!



# **Musculoskeletal Disorders (MSDs) in Commercial Fishing:**

**Alaska Fishermen's Fund data indicates @ 40% of claims due to strains, sprains, MSDs, and Carpal Tunnel Syndrome (CTS). - 2009-2012**

**In North Carolina 39% had a traumatic injury in 12 months. 50% strains, sprains, CTS; 70% due to lifting/moving; 18% said it limited work ability.**

**1/2 of Swedish fishermen had low back pain in last 12 months. 2/3 of New Zealand fishermen have lower back problems.**



# Prevention: cheaper than the cure

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**Then: (DePalma & Rothman, 1970)**  
**“No operation in the field of surgery leaves in its wake more human wreckage than surgery on the lumbar disks” -**

**Now: (Weinsten et al; 2006)**  
**Surgical success rates for**  
**Disc surgery= 42.6% vs 32.4% for**  
**non-operative**





# **Musclo-skeletal system-**

## **Your bodies winch system**

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- 1. Muscles are the motor (generate force).**
- 2. Tendons are the cables (transfer force)**
- 3. Skeletal system is metal framework.**



# **Risk Factors for “Ergonomic Injuries” (Musculoskeletal Disorders - MSDs)**

- **“BIG FOUR” RISK FACTORS**
  - High Force
  - Bad Posture
  - Exertion Repetition and Duration
  - Work Shift Duration
- **OTHER RISK FACTORS**
  - Environment- cold, heat
  - Personal Characteristics- age, BMI, smoking, diet, fatigue, supportive home environment.



# **MSD - Risk Factors (Cold temp)**

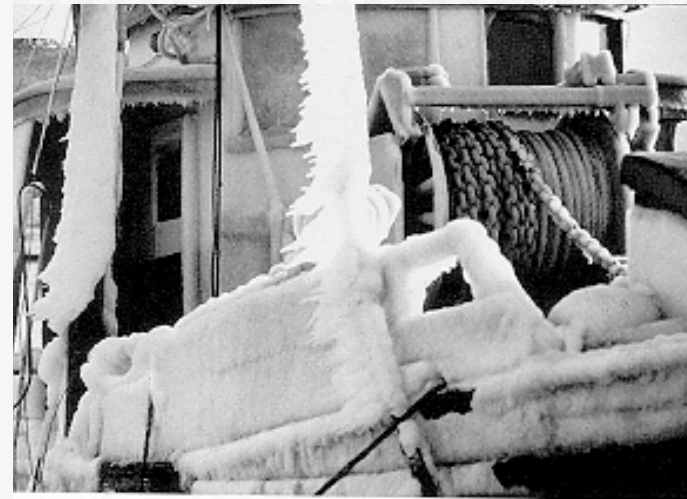
**Direct hazard to tissues/desensitize receptors in hands - workers grip tools harder.**

**Little research, but cold appears to increase MSD symptoms. This tendency increases with years of exposure.**

**Back – yes**

**Shoulder – maybe**

**Wrist – yes, with repetition**



# Musculoskeletal Injuries

## Section 1: Back (and shoulder)

**SPINE**

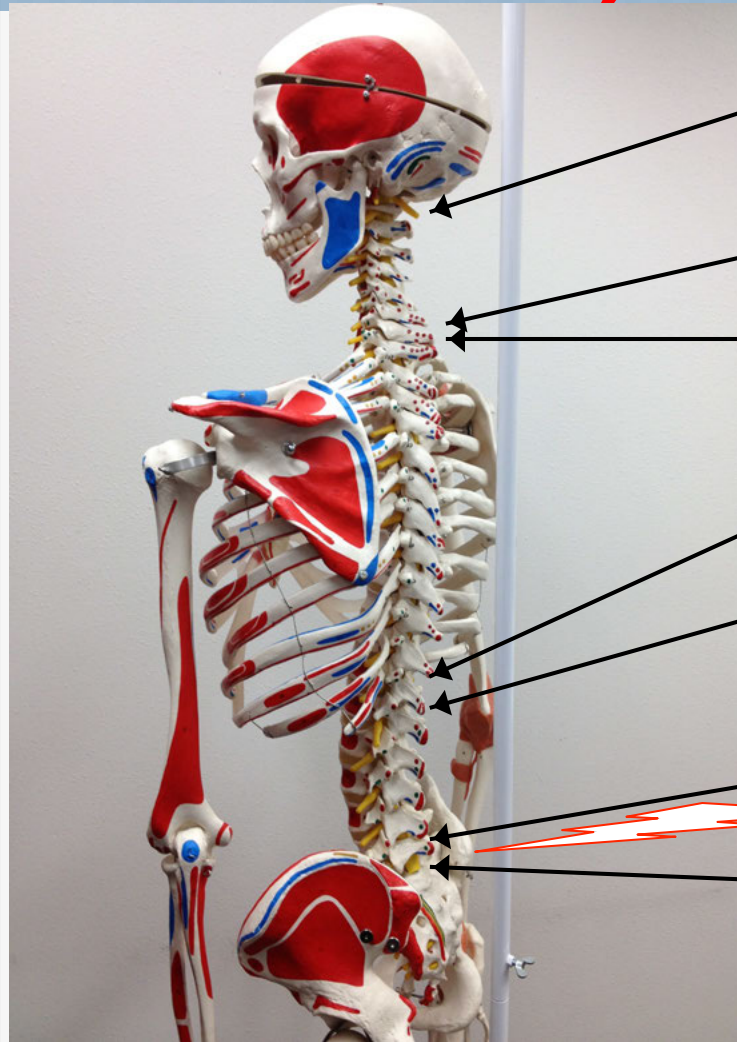
**Vertebrae-  
4 curves:**

Cervical  
C1-C7

Thoracic  
T1-T12

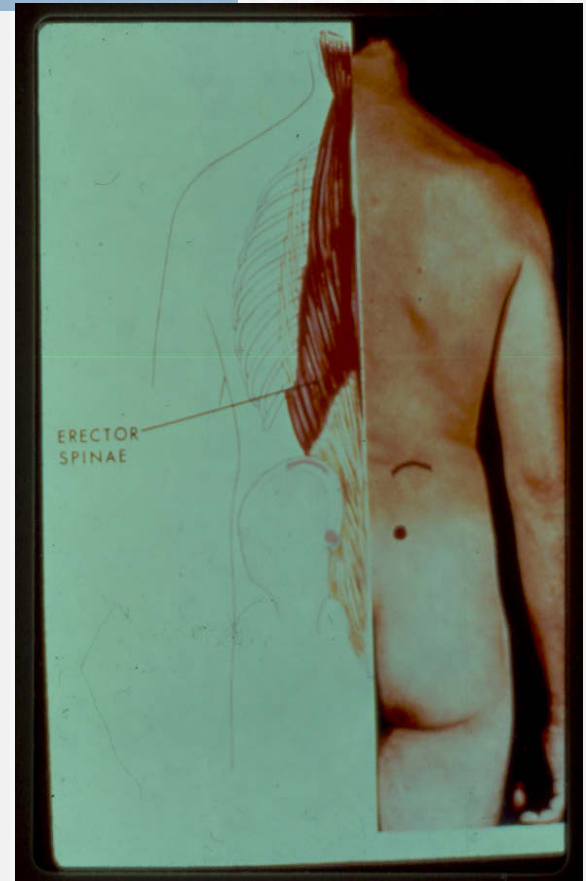
Lumbar  
L1-L5

**L5-S1**  
Sacral  
S1



# Back Anatomy

**The back muscle (erector spinae) resists the tendency for the upper body to bend forward when lifting the load AND the upper body weight.**

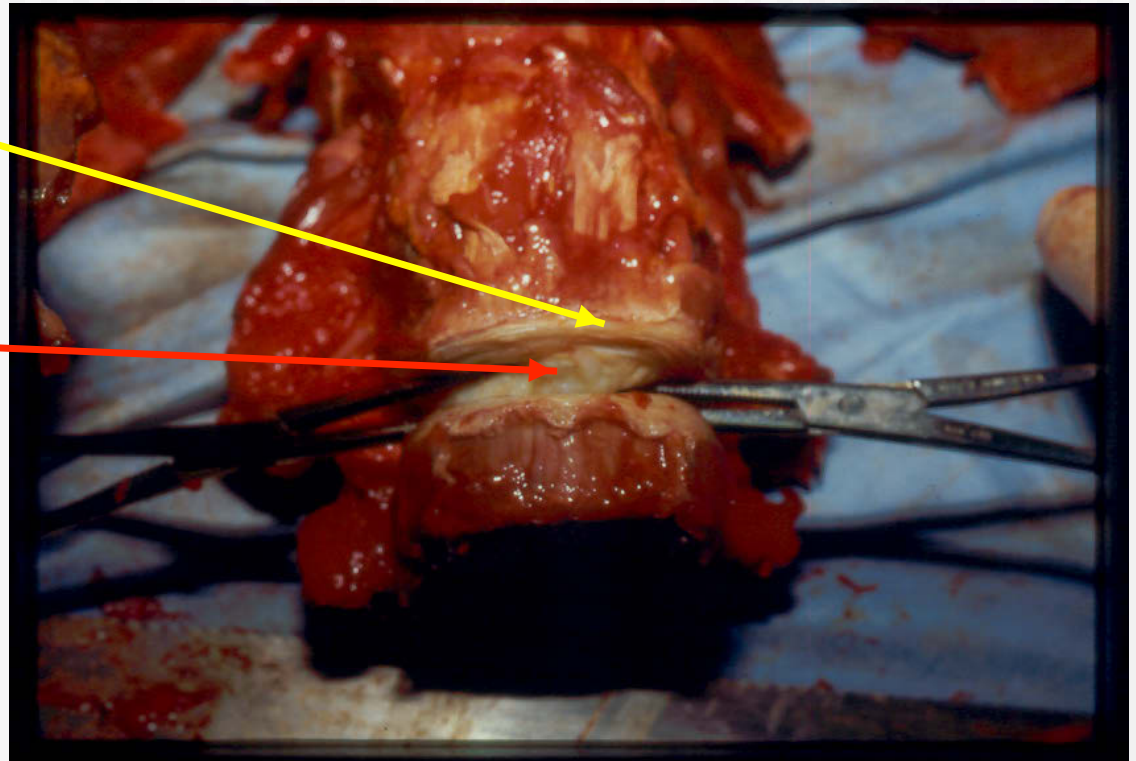




# Spinal Disc Anatomy

The spinal disc is composed of a harder outer layer (rings of ligament) with a soft inside (sponge like)

(Like a jelly roll.)



# 5 risk factors of musculoskeletal back injury:

1. The **weight/size and direction of the load or force** on the hands.



## 2. The **posture** assumed

(Including twisting of body and horizontal distance of load out from body.)





# 1 & 2

## Stress from **force** and **posture**.



1. **Force** and 2. **posture** cause biomechanical stress. Stress is also increased due to .....

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3. **Frequency**  
of force

4. **Duration**  
of activity

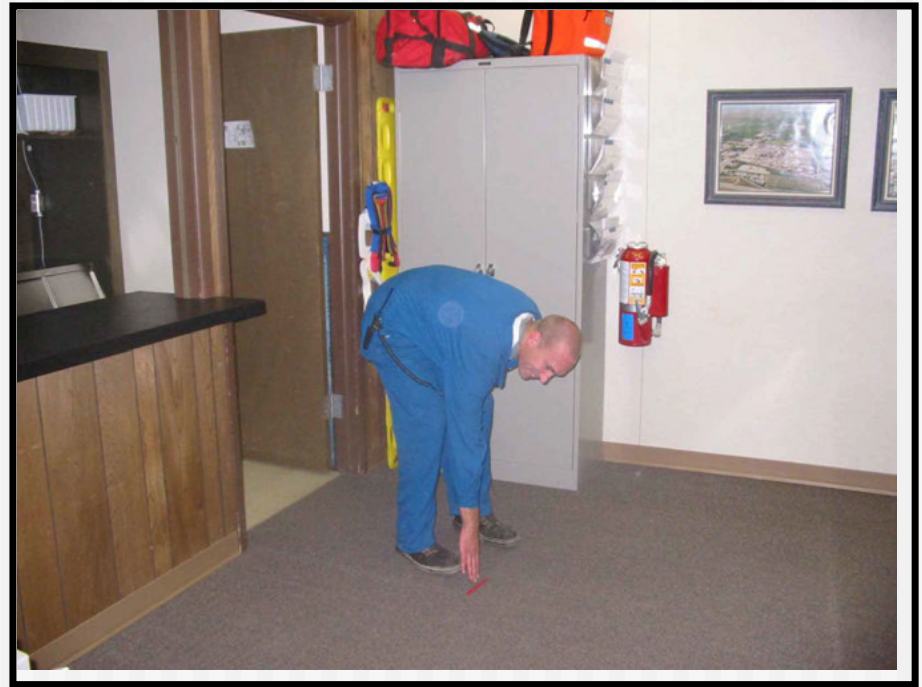
5. **Fixed** or  
**stationary postures**





# Compressive Force

- Assume Joe is 6' 2", weighs 185 pounds, and is picking up his pen.
- What do you think his back compressive force is in this posture?



- ~585 pounds (assuming straight legs, torso at 90 degrees, and no arm support on knee).

# Compressive Force

- How much does the box in the picture have to weigh to produce a back compressive force the same as when Joe was picking up his pencil?



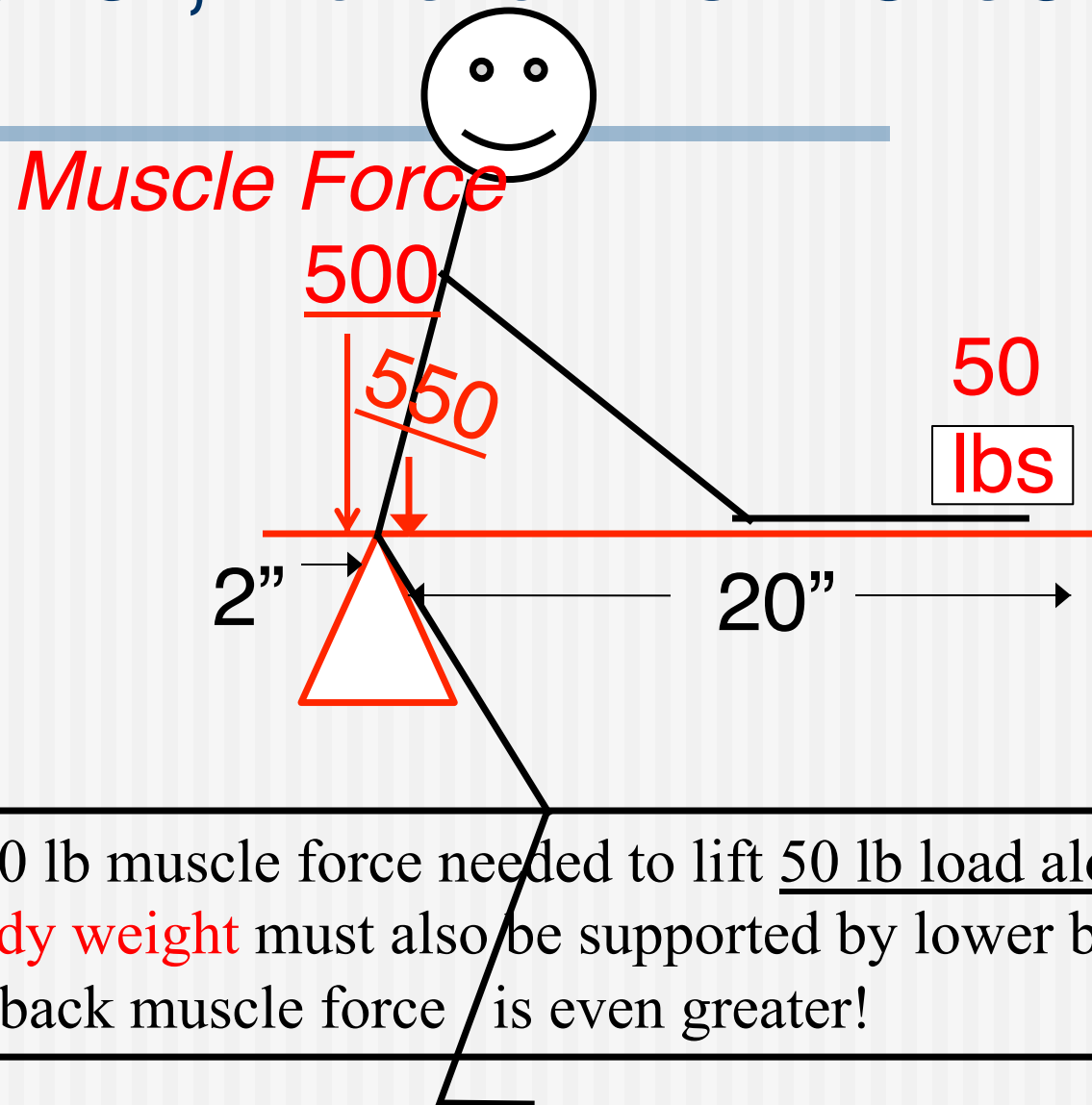
# Similar Compressive Force



- These are equivalent, what does this tell you?

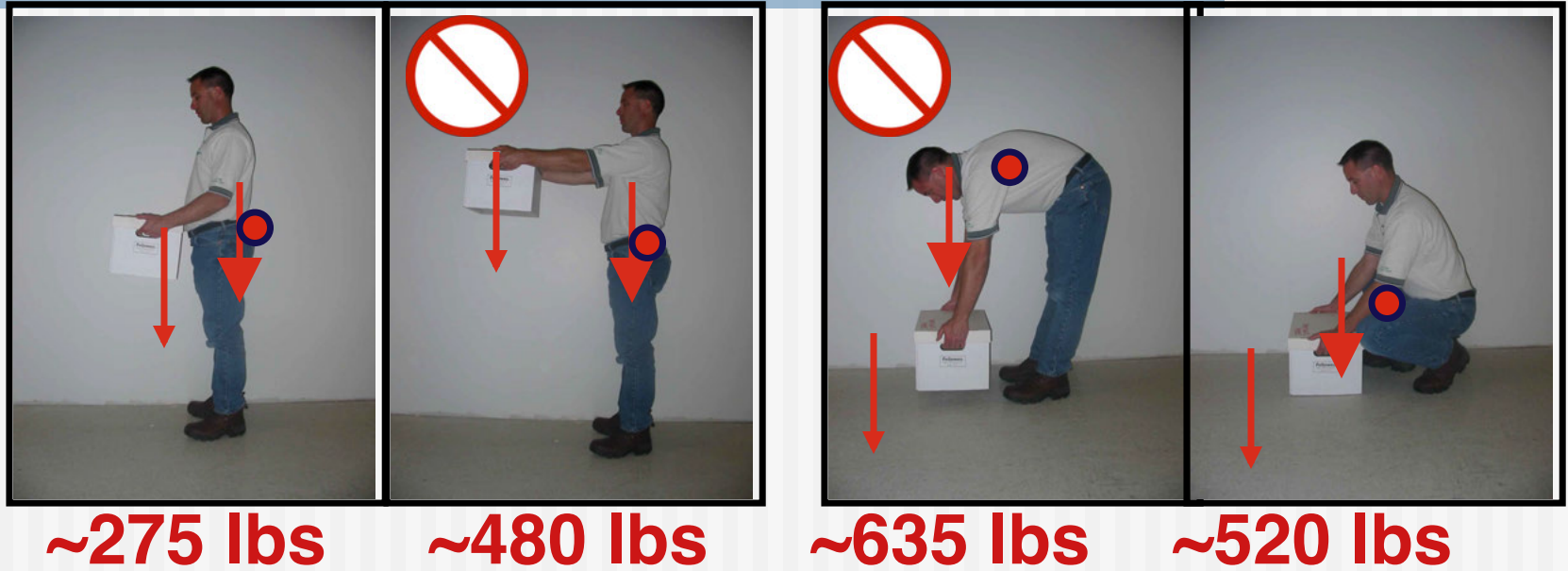


# The Lever, Fulcrum & Force



Note: The 500 lb muscle force needed to lift 50 lb load alone. But **upper body weight** must also be supported by lower back. If back is bent, back muscle force is even greater!

# Compressive Force



**For a load, musculoskeletal stress is reduced by keeping load close to body. This reduces back compressive force.**



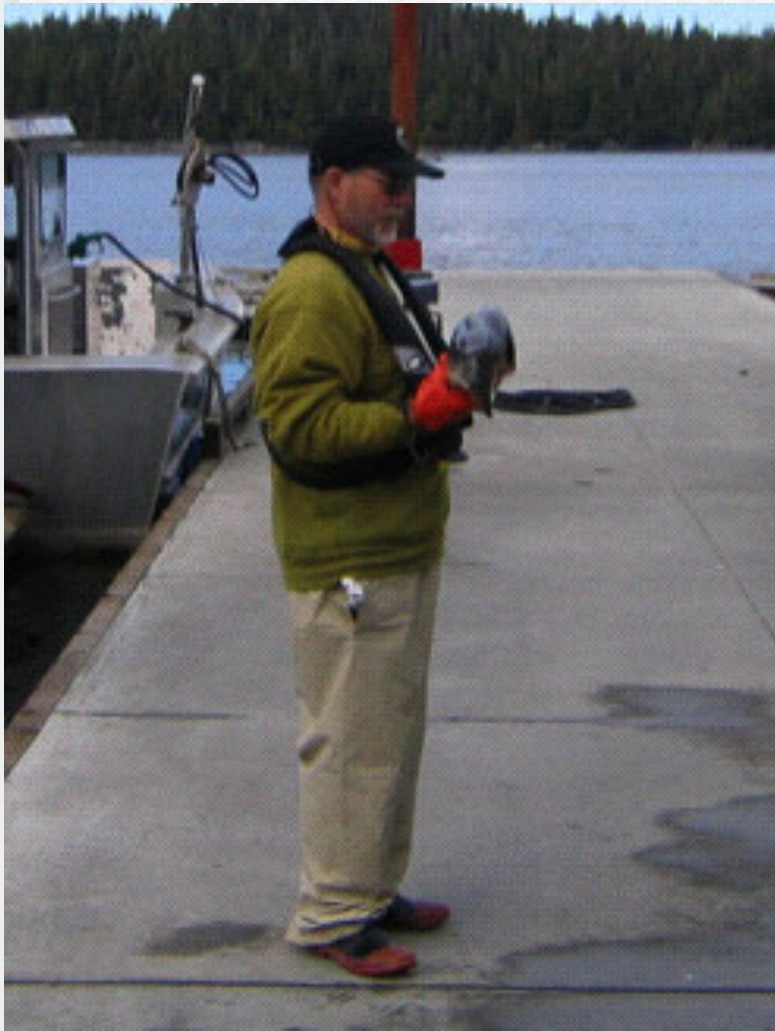
# When lifting/lowering a weight, the torso weight can contribute more stress.

**Keep torso as upright as possible. NOT like this!**



# How to hold a heavy salmon

**CORRECT way to hold**      **NOT like this.**



# National Institute for Occupational Safety & Health (NIOSH)

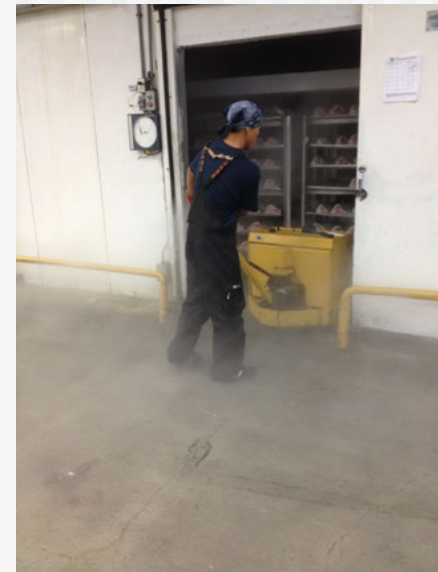
## GENERAL RECOMMENDATION

- **Avoid** lift of more than **51 lbs** at one time, especially if **frequent** and **long duration** BUT.....
- often **NOT possible** in the **fishing** industry!

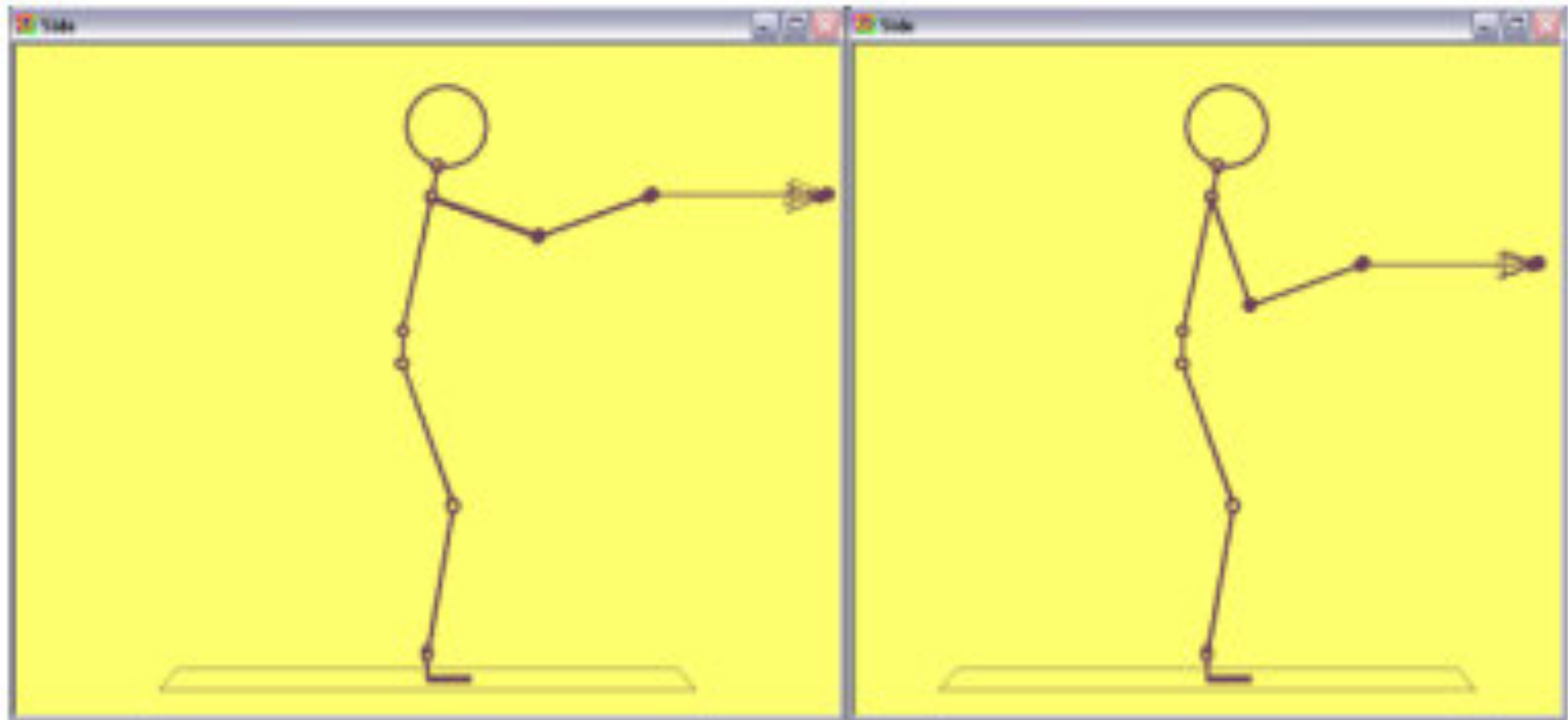


# STRESS DURING PUSH/ PULL TASKS

- Low-back compressive force less when the force direction is close to the waist.
- Shoulder stress less when force direction is through the shoulder by work design and/or work practices.







To lower shoulder stress

To lower back stress

**In general, pushing is lower stress than pulling.**



# Low-Back Stress

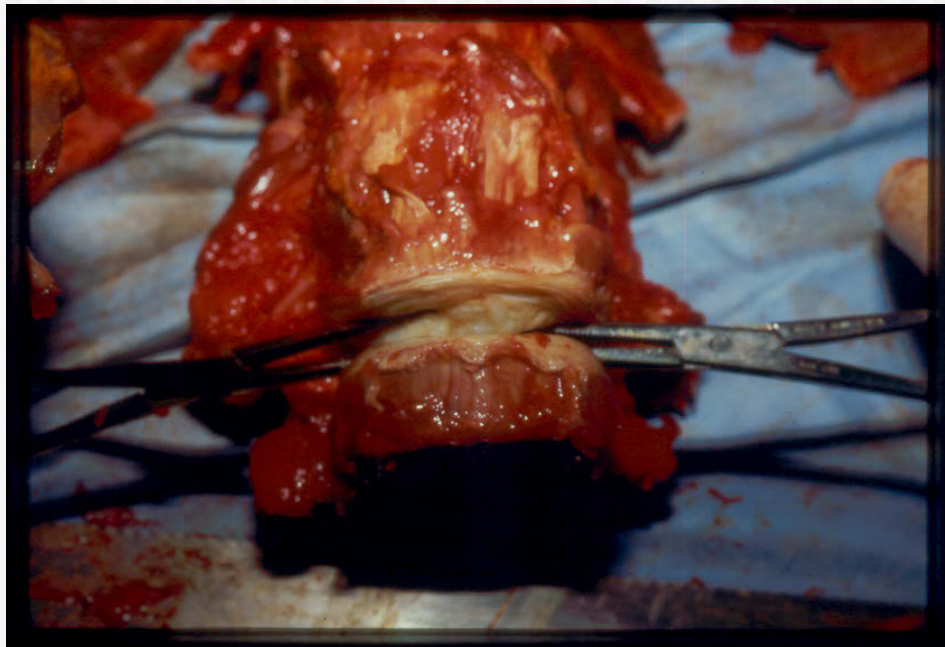
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**Move your feet - don't twist your body while using force.**



# Low-Back Stress

**Body twisting can cause additional stress on spinal discs**





# Low-Back stress

**Fatigue may alter the way a task is performed and poor posture.**



# Effort Repetition and Task Duration (Physical Stress)





# Other Things to Think About: Two person lift

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# Other Things to Think About: Lift end of Board



**Max Hand  
Force = 50%  
of board  
weight**



# **Other Things to Think About: Environmental Conditions**

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**Hot temperatures increase fatigue & affect lifting posture.**

**Cold temperatures require bulky clothing, which affect lifting posture also.**



# BACK BELTS?

**NIOSH: little evidence that belts prevent back injuries.**

**In the “Home Depot Study” use of back belts was associated with reduction in low back injuries, but there were confounding factors.**



**SUPPORT & LIFT BELTS**  
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<b>9-IN. LOWER BACK SUPPORT BELT</b> <b>24.99</b> <small>Through Jan. 9 Reg. 29.99</small> <ul style="list-style-type: none"><li>• Supports front abdominal muscles while reducing pressure on the lower back</li><li>• Quick-release, non-slip adjustable suspenders</li><li>• Available in sizes S-M-L</li></ul>	<b>6-IN. BACK SUPPORT IDEAL FOR HEAVY LIFTING</b> <b>14.99</b> <small>Through Jan. 9 Reg. 19.99</small> <ul style="list-style-type: none"><li>• 6-in. wide lifters style back support belt with a built-in lumbar pad</li><li>• 2-in. web belt with quick-release buckle</li><li>• Holds a wide variety of nail/tool pouches</li><li>• Available in sizes S-M-L</li></ul>
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# 8 Back Recommendations

1. Keep body upright (as much as possible)
2. Keep load/force close to body.
3. Push/pull mid-torso height.
4. Don't twist body.
5. Don't jerk.
6. Get help moving.
7. Make a "bridge".
8. Tighten stomach, exhale when lifting.



# LOW BACK ISSUES - Summary

- **Use Better POSTURE**
- **Use less FORCE**
- **Decrease FREQUENCY & DURATION**

