INDUSTRIAL REHABILITATION/WORK HARDENING-CONDITIONING

OT 624 BIOMECHANICAL INTERVENTIONS IN OT
Stakeholders

- Client/injured employee
- Employer
- MD
- OT
- Workers’ Compensation
- Client’s attorney
Timeline

- Injury or reach threshold for CTD
- DC regular work hours and referral to MD for evaluation & diagnosis; surgery??
- Referral to PT/OT for acute care
- Referral to OT/Work Hardening/Industrial Rehab
- Full evaluation (FCE/PCE/Job Site Eval)
- Begin OT intervention
  - Communication with employer – light work schedule?
  - Set up program
OT intervention (continued)

Program (cont):
- Lifting education & supervised practice
- Stretching routine and pain management
- Splinting and adaptations to work tasks
  - Change way to do task
  - Change tools/handles
- Suggest/change administrative controls (task rotation, rest breaks-schedules)
- Work simulation or back on the job with adaptations/light schedule
Recommendations

- Understanding work level/physical demand classification/limits
- NIOSH Lifting Equation to determine RWL:
  - Consider a 20-pound vertical lift
The NIOSH lifting equation determines this lifting task should be studied and engineering or ergonomic improvements should be implemented to reduce the risk of injury.
20 pounds is too heavy – see the warning:

<table>
<thead>
<tr>
<th>Calculated Recommended Weight Limits:</th>
</tr>
</thead>
<tbody>
<tr>
<td>RWL = LC X HM X VM X DM X AM X FM X CM</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Origin</th>
<th>LI = 20 / 19.89 = 1.01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destination</td>
<td>LI = 20 / 22.50 = 0.89</td>
</tr>
</tbody>
</table>

The NIOSH lifting equation determines this lifting task should be studied and engineering or ergonomic improvements should be implemented to reduce the risk of injury.
Reducing to 15 pounds results in compliance with RWL and a safe LI:

<table>
<thead>
<tr>
<th>Lifting Index (LI) = Object Weight / RWL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Origin</td>
</tr>
<tr>
<td>LI = 15 / 19.89 = 0.75</td>
</tr>
<tr>
<td>Destination</td>
</tr>
<tr>
<td>LI = 15 / 22.50 = 0.67</td>
</tr>
</tbody>
</table>

Recommendation Based on Lifting Index:

The NIOSH lifting equation determines this lifting task is acceptable under the current conditions. To further improve this task, implement engineering or ergonomic improvements which will bring the multipliers closer to 1.
NIOSH Data Collection Sheet

- Necessary for equation: click here
- Shows figures like this:

Graphic Representation of Hand Location
Understanding the job in context of Dictionary of Occupational Titles

Physical Demands

- The physical demands listed in this publication serve as a means of expressing both the physical requirements of the job and the physical capacities (specific physical traits) a worker must have to meet those required by many jobs (perceiving by the sense of vision), and also the name of a specific capacity possessed by many people (having the power of sight). The worker must possess physical capacities at least in an amount equal to the physical demands made by the job.
The Factors

1. Strength: This factor is expressed in terms of Sedentary, Light, Medium, Heavy, and Very Heavy.

a. Worker Position(s):
   
   (1) Standing
   (2) Walking
   (3) Sitting

b. Worker movement of objects (including extremities used):
   
   (1) Lifting
   (2) Carrying
   (3) Pushing
   (4) Pulling
The five degrees of Physical Demands Factor No. 1 (strength) are as follows:

**S Sedentary Work**
Lifting 10 lbs. Maximum and occasionally lifting and/or carrying such articles as dockets, ledgers . . .

**L Light Work**
Lifting 20 lbs. Maximum with frequent lifting and/or carrying of objects weighing up to 10 lbs. Even though the weight lifted may be negligible amount, a job is in this category when it requires walking . . .

**M Medium Work**
Lifting 50 lbs. Maximum with frequent lifting and/or carrying of objects weighing up to 25 lbs.

**H Heavy Work**
Lifting 100 lbs. Maximum with frequent lifting and/or carrying of objects weighing up to 50 lbs.

**V Very Heavy Work**
Lifting objects in excess of 100 lbs. With frequent lifting and/or carrying of objects weighing 50 lbs. Or more.
The Factors (continued)

2. Climbing and/or Balancing
3. Stooping, Kneeling, Crouching, and/or Crawling:
4. Reaching, Handling, Fingering, and/or Feeling:
5. Talking and/or Hearing
6. Seeing

   (1) acuity, far and near, (2) depth perception, (3) field of vision, (4) accommodation, and (5) color vision
Lots of other descriptors in DOT:

- DOT
- Finding “occupational therapist”
- More description –
- More than you want . . .
Specific Assessments:

- **BTE** – overheads
- **Valpar** – read pp. 899-900
### Maximum Strength Comparison

**Patient ID:** 1234  
**Attachment:** 1628  
**Name:** ALBERT JONES  
**Height:** 35

<table>
<thead>
<tr>
<th>LEFT</th>
<th>RIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: 324 inch-lbs.</td>
<td>1: 206 inch-lbs.</td>
</tr>
<tr>
<td>2: 321 inch-lbs.</td>
<td>2: 212 inch-lbs.</td>
</tr>
<tr>
<td>3: 305 inch-lbs.</td>
<td>3: 214 inch-lbs.</td>
</tr>
</tbody>
</table>

**Average:** 317 inch-lbs  
**Coeff. Of Variation:** 2.6%

**Average:** 211 inch-lbs  
**Coeff. Of Variation:** 1.6%

Right is 33.4% Less Than Left

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1 - Name of test  
2 - Type of test (could be isometric or isotonic)  
3 - Patient ID as entered in the database  
4 - Patient name as entered in the database  
5 - BTE attachment number and the function being tested  
6 - Height at which the exercise head was set  
7 - Peak isometric force outputs for individual trials  
8 - Average of all peak force outputs for the side tested  
9 - Coefficient of variation (standard deviation divided by average)  
10 - Right to left comparison of average peak forces  
11 - Each printout is personalized with the name of your facility
<table>
<thead>
<tr>
<th>Patient ID: 1234</th>
<th>Name: ALBERT JONES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment: 1628</td>
<td>GRIP STRENGTH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LEFT</th>
<th>RIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: 7872 Engals</td>
<td>1: 4662 Engals</td>
</tr>
<tr>
<td>Force: 156 inch-lbs</td>
<td>Force: 99 inch-lbs</td>
</tr>
</tbody>
</table>

Average Power:
- LEFT: 7872 Engals
- RIGHT: 4662 Engals

Force:
- LEFT: 156 inch-lbs
- RIGHT: 99 inch-lbs

**Notes:**
- Must Be 3 Or More Trials For Coefficient Of Variation
- Right Is 34.1% Less Than Left

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September 27, 1988 At 16:29 from ST. WILBERFORTE HOSPITAL

1 - Name of test.
2 - Type of test - isometric.
3 - Power output - recorded in engals.
4 - If more than one power trial per side is given.
5 - Force setting for this test.
6 - A coefficient of variation is calculated if there are three or more trials per side.
7 - Right to left comparison of average power outputs.
# Endurance Comparison

**Patient ID**: 1234  
**Name**: ALBERT JONES  
**Attachment**: 6010 - SUPINATION/PRONATION  
**Height**: 48  
**Cycle Time**: 1

**Patient Information**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LEFT</td>
<td>99 Secs</td>
<td>9 Inch Lbs.</td>
<td>323189 inch-lb.-degress</td>
<td>77 Degrees</td>
</tr>
<tr>
<td>RIGHT</td>
<td>52 Secs</td>
<td>9 Inch Lbs.</td>
<td>183986 inch-lb.-degress</td>
<td>77 Degrees</td>
</tr>
</tbody>
</table>

**Note**: Right is 43.1% Less Than Left

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1. Name of test  
2. Type of test – isotonic  
3. Work output for each side is graphed for comparison.  
4. Time is the number of seconds which each side worked during the test.  
5. Force which was set for this test – measured in inch-pounds  
6. Total work output for each side during this test  
7. Number of degrees per rep for each side. The rep size is set by the user before beginning the test.  
8. Right to left comparison based on work output
1 - Name of test.
2 - Type of test - isotonic
3 - Vertical axis measures power output in engals.
4 - Horizontal axis counts number of reps.
5 - Power for this 10 second test - measured in engals.
6 - Force setting for this test - measured in inch-pounds.
7 - Distance for this test - measured in total degrees of rotation.
8 - Coefficient of variation for reps in each direction.
9 - Bars produced "real time" as test is performed. Different bars represent agonist vs. antagonist. Solid bars represent incomplete reps.
What the BTE is NOT:
Grip Strength Curve – shows strength of grip but NOT used in that way here. This is a measure of “trying your hardest” – a measure of trustworthyness:
Cut Points for “Sincerity of effort” (Maximum Voluntary Effort or MVE testing). Entering the world of “Coefficient of Variation”:

<table>
<thead>
<tr>
<th></th>
<th>Position 1</th>
<th>Position 2</th>
<th>Position 3</th>
<th>Position 4</th>
<th>Position 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>9.01%</td>
<td>5.84%</td>
<td>5.64%</td>
<td>5.62%</td>
<td>6.05%</td>
</tr>
<tr>
<td>SD</td>
<td>5.41%</td>
<td>3.62%</td>
<td>3.75%</td>
<td>4.45%</td>
<td>4.76%</td>
</tr>
</tbody>
</table>

Table 5. Dominant Hand Coefficient of Variation, Mean & Standard Deviation

<table>
<thead>
<tr>
<th></th>
<th>Position 1</th>
<th>Position 2</th>
<th>Position 3</th>
<th>Position 4</th>
<th>Position 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>8.63%</td>
<td>6.26%</td>
<td>5.48%</td>
<td>5.66%</td>
<td>6.74%</td>
</tr>
<tr>
<td>SD</td>
<td>6.61%</td>
<td>4.04%</td>
<td>3.79%</td>
<td>4.07%</td>
<td>5.46%</td>
</tr>
</tbody>
</table>

Table 6. Non-Dominant Hand Coefficient of Variation, Mean & Standard Deviation
So you think you have followed procedure and found variation in effort (indicating lack of max effort) – but consider this:

- The instrument (in this case the Jamar dynamometer) you have been told is appropriate to measure sincerity of effort . . . may not be! “The General Guidelines for Selection of Measures” states “. . . . the instrument must”: 
2. *NOT* directly involve an impaired component of the biomechanical system.

4. & 5. Have low error variance and high inherent stability relative to the range of recorded values.

- The Jamar used to test consistent effort in someone whose every move creates pain (as in back injury) or using the extremity in which the pathology exists violates #2 above.

- The Jamar is inherently more variable with the smallest and largest grip span setting – violating #4 above.
Detecting Sincerity of Effort: 
A Summary of Methods and Approaches

Despite the widespread use of methods that are supposed to detect the sincerity of patients' efforts in clinical assessment, little has been written summarizing the literature that addresses the reliability and validity of measurements obtained with these methods. The purpose of this article is to review the literature on the reliability and validity of scores for Waddell's nonorganic signs, descriptions of pain behavior and symptom magnification, coefficients of variation, correlations between musculoskeletal evaluation and function, grip measurements, and the relationship between heart rate and pain intensity. The authors of the articles reviewed concluded that none of these methods have been examined adequately. Some of these methods, such as Waddell's nonorganic signs, were not developed for the purpose of detecting sincerity of effort. Clinicians are encouraged to critically read the literature addressing these methods. With further research, some of the discussed methods may prove useful. Until such research is reported in the peer-reviewed literature, however, clinicians should avoid basing evaluation of sincerity of effort on these tests. Therapists are encouraged, instead, to use a biobehavioral approach to better understand and address the complex factors underlying delayed recovery. [Lechmer DE, Bradbury SF, Bradley LA. Detecting sincerity of effort: a summary of methods and approaches. Phys Ther. 1998;78:867–888.]

Key Words: Malingering; Neck and trunk, back; Pain; Reproducibility; Sincerity of effort; Submaximal effort.

Deborah E. Lechmer
Sam F. Bradbury
Lawrence A. Bradley

Physical Therapy, Volume 78, Number 8, August 1998
Despite the widespread use of methods that are supposed to detect the sincerity of patients’ efforts in clinical assessment, little has been written summarizing the literature that addresses the reliability and validity of measurements obtained with these methods. The purpose of this article is to review the literature on the reliability and validity of scores for Waddell’s nonorganic signs, descriptions of pain behavior and symptom magnification, coefficients of variation, correlations between musculoskeletal evaluation and function, grip measurements, and the relationship between heart rate and pain intensity. The authors of the articles reviewed conclude that none of these methods have been examined adequately. Some of these methods, such as
Included in insufficiently studied assessments:

- Grip strength
- Coefficients of variation
- Correlation between musculoskeletal evaluation and function
- Correlation between heart rate and pain intensity
Closer look at grip strength:

“... for this sample, "flattening" of the grip strength curves was a function of weak grip. The present data do not support the use of raw score curve shape as an indicator of sincerity of effort during grip strength testing.”
Clinicians should be evidence-minded.

Evidence provides the only real support when you are asked to back up your evaluative findings in court!

Basing evaluation and treatment on evidence (when available) is the only way to practice ethically.
Finally – Return to work: Does Employee ability match “Essential Job Functions”??

- **Tasks that are fundamental and necessary for the position:** e.g., typing proficiency, telephone skills, etc.
- **Does not include incidental duties:** e.g., making coffee.
Amount of time spent on a specific task or duty: e.g., typing at least 50 words per minute. An employer is not required to hire an individual who performs an essential task at a significantly slower rate than other applicants, even if the slower speed at which they perform the task is a direct result of their disability. As long as applicants without disabilities are held to the same time standard for a task (e.g., must be able to type 50 wpm to be considered for a secretarial position), this is not considered discriminatory under Title I of the ADA.
What the employer believes to be an essential job function: e.g., operating the copy machine. The employer can set his/her own job standards as long as these can be verified (e.g., the secretary must be able to operate the copy machine because s/he frequently is alone in the office, the office uses a high volume of photocopies, etc.).
Duties performed by past and current workers in the position: e.g., using specific computer software, etc. However, instances where past employees have expanded their job function (i.e., gone beyond what the job description requires - such as a secretary voluntarily taking notes at meetings, creating a web page, etc.) are not considered "essential job functions" under the ADA.

Source:
http://ada.ky.gov/employment_title_one.htm