Occupational Therapy for the Computer User: A Balancing Act

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Objectives

Participant will:

- Understand American Occupational Therapy Association (AOTA) centennial vision and how OT can impact work, health and wellness
- Understand the relationship between work, worker and workplace during a work station assessment
- Gain information for development of a high quality, evidence-based, OT intervention program, focused on preventing and reducing musculoskeletal disorders (MSDs) in computer users

AOTA Centennial Vision

“We envision that occupational therapy is a powerful, widely recognized, science-driven, and evidence-based profession with a globally connected and diverse workforce meeting society’s occupational needs” (AOTA, 2007, p 613).
Work

- Increases self-esteem/self confidence
- Economic advances
- Skill competency
- Mental health fulfillment

Benefits of Work and Potential Impact

- Work injury creates physical problem and pain as well as psychological, social, and economic concerns (Lax & Klein, 2006)
- Potential impact:
  - Activities of daily living
  - Work
  - Rest
  - Leisure
  - Families' domains

Calling all OTs

- Work is a critical occupation and dates back to the founding days of our profession
- Educated in anatomy, physiology, and activity analysis; thus highly equipped to serve as evaluators and educators
- Empowering individuals to increase control over, and improve their own health (WHO, 2012)
Improving US Health Care: Patient Protection Affordable Care Act

- Improving the experience of care
- Improving the health of populations
- Reducing health care expenditure

Two Practice Areas Targeted

Work, Worker & Workplace
Nonfatal Work Related Injuries

- The Bureau of Labor Statistics reported 4 million nonfatal work-related injuries and illnesses in 2013 (2014)
- Two most common injuries
  - Sprains, strains and tears
  - Soreness/pain

The Challenge

- Absenteeism
- Returning to work too soon
- Aging workforce
- Stress
- Fatigue
- Depression

All impact employer’s medical costs and employees’ productivity

Productivity Losses

- Productivity losses linked to absenteeism cost employers $225.8 billion or average of $1,685 per employee per year (CDC, 2013).
Presenteeism

- People going to work when they are sick account for 2/3 of the total costs of worker illness
- Can cut productivity to 1/3 or more (Hemp, 2004)

Aging Worker

- According to the U.S. Bureau of Labor Statistics, by 2020, one in four American workers will be over 55 (2014)
  - Muscle Strength/Range of Motion: In general lose 15-20% of strength between ages of 20-60.
  - Cardiovascular & Respiratory: By age 30-65 the heart, lungs and circulatory systems decrease ability to carry oxygen.
  - Posture and Balance: Falls generally increase in the aging population
  - Sleep Regulation
  - Vision
  - Hearing
  - Cognition

  Canadian Center for Occupational Health and Safety, 2012

Stress

- Work related stress is the #1 workforce health issue ranking above physical inactivity and obesity (Towers Watson Survey, 2013)
Fatigue

- Lacking sleep leads to
  - Worker error
  - Decreased productivity
  - Safety incident

Depression

- 1 in 10 adults suffer from depression in the U.S. (CDC, 2013)
- Can result in
  - Absenteeism
  - Short-term disability
  - Decreased productivity

National Health Concern

CDC

[Image of health concern]
The Silent Killer: Sitting

- One hour of sitting prompts biochemical changes in:
  - Lipoprotein lipase activity (an enzyme involved in fat metabolism)
  - Glucose metabolism

- Leads to deposits of fats in adipose tissue rather than being metabolized by muscle

Sitting Can Lead to...

- Obesity
- Increased risk for chronic diseases
  - Cardiovascular disease
  - Type 2 diabetes
  - Cancer
  - Kidney disease
  - Death

Today’s worker faces serious health challenges

Obesity

- U.S. workers who are overweight or obese with other chronic health conditions miss approximately 450 million more days of work compared to healthy workers, costing more than $153 billion a year in lost productivity (Gallup-Healthways Well-Being Index, 2011).
Heart Disease

- Sitting can increase the risk of heart disease by as much as 15% and early death by 13%

Heart Disease and Stroke

- Treatment of these diseases accounts for approximately $1 of every $6 spent on U.S. health care (CDC, 2014).
- More than 795,000 people in the U.S. have a stroke each year (CDC, 2014).

Diabetes

- U.S. health care costs totaled $245 billion
- 7th leading cause of death
- Every two hours, middle-aged women sat and watched television, there was an increased risk of obesity by 23% and 14% higher risk for developing diabetes

(American Diabetes Foundation, 2015)
Musculoskeletal System

- Musculoskeletal system is also at risk as it is dependent on proper blood flow which decreased motion can impact
- Sitting places 50% increased force on the spine while in the sitting positioning compared to standing (Maltchev, 2012)


- Musculoskeletal disorders (MSDs) accounted for 33 percent of all work injury and illness cases in 2013
- Workers who sustained MSDs were out of work a median of 11 days
- The estimated cost of chronic pain is estimated to be as high as $635 billion per year (National Research Council & Institute of Medicine, 2011)

Common MSDs in Computer Users

- Neck and back pain
- Headaches
- Shoulder discomfort
- Tendonitis
- Carpal tunnel
- Cubital tunnel
Causes
- Repetitive motion
- Poor posturing
- Static work positions
  - Sitting
- Poor work practices
- Physical fitness level and body shape
- Training issues
- Stress
- Inadequate workstations
- Increased productivity
- Combination

OT and Work
- Evaluation
- Ergonomic Intervention
- Exercise
- Exposure Reduction
- Education

Evaluation
Outcomes of an Injury Prevention Program

- Safety
- Productivity
  - Not widely included in ergonomic studies
- Comfort
  - Most commonly assessed

Evaluation

- Observation
- Videotaping
  - No gold standard for assessing biomechanical exposures
  - Technically posture/joint ROM can be measured
- Functional outcome assessments
  - Less expensive
  - Low risk
  - Can have varying reliability and validity

Evidenced-based Outcome Measures for Computer Users

- RSI Quick Scan
- Short form Workstyle measure
- Rapid Upper Limb Assessment
- Rapid Office Strain Assessment (ROSA)
- Cornell University Discomfort Questionnaire (CUDQ)
ROSAROSA

- Picture centered posture checklist
- Quantifies exposure to risk factors in an office work environment
- Inter and intra-reliability is good
- Research shows a correlation between increasing discomfort levels and increasing ROSA (Sonne, Villalta, & Andrews, 2012)

CUDQCUDQ

- Assessment tool that examines the frequency and intensity of worker discomfort and the effects that this discomfort has on productivity
- High validity and reliability (Erro et al., 2008)
Ergonomic Intervention and Education

Ergonomics

- Greek origin; ergos meaning “work” and nomos meaning “law”
- Fitting the work to the user
- Goal of ergonomics is to obtain a safe, comfortable, and efficient work environment
- Systems and holistic approach
Ergonomic Considerations

- Body mechanics and posture
  - For the body to maximize strength, mobility, and stability, alignment to the center of gravity is important
  - Without the alignment over the center of gravity and along the base of support, the muscles become fatigued, increasing risk of injury to the muscle and supported joints

- Uneven forces places stress on the spine

Neutral Position

- Elbows close to sides
- Reduce marching
- Wrists straight (slight 20 degrees extension)
- Ears over shoulders
- Shoulders over hips
- Hips in line with feet
- No rotation of spine
Neutral takes time to learn

Chair
- Suggested 90 degrees of flexion at the hips, knees and ankles.
- Chair too high
  - Blood vessels may become impinged in posterior thigh (Tichauer & Gage, 1978)
  - Encourages worker to sit too far forward which can lead to low back muscle contraction (Harisinghani et al., 2004)
- Chair too low
  - Increased pressure under buttocks potentially causing spinal lean and pelvic rotation, which can compromise the lumbar spine curve (Harisinghani et al., 1999)

Chair
- Depth
  - Too long, low back support will be decreased or lost
  - Too short, pressure is increased on the back of the thigh causing compressed blood vessels and nerves (Tichauer & Gage, 1978)
**Armrests**
- Shoulders relaxed
- No sharp edges
- Soft in nature (Szabo & Gelberman, 1987)
- Avoid compression at the cubital tunnel

**Lumbar Support**
- Should be adjustable
- Placed at worker's lumbar region supporting natural curve
  - Without this support, the ligaments, tendons, and muscles of the back can be compromised (Harrison et al., 1999)
- Directly in front of worker
  - Placed to side can cause neck strain

**Monitor**
- 40-75 centimeters
- Generally can gauge with worker placing at arm's length
- Top of monitor screen at eye level of seated worker (Canadian Standards Association, 2000)
- Deviations can cause increased muscle strain to neck and upper shoulders
**Keyboard**
- Elbows placed at approximately 90 degrees with shoulders relaxed
- Wrists neutral
- Avoid wrist placement on hard surfaces (Canadian Centre for Occupational Health and Safety, 2005)
- Deviation can increase upper back and shoulder muscle activity (Korhonen et al., 2003)

**Mouse**
- Fit the size of the worker's hand
- Positioned in line with the worker's shoulder with wrist neutral
- Same surface as keyboard
- Deviation can cause increased UE muscle activity (Cook & Kothiyal, 1998)

**Telephone**
- Placement should be within easy reach in order to eliminate excessive reaching
- Avoid ear and shoulder as source of stabilization
**Ergonomics & Counseling**

**Mixed Evidence**
- Means of educating were varied
  - Booklets, one-on-one, group training
- Length of sessions varied
- Number of sessions varied

**Ergonomic Training & Workstation Adjustment**
- One high quality study found positive effect on the elbow and forearm (Martin, Irvine, Fluharty, & Gatty, 2003)
- One high quality study found participant’s ability to rearrange their workstation properly (Levanon, Gefen, Lema, Givon, & Ratson, 2012)

**Ergonomic Training, Workstation Adjustment and Micro-Break Discussion**
- One level I study showed decreased UE pain via three hour training session incorporating:
  - Discussion groups and didactic interaction
  - Workstation problem solving and dialogue centered
  - Exercise
  - Work organization
  - Micro-breaks (Green, 2005)
Alternative Keyboards (Mixed Evidence)

Level I showed a Microsoft Natural Multimedia keyboard effective in reducing MSDs (Ripat et al., 2006)

Level I found an alternative halved keyboard, located at right angles to be more effective than traditional (Swanson & Sauter, 2006)

Level I found increased comfort with the use of an Apple adjustable keyboard with a split design (Tittiranonda, Rempel, Armstrong, & Burastero, 1999)

Mouse

• Concept is to decrease pronation
• Level I found positive effects for a trackball compared to a conventional mouse (Rempel et al., 2006)
• Level I showed participants who used an Anir mouse for six months decreased pain in the shoulder, forearm, wrist and hand (Aaras, Dakhdof, Ro, & Rhorensen, 2002)

Arm Supports

• Moderate evidence supporting the use of arm supports especially for the dominant arm (Conlon, Krause, & Rempel, 2008; Rempel et al., 2006)
Exercise

Exercise/Movement

- Mixed evidence

- Two high quality studies found positive effects for the neck (Lundblad, Elert & Gerdle, 1999; Sjogren et al., 2005)

Exposure Reduction
Repetitive Motion

- Can cause:
  - Muscle fatigue
  - Joint pain and injury
  - Neurological problems

Static Positioning

- Muscles contract for long periods of time
- Causes reduced oxygenation
- Muscles tighten
- Can occur with large or small body motions
- Vascular compromise (varicose veins)
- Standing or crouching too long
- Veins need the movement of muscles around them to keep blood from pooling and causing pain

Standing

- Standing is being advocated because this uses more muscle activity burning 20% more calories
Standing Too Long...

- Increased load to circulatory system
  - Men with ischemic heart disease: increases the progression of carotid atherosclerosis because of increased load
  - Increases risk of varicose veins and accounts for 20% of all cases in working ages
  - Fine motor tasks more difficult

Rest Breaks

Level I and III (Galinsky, Swanson, Sauter, Humell, & Schleifer, 2000; Galinsky et al., 2007) found positive effects of a five minute break every hour

Or

30 second break every 20 minutes (McLean, Tingley, Scott, & Rickards, 2001) has positive effect on UE MSDs

Rest Breaks with Exercise

Insufficient evidence to determine whether combination has an effect on UE MSDs (Kennedy, et al., 2010)
Other

- Biofeedback/Myofeedback:
  - No evidence by itself (Larsman et al., 2009)

- Yoga
  - Level II study by Joshi and Bellad report potentially useful intervention for computer related MSDs (2011)

Augusta Health's Program

- Referral
- Evaluation
- Intervention
- Follow-up

Workplace Wellness
Employee Wellness

Work

- One of eight areas of occupations
- Members of Work & Industry Special Interest Section (WSIS):
  - 269 occupational therapists
  - 21 assistants
- Smallest membership of the eleven Special Interest Sections
  - Compared to 3,856 occupational therapists and 455 occupational therapy assistants in the largest group, Physical Disabilities (AOTA, 2013a).
- Membership not growing
References


