SPORT VS. INDUSTRY "ATHLETES": PHYSICAL DEMANDS & INJURY PREVENTION METHODOLOGIES

BROCK ANDERSON  CPE, LSSBB, CIE, CSCS
FOUNDER & PRINCIPAL CONSULTANT
Purpose:

• Compare **Physical Demands** in Sport & Industry
• Discuss **Constraints & Goals** of Both Sport & Industry
• Highlight Fatigue Multipliers Which Effect **Total Body Work Intensity**.
• Discuss Common Injury Prevention **Methods** & Professional Support Efforts

So that,

• The Most **Effective** Injury Prevention & Performance Improvement **Methodologies** are Applied by Sport Coaches & Occ. Health Professionals.
Win Games
- Acceleration (explosiveness)
- Muscular strength and/or endurance
- Muscle response (reaction time)
- Cardiovascular efficiency
- Motor skills (hand-eye coordination)
- Functional movement capability.
- Injury Prevention

Goals

- Maximize Profits
  - Improve Productivity & Quality
  - Ergonomics
- Minimize Loss
  - Injury Prevention
  - Ergonomics
Cross Examination of Physical Demands - Magnitude

“Exertion % relative to an Athlete’s maximal ability at a given time”

Lower Joint Acceleration Muscular Contraction

Higher Joint Acceleration and Muscular Contraction

Heart Rate - - - Metabolic Rates - - - Muscles Contraction
Cross Examination of Physical Demands - Duration

“Time on Task”
Cross Examination of Physical Demands – Stress Volume

“The interaction of total physical demands and allotted recovery time.”

“Every muscle contraction (performance output), has a cost (time to recover).”
“Work Intensity”

1. Physical Demands (Environmental Factors)
2. Energy Expenditure (Performing)
3. Total Body Work Intensity (Fatigue)

- Calculate BMR
- Determine Activity Factor
- Calculate Total Energy Expenditure
Cross Examination of Physical Demands – Work Intensity

Case Study: Using Metabolic Rates as a Measure of Physical Demands

Beverage Distribution  Tool Mfg. Assembly Line  College Baseball Team  Professional Football Team
Avg. Work Intensity (seasonal)

Is work conditioning possible in this time period?

How do I use low demand time most effectively?

Will Baseball season ever end?

Gradual Change

30 day

2 months

6 months

Football

Baseball

Distribution (Driver)

Sub - Assembly (Tool Maker)
Avg. Work Intensity (Heavy Week)

- Football
- Baseball
- Distribution (Driver)
- Sub-Assembly (Tool Maker)

If Industry Job’s Yield a High MET Rate; should they have a mid-week off day too?

Common Weekend Intensity’s

- Game Day
- Off Day
- Recovery Day
Cross Examination of Physical Demands – Pattern Overload

“A restricted movement in one or more planes of motion and/or overuse of any given pattern of movement.”

- Can be the limiting factor to performance
- Can still be high with a low metabolic rate

<table>
<thead>
<tr>
<th>Body Part</th>
<th>Threshold Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hands – Wrist - Elbows</td>
<td>≥ 30/min</td>
</tr>
<tr>
<td>Shoulders – Back – Neck - Legs</td>
<td>≥ 2/min</td>
</tr>
</tbody>
</table>
## Cross Examination of Physical Demands – Age & Biometrics

### 2017

<table>
<thead>
<tr>
<th>Industry</th>
<th>Total, 16 years and over</th>
<th>16 to 19 years</th>
<th>20 to 24 years</th>
<th>25 to 34 years</th>
<th>35 to 44 years</th>
<th>45 to 54 years</th>
<th>55 to 64 years</th>
<th>65 years and over</th>
<th>Median age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total employed</td>
<td>153,337</td>
<td>5,074</td>
<td>14,132</td>
<td>34,439</td>
<td>31,892</td>
<td>32,503</td>
<td>26,064</td>
<td>9,234</td>
<td>42.2</td>
</tr>
</tbody>
</table>

*References:
- B.L.S, John Hopkins Health Library & National Collegiate Athletic Association
- [https://www.bls.gov/cps/cpsaat18b.htm](https://www.bls.gov/cps/cpsaat18b.htm)
Physical Abilities Testing

- Quantify Physical Abilities
- Quantify Demands of Essential Job Tasks
- Physical Abilities Test

Pass : Fail Score
Required Prior to Employment
Required for Return to Work – Injured Employees

40 YARD DASH
ON THE CLOCK

Pass
 Fail

ENHANCING LIVES. IMPROVING PRODUCTIVITY.
# Strength & Conditioning

<table>
<thead>
<tr>
<th>Sport</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competitive Seasons</td>
<td>Daily Routines</td>
</tr>
<tr>
<td>Control of athletes fitness levels</td>
<td>Fitness level is a choice of the athlete</td>
</tr>
<tr>
<td>Size: &lt; 50</td>
<td>Size: &lt; 500 +</td>
</tr>
</tbody>
</table>

## Strength Phases for a College Football Player (Lineman)

<table>
<thead>
<tr>
<th>Month</th>
<th>Preparation period</th>
<th>Competition</th>
<th>Transition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar</td>
<td>Basic strength</td>
<td>Hypertrophy</td>
<td>Convert to power</td>
</tr>
<tr>
<td>Apr</td>
<td>Hypertrophy</td>
<td>Max strength</td>
<td>Maintain max strength and power</td>
</tr>
<tr>
<td>May</td>
<td>Max strength</td>
<td>Convert to power</td>
<td>Active recovery / basic strength</td>
</tr>
<tr>
<td>Jun</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Jul</td>
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<td>Aug</td>
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<td>Sep</td>
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<tr>
<td>Oct</td>
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<tr>
<td>Nov</td>
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<tr>
<td>Dec</td>
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<td></td>
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<tr>
<td>Jan</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Feb</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Training - Biomechanics

Applicable – Repeatable – Scalable – Sustainable
(keys for successful training)
“Sports”  “Outside 4 Walls”  “Inside 4 Walls”

Area of Focus

Athlete  Workplace
Ergonomics Design: Eliminate Risk

**TIME SAVINGS:** $38,325 – Annually

**Risk Reduction:** Eliminated 1,000 Lifts / Day

**Quality Savings:** $460,000 Annually
**Time Savings:** $65,700 Annually
**Risk Reduction:** High to Low

2 Injuries (2015)
0 Injuries (2016/2017)
Physical Demand Analysis (PDA's)

- Metabolic Rates
- Shift Length
- Lifting
- Reaching
- Standing / Walking
- Carrying
- Push / Pull
- Sitting
- Climbing
- Work Conditions
- Tools, Equipment, Materials

1. Endurance
   Work Intensity: 2.1 METs (moderate intensity)

2. Lift and Carry
   - Objects Lifted: Stamped parts
   - Lift Description 1: Workers manually lift undisturbed parts from bulk bin and insert into press
   - Lift Description 2: Workers manually lift stamped parts and place in overhead barrel

<table>
<thead>
<tr>
<th>Maximum</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (lbs)</td>
<td></td>
</tr>
<tr>
<td>Up to 50 lbs, over 15-95 lbs</td>
<td>Up to 5 lbs</td>
</tr>
<tr>
<td>Lowest Lift Point</td>
<td>20°</td>
</tr>
<tr>
<td>Highest Lift Point</td>
<td>Up to 45°</td>
</tr>
<tr>
<td>Carry Distance</td>
<td>Up to 40 feet</td>
</tr>
<tr>
<td>Frequency</td>
<td>Weekly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight (lbs)</th>
<th>Lift Carry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-25 lbs</td>
<td>X</td>
</tr>
<tr>
<td>26-50 lbs</td>
<td>X</td>
</tr>
<tr>
<td>51-75 lbs</td>
<td>N/A</td>
</tr>
<tr>
<td>76-100 lbs</td>
<td>N/A</td>
</tr>
<tr>
<td>100+ lbs</td>
<td>N/A</td>
</tr>
</tbody>
</table>

3. Push and Pull
   - Objects Moved: Stacked parts in barrels, pallet jack
   - Push/Pull Description 1: Worker pushes/pulls pallet jack with barrel of stamped parts to staging area. Jobs involved pallets with 4-in. tine extenders. Formed knife cuts, requiring adequate number of pushes (down) on pallet jack handle

<table>
<thead>
<tr>
<th>Maximum</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Force</td>
<td>Up to 30 lbs</td>
</tr>
<tr>
<td>Hand Height</td>
<td>36&quot; +/- 1/2&quot;</td>
</tr>
<tr>
<td>Distance</td>
<td>Up to 80 feet</td>
</tr>
</tbody>
</table>

* sample page
What is Lean?

The persistent quest of the perfect process through waste elimination...

Waste = Cost

Productivity

Quality

Injury
Types of Waste

1. Transportation (moving material/product from one place to another)
2. Inventory (material/product waiting to be processed)
3. Motion (excess movement and/or poor ergonomics)
4. Waiting (delays caused by shortages, approvals, downtime)
5. Overproduction (producing more than is needed)
6. Over-processing (adding more value than the Customer is willing to pay for)
7. Defects/Rework (correcting mistakes)

Also Skill or People – unused or under-utilized talents
Lean – Process Improvement

Cost Savings Example: Route to Market (eliminated wasted drive time w/ truck drivers)

- **Sustainability (Fuel):** $76,700 / facility / year (assume 260 days)
  - 5 gals gas or $14.75 / truck / day ($2.95 gal)
  - 14.75 / truck x 20 = $295 / facility / day
  - $295 / facility / day = $76,700

- **Time:** $16,425 / employee / year
  - Avg.: 45 min/day

- **Fatigue:** 9,000 step reduction (4.6 miles) / driver / day
Athletic Trainer’s Early Intervention Conversations

Awareness / Training

Warm-Up Instruction(s)

External Support (tape/ice)

Risk Observations

Early Intervention Conversations

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Industry: Efficient & Effective Efforts

“Stop the bleeding”

“Sunshine & Butterfly's”

1st Effort to Reduce Injury (reduce demands)
2nd Effort to Reduce Injury (support “athlete”)
Area of Focus

Athlete

• Combine / Showcase Testing
• Technique Coaching (Knowledge Lift)
• Strength / Conditioning
• Athletic Training
• Wellness (Nutrition/Sleep)

Workplace

• Physical Abilities Testing
• Ergonomic Design Implementation
• PDAs / Risk Assessments
• ATC’s / Early Intervention Methods
• Behavior Based Safety (Knowledge Lift)

• Physical Abilities Testing
• Ergonomics Design
• Ergo-Lean Opportunity
• PDAs / Risk Assessments
• Medical Management
• Early Intervention Methods
• Behavior Based Safety
Current clients observing increased profits and minimized loss (injury):
SPORT VS. INDUSTRY "ATHLETES":
PHYSICAL DEMANDS & INJURY PREVENTION METHODOLOGIES

While athletic coaches and occupational health professionals share common goals; maximizing performance and minimizing injury, they should take two very different approaches based on the differences in each athlete’s environment and physical capability. This presentation will compare and contrast these two settings and uncover best methods to managing risk and improving performance; all while, pointing out several methods in Sport may not be as beneficial in Industry (vice versa).

Host: Applied Ergonomics Conference Committee
Presenter: Brock Anderson CPE, LSSBB, CSCS
Date: November 1st (2 p.m Eastern Time)