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- Email customerservice@OccupationalTherapy.com
Therapeutic Office Ergonomics for Computer Use-Intensive Rehab Patients

Jeannie Koulizakis, MPT, CEES
Founder & CEO, ErgoRx.com
Director of Physical Therapy, Nova Pain and Rehabilitation

Learning Outcomes

1. After this course, participants will be able to identify the need and role of computer work ergonomics in today’s spine and joint rehab healthcare.
2. After this course, participants will be able to describe basic research about office ergonomics on which to base evidence-based therapeutic ADL training.
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- Adults spend more than 11 hours per day watching, reading, listening to or simply interacting with media.
  - Media includes computers, tablets and smartphones.
  - That's up from nine hours, 32 minutes just four years ago
  - At this rate what will happen in four years from now?

Q1 2018 Share of Daily Time Spent by Platform Based on Total US Population

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Live + Time-Shifted TV</th>
<th>Radio</th>
<th>TV connected Devices</th>
<th>Internet on a computer</th>
<th>App/Web on a Smartphone</th>
<th>App/Web on a tablet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult-18+</td>
<td>42%</td>
<td>16%</td>
<td>7%</td>
<td>6%</td>
<td>21%</td>
<td>7%</td>
</tr>
<tr>
<td>18-34</td>
<td>26%</td>
<td>16%</td>
<td>14%</td>
<td>7%</td>
<td>29%</td>
<td>7%</td>
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<tr>
<td>35-49</td>
<td>37%</td>
<td>16%</td>
<td>8%</td>
<td>7%</td>
<td>25%</td>
<td>7%</td>
</tr>
<tr>
<td>50-64</td>
<td>48%</td>
<td>17%</td>
<td>4%</td>
<td>6%</td>
<td>19%</td>
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<tr>
<td>65+</td>
<td>60%</td>
<td>14%</td>
<td>2%</td>
<td>4%</td>
<td>13%</td>
<td>7%</td>
</tr>
</tbody>
</table>

Based on information retrieved from: [https://www.marketwatch.com/story/people-are-spending-most-of-their-waking-hours-staring-at-screens-2018-08-01](https://www.marketwatch.com/story/people-are-spending-most-of-their-waking-hours-staring-at-screens-2018-08-01)

Children, Teens & Screen Time

- **No evidence of link** (yet) between increased screen time for children, teens and:
  - cardiovascular disease
  - diabetes
  - high cholesterol
Children, Teens & Screen Time

- Ages 8 to 18 are spending 7+ hrs. on screens per day
- **Evidence of link to obesity** - SLIPPERY SLOPE:
  - kids start snacking
  - ignore cues they are full
  - exposed to food advertising
  - exposed to blue light known to disturb sleep
  - poor sleep hygiene linked to obesity

---

Adult Screen Time

- **For many, screen time = work**
- **Evidence of link between technology devices and:**
  - cardiovascular disease, diabetes, high cholesterol
  - **WMSD** - work-related musculoskeletal diseases
- **Primary WMSD risk factors:**
  - poor postures
  - poor movement patterns during work
Common WMSDs:

- Neck and upper back pain
- Muscle strains and low back injuries
- Carpal tunnel syndrome
- Tendinitis
- Rotator cuff injuries (affects the shoulder)
- Epicondylitis (affects the elbow)
Body parts most affected by WMSD:

- Low Back - 63%
- Neck 53%
- Shoulder 38%
- Wrist 33%

Impact of WMSD in the Workplace

- Work related MSDs are among the most frequently reported causes of lost or restricted work time.
- According to the Bureau of Labor Statistics (BLS) in 2013, MSD1 cases accounted for 33% of all worker injury and illness cases.
Human Cost of MSD Injuries

- **Cost 1: The Employee**
  - Physical and financial well being affected

- **Cost 2: The Family**
  - MSD can be the catalyst for financial demise and divorce

- **Cost 3: The Team**
  - Increases work on coworkers

- **Cost 4: The Morale**
  - Working in pain kills morale

- **Cost 5: Productivity**
  - Working in pain also kills productivity

- **Cost 6: Culture**
  - Working in pain is never cause to celebrate
Human Cost of MSD Injuries

- Cost 7: Absenteeism & Presenteeism
  - Presenteeism may cause more aggregate productivity loss than absenteeism
  - With MSD’s presenteeism is often a substantial hidden cost
  - A recent study in one company showed 70% of employees experiencing fatigue, discomfort, or pain on a daily basis

Financial Burden of WMSDs

- Average direct cost of WMSD injury is between $12,000-$100,000
- Between direct and indirect cost Osha statistics indicate that WMSD-related expenses cost a staggering $20 to $50 billion a year
- Costing the US alone $88 billion a year low back and neck pain is widespread and expensive despite the fact that treatments don’t work overtime to prevent re-injury
What is Office Ergonomics?

- Office ergonomics is a process for protecting screen users from WMSD risks
- Office ergonomics involves optimizing human performance by designing a computer workspace environment to safely minimize effort
- To reduce WMSD risk, best-practices include using ideal postures and movement patterns

For Whom is Office Ergonomics?

- Employers are traditionally responsible for providing a safe and healthful workplace for their workers, including ergonomic furnishings and ergonomics training.
- BUT, people don’t always acknowledge their pain
- People don’t only work for others
For Whom is Office Ergonomics?

- For the gig economy, remote workers, and the self-employed, most need to provide a safe work environment for themselves.
- Spine and joint healthcare practitioners should consider including evidence-based therapeutic ADL instruction for patients, across the lifespan, interacting with screens for more than 4 hours per day.

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Ideal Seated Posture

For purpose of posture observation, 3 possible postures:

- Recline
- Upright
- Forward Leaning

Which Posture is Best?

1974 Research #1:

- “Lumbar disc pressure and myoelectric back muscle activity during sitting. Studies on an office chair”
  - reclining reduces the load on the lumbar spine and paraspinal musculature
Which Posture is Best?

1979 Research #2:

- "The influence of back rest inclination and lumbar support on the lordosis in sitting"
  - Four angles of backrest inclination and four different sizes of lumbar support were studied on 38 healthy subjects.
  - When sitting down from a standing position, the pelvis rotates and the lumbar lordosis decreases.
  - Increases in the backrest-seat angle had only minor effect on the lumbar lordosis.
  - A lumbar support had a significant influence: the lordosis increased with increasing support

1981 Research #3:

- "Epidemiologic aspects of low back pain in industry"
  - Reclining pumps nutrients to the intervertebral discs compared to upright
  - Upright postures is where the effects of gravity on the spine are most pronounced
  - Reclining reduces compression of the discs and, thus, reduces the rate of disc fluid dissipation
Which Chair is Best?

2006 Research #1: Stability ball versus standard office chair:

- “Stability ball versus office chair: comparison of muscle activation and lumbar spine posture during prolonged sitting.”
  - Prolonged sitting on a stability ball does not greatly alter the manner in which an individual sits
  - appears to increase the level of discomfort
  - Therefore, it is important to fully explore a new chair design and consult scientific research before implementing its use

Which Chair is Best?

2008 Research #2: Impact of leisure seating on LBP:

- “Seated Postures: Extending Concepts of Postural Health Beyond the Office”
  - Sustained kyphosed postures adversely affect spinal ligaments, muscles and joints and lead to neuromuscular and cumulative trauma disorders and loss of spinal stability.
  - Postures popularly assumed in recreational or leisure seating lead to cumulative damage to soft tissues of the spine.
  - Health professionals must consider the impact of leisure seating design and recreational sitting behavior.
Which Chair is Best?

2012 Research #3

- "Can we reduce the effort of maintaining a neutral sitting posture?"
  - The ability to maintain a neutral lumbar posture with less lumbar multifidus activation in recline is advantageous during prolonged sitting.
  - Evidence that chair design on longer duration sitting may affect LBP.

What about standing?

- Some say sitting is the new smoking
- Sitting may increase risk of cardio disease but no evidence supports that standing desks diminish that harm
- Standing burns only 8 calories more than sitting
- Standing for long periods can cause enlarged veins and blood to pool in feet
- Standing and sitting are both fine in moderation
- Inactivity is the new smoking
Ideal Sit-Stand-Move Patterns

2015 Research #4:
- "The sedentary office: a growing case for change towards better health and productivity."
  - Sit to do computer work
  - every 20 minutes stand for 8 minutes AND MOVE for 2 minutes.
  - In absence of standing desk, about every 20-30 minutes take a posture break and stand and move for a couple of minutes.
  - Simply standing is insufficient. just walking around is sufficient.

[Diagram: HEDGE’S 3S’s IDEAL WORK PATTERN]

- Every 30 minutes
  - Move and gently stretch
  - Stand in neutral postures
  - Sit in neutral postures

For a 7.5 hrs day this gives a total of:
- 5 hours sitting
- 2 hours of standing
- 0.5 hours of moving
- 16 sit-to-stand transitions

(continued)
Real World Posture Behaviors

2001 Research #1:

- “Office Seating Behaviors, An Investigation of Posture, Task, and JobType”.
  - 75% found to be forward leaning
  - “The finding reported in this paper can be seen as top line or headline findings”

2016 Research #2:

- “What am I sitting on? User knowledge of their chair controls.”
  - Posture observation field research
  - n=1004 office workers, 23 different companies
  - 60 different office chairs
  - 47% leaning forward
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Posture Risk Assessment: RULA & REBA

- RULA (Rapid Upper Limb Assessment) has been validated on groups of computer users
- RULA focuses on the neck, trunk and upper limbs
- REBA (Rapid Entire Body Assessment) focuses on standing postures
- Quick and easy to complete
- Scores indicate the level of intervention required to reduce MSD risks.
RULA Form

MUSCLE USE: Raise the score by 1 if the posture is mainly static, e.g. held for more than 10 minutes or repeated more than 4 times per minute

FORCE/LOAD: 0 = 4 or less pounds of load or force. Most force/loads for computer work are zero for RULA
RULA Scoring

<table>
<thead>
<tr>
<th>Score</th>
<th>Level of MSD Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>negligible risk, no action required</td>
</tr>
<tr>
<td>3-4</td>
<td>low risk, change may be needed</td>
</tr>
<tr>
<td>5-6</td>
<td>medium risk, further investigation, change soon</td>
</tr>
<tr>
<td>6+</td>
<td>very high risk, implement change now</td>
</tr>
</tbody>
</table>

Case Study #1

RULA = 4
Low risk, change may be needed

Look Up in Table C for Grand Score
Case Study #2

RULA = 6
Medium MSD Risk, Change Soon

REBA Form
REBA Scoring

<table>
<thead>
<tr>
<th>Score</th>
<th>Level of MSD Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>negligible risk, no action required</td>
</tr>
<tr>
<td>2-3</td>
<td>low risk, change may be needed</td>
</tr>
<tr>
<td>4-7</td>
<td>medium risk, further investigation, change soon</td>
</tr>
<tr>
<td>8-10</td>
<td>high risk, investigate and implement change</td>
</tr>
<tr>
<td>11+</td>
<td>very high risk, implement change</td>
</tr>
</tbody>
</table>

Case Study #1

REBA =4
Medium risk, further investigation, change soon
Case Study #2

REBA = 7
Medium risk, further investigation, change soon

Ergonomic Workspace Fitting
### Ergonomic Workspace Fitting

<table>
<thead>
<tr>
<th>CLIENT HEIGHT (IN)</th>
<th>SEAT HEIGHT (IN)</th>
<th>SITTING MONITOR HEIGHT</th>
<th>SITTING KEYBOARD HEIGHT</th>
<th>SITTING DESK HEIGHT</th>
<th>STANDING FOOTREST HEIGHT</th>
<th>STANDING KEYBOARD HEIGHT</th>
<th>STANDING MONITOR HEIGHT</th>
<th>STANDING MONITOR HEIGHT</th>
<th>SEATING FOOTREST HEIGHT</th>
<th>SEATING FOOTREST HEIGHT</th>
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<td>26.3</td>
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<tr>
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<td>A or B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5'3&quot; 63</td>
<td>20.3</td>
<td>26.3</td>
<td>30.3</td>
<td>4.5</td>
<td>39.7</td>
<td>66.7</td>
<td>B or C</td>
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<td>B or C</td>
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<td>4.7</td>
<td>41.6</td>
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<td>B or C</td>
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<td>B or C</td>
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<td>31.2</td>
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<td>42.8</td>
<td>63.8</td>
<td>B or C</td>
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<td>B or C</td>
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<td>B or C</td>
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<td>6'1&quot; 73</td>
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<td>34.1</td>
<td>5.3</td>
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<tr>
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<td>34.6</td>
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<td>6'4&quot; 76</td>
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<td>70.1</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Ergonomic Workspace Fitting

- Recurve Angle: 15°-30°
- Seat Height: Adjust as needed
- Footrest Height: Adjust as needed
- Monitor Height: Adjust as needed
- User Height: 10°-20° LTR
- Monitor Height: 10°-20° LTR

Ergonomic Workspace Fitting
Ergonomic Workspace Fitting

- Optimize chair height and monitor position
- Maintain a 90° wrist angle
- Adjust keyboard to 2-5° tilt
- Use a footrest for support
- Adjust screen height to eye level

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Ergonomic Workspace Fitting

- Use a chair with proper back support
- Adjust desk height to reach keyboard and monitor comfortably
- Use a footrest when standing
- Adjust screen height to eye level
Ergonomic Workspace Fitting

- Recline Angle: 15°-30°
- Monitor Height
- Desk Height
- Footrest Height
- Keyboard Height
- Seat Height + Shoe Height + Seat Height
- Standing Footrest Height

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Ergonomic Workspace Fitting

- User Height
- In Inches
- 10°-20° tilt
- 10°-20° tilt

7/16/19
Ergonomic Workspace Fitting

Multiple Monitor & Neck Pain Solution

BEFORE

AFTER
Ergonomic Workspace Fitting

Multiple Monitor & Neck Pain Solution

Before & After
Before & After

Before & After
Before & After

Before & After
Before & After

Before & After
References:

- SLIDE 4,5
  https://www.marketwatch.com/story/people-are-spending-most-of-their-waking-hours-staring-at-screens-2018-08-01/print
- SLIDE 6,7
  https://www.marketwatch.com/story/people-are-spending-most-of-their-waking-hours-staring-at-screens-2018-08-01/print
- CBS News Health experts say parents need to drastically cut kids’ screen time August 6, 2018 By Ashley Welch

References

- Adam Ruins Everything - The Problem with Standing Desks https://www.youtube.com/watch?v=s7N2MvH0jBg
References

- Adam Ruins Everything - The Problem with Standing Desks https://www.youtube.com/watch?v=s7N2MvjH0j8
Questions?

- Email: info@ergoRX.com