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ENVIRONMENTAL HEALTH AND SAFETY

Office Ergonomics Guideline

1.0 Introduction

This guideline outlines best office work practices to eliminate or minimize the risk factors for developing Musculoskeletal Disorders (MSDs) and visual strain associated with working at a computer workstation.

What is an MSD?

Musculoskeletal Disorder or MSD is an umbrella term for a number of injuries and disorders of the musculoskeletal system (muscles, tendons, nerves, bursa, blood vessels, joints, spinal discs, ligaments, etc.). Many body areas can be affected; however, the lower back is the most common, followed by the shoulders, neck, elbow, hands, and wrists. Other terms with the same meaning as MSD include:

- Repetitive Strain Injury (RSI)
- Cumulative Trauma Disorder (CTD)
- Work-related Musculoskeletal Disorder (WMSD)

Under the Ontario Occupational Health and Safety Act (OHSA), the general duty clause (section 25(2)(h) states that an employer must "take every precaution reasonable in the circumstances for the protection of a worker". Employers who are covered by the *Occupational Health and Safety Act* (OHSA), and its regulations, have legal obligations to protect workers from hazards due to poor ergonomics, such as:

- musculoskeletal disorder hazards
- visibility hazards
- fall hazards

2.0 Scope

This guideline applies to University of Toronto employees who perform moderate and/or intensive computer work but can also be used by Departments/Faculties for workers who perform light computer work.

MSDs can occur suddenly or develop gradually over weeks, months, or even years. They are linked to known hazards in the workplace. The key hazards, which can act in combination, are:

- force
- fixed or awkward postures
- repetition

People working on computers for prolonged periods are at increased risk of developing a number of health problems. These include:

- headaches
- back pain
- upper limb MSDs (e.g., carpal tunnel syndrome)
- visual fatigue (e.g., eye irritation and discomfort, headache, blurred vision)

The risk of computer-related health problems can be reduced by:

- proper lighting
- good task design
- appropriate workstation design (e.g., suitable desks and adjustable chairs)
- use of suitable equipment (e.g., keyboards, mouse, and monitors)

3.0 Definitions

Armrest – support for the lower arms that includes the arm post and any pads/caps that the lower arm contacts. An armrest is typically attached to the seat, back, or base of the chair and may be fixed, adjustable, or removable.

Backrest – the vertical part of the chair above the seat. The backrest includes the lumber support and where applicable, neck/head rests.

Ergonomics – the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data, and methods of design to enhance human well-being and optimize overall system performance.

Lumbar support – a protrusion in the lower portion of the backrest. Lumbar height is measured as the distance of this protrusion above the compressed seat.

Popliteal height – the distance from the underside of the foot to the underside of the thigh at the knees.

Seat – the horizontal part of the chair.

Work surface – a surface where work is performed (typically paper-based or computer-based work tasks). The work surface is commonly used to support technology and associated equipment and materials.

4.0 Responsibilities

Employer
- Provide information, instruction, and supervision to protect worker health and safety. This may include:
  - safe-work methods specific to the workplace that target a reduction in MSD risk;
  - computer ergonomics;
  - safe ways of using equipment;
  - how to recognize the signs and symptoms of MSDs and the importance of early reporting;
  - how to recognize and report MSD hazards; and,
  - workstation setup and work practices that reduce MSD risk.

Supervisors
- Identify all moderate and intensive computer users;
- Provide equipment and furnishings appropriate to the work being conducted;
- Ensure that all moderate and intensive computer users are informed on the acceptable work postures, habits, and proper adjustment of the workstation and accessories; and,
- Encourage all computer users to report ergonomic concerns to their supervisor.

Workers
- Use and adjust workstations and accessories to accommodate individual needs;
- Apply the principles of good working posture and work habits; and
- Report ergonomic concerns and MSD hazards to their supervisor.

5.0 Education and Training

Training is an important component in preventing and reducing the risk factors for developing MSIs. EHS offers the following resources:
- EHS536 Office Ergonomics Online Course
- Office Ergonomics Website
- Office Ergonomics: Workstation Self-Assessment Form

6.0 Guidance on Office/Computer Furniture for Moderate and Intensive Computer Users

Office Chair	
Seat Height	• Seat height should be adjustable by user to allow for postural variation. • Torso-to-thigh angle should not be less than 90 degrees. • Seat height (popliteal height) adjustment range to include 376-512 mm. • Adjust seat height such that your keyboard/work surface is at elbow height when typing and with shoulders relaxed (if working at a fixed height work surface, a footrest may be required).

Seat Pan	• Front edge of seat designed to minimize compression on the underside of the thigh and behind the knee. Most task chairs will provide adjustable seat pan. Ensure there is at least two fingers space behind the knee.
	• With back properly supported by the backrest, and with adequate buttock and thigh support, user should be able to sit in chair without undue pressure on back of knees.
	• Seating surface should have sufficient friction to prevent sliding off the seat and have breathable surface for comfort (minimize heat and moisture build-up).
	• Seat pan depth (buttock-popliteal length) is adjustable and includes 415 mm and adjustable by at least 50 mm.
	• For chairs with fixed seat pan, seat depth is ≤415 mm.
	• Seat width (hip breadth) ≥489 mm.
	• Seats may have an adjustable or fixed seat angle.
	    ○ Fixed: fall within a range of 0 degrees (horizontal) to 4 degrees (rearward).
	    ○ When seat angle is adjustable, it should include part of the range between 0 degree to 4 degrees. rearward.

Backrest	• Have breathable surface for comfort (minimize heat and moisture build-up). • Backrest should be high enough to support the back in a

	variety of postures but not interfere with movement of user's arms.
	• For rearward postures, backrest should provide support for shoulders and neck/head. For tasks requiring upper body mobility, backrest height should provide adequate support for the user's back but not interfere with movement of user's arm.
	• Chairs should have a height-adjustable lumbar support. Lumbar support should be of height and shape to support user's lower back (lumbar region of spine).
	• Lumbar support should be height adjustable and include at least part of the range between 150-250 mm above seat.
	• Backrest height should be ≥354 mm.
	• Backrest width ≥360 mm in lumbar region.
	• Backrest angle minimum adjustment range of 15 degrees (within 90 to 120 degrees relative to horizontal).
	• Backrest to seat angle should not be less than 90 degrees.
	• Tilt mechanism should either: 1. allow backrest to tilt with the seat in a ratio greater than 1:1 (i.e., synchro-tilt); or 2. allow seat and backrest to tilt in unison (1:1 ratio)
Armrests	• Armrests must allow user to rest their forearms and elbows in a matter that avoids: 1. lifting the shoulders (armrest too high); or 2. leaning to the side/dropping the shoulders to reach the armrest (armrest too low). • Armrests should be adjustable in height and include range between 195-289 mm; • The length, width, and positioning of the armrests should allow user to support forearms properly while sitting close enough to work surface to performance task. Armrests should not be a source of contact stress or impede access to workstation or arm movement. • User should be able to adjust armrests inward/outward to achieve a comfortable arm posture and support forearms and elbows in a manner that avoids lifting shoulders or forcing elbows away from body. • Distance between armrests should include 493 mm with horizontal adjustment of at least 50 mm per side and allow user to easily enter/exit the chair and comfortably fit their hips between the armrests. • Armrest should be made of soft, durable, easy to clean, and non-abrasive material.
Chair Base	• The legs of the work chair should ensure stability without creating a trip hazard. • Chairs should have five prongs for stability.
Swivel	• Chair should enable user to swivel while seated to get close to equipment, accessories, or materials. • Seat, backrest, and armrests (if chair has armrests) should swivel in unison relative to base.

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Computer Workstation	
Computer Desk, Workstation Surface	• Clearance envelope under work surface should allow user to sit and/or stand directly in front or close to work surface in an upright posture without obstruction. • User should be able to freely move through multiple postures while seated, including extending the lower legs, or to stand without obstruction. ○ Common sources of obstruction include desk drawers, table legs, and personal items. • Surface height should enable user to sit and/or stand with feet comfortably supported on the floor in a variety of positions with shoulders/elbows/wrist in neutral postures, and without exposure to contact stress. • Width of work surface should be wide enough to accommodate keyboard and input device (mouse) on the appropriate side of the keyboard in such a way that maintains neutral body postures. • Adjust workstation surface such that the keyboard is aligned with the elbow when typing and mousing. If the work surface is fixed, refer to adjusting chair. A footrest may be required. • Work surface depth should allow for minimum viewing distance. • Sit-stand desk adjustable range should be between 575-1237 mm.
Computer Monitor	• User able to view the entire monitor display without excessive turning, tilting, flexing, or extending neck. Top of the screen should not be closer to the eyes than the bottom of the screen. • Adjust monitor upwards or downwards such that top of active area of screen should be no higher than user's horizontal eye level when seated in upright posture. Where possible, select monitors with adjustable height features or a monitor riser may be used. • A single monitor should be located directly in front of user so there is no twisting of head/neck/torso. • Where two monitors are used at once, and one is used more frequently than the other, primary monitor should be located directly in front of user. • Where two monitors are used equally, both monitors should be positioned side by side, touching each other, and the point where they meet should be directly in front of user. All information on screens should be within 35 degrees to either side of the midline. • Distance to monitor (viewing distance) ≥500 mm to 1000 mm. • Monitors should have swivel or tilt capability such that the screen can be positioned to reduce or eliminate unwanted glare. • Appropriate minimum screen size based on task requirement, screen resolution, viewing distance, and time user spends viewing the display.

	• Displays should have controls for adjusting brightness and contrast. • Distance from user's eyes to monitor (i.e., viewing distance) should allow the user to focus on the screen images in such a way that they are legible and readable when user assumes reference posture.
Keyboard and Mouse	• Keyboards without a numeric keypad is an option for individuals who infrequently use the numeric keypad and operate the mouse with their right hand. • Non-keyboard input devices (e.g., mouse) should support either left- or right-handed use where applicable. • Keyboard should be movable so that most frequently used keys can be centred in front of user; the "Y" key is centred in front of the user. • Keyboard should be located at an appropriate height and angle to ensure user can maintain neutral hand, arm, and shoulder postures. Avoid tilting keyboard upwards, causing wrists to be bent while typing. • Mouse should be placed as close to the keyboard as possible to maintain neutral hand, arm, and shoulder postures.
Drawers	• Drawers and extendable shelves should have stops to prevent their accidental removal but should be capable of being opened when required. • Drawers should not interfere with or obstruct the clearance envelope for legs/feet under work surface.
Storage of items and materials	• Storage should be placed in a way that does not encroach clearance envelope for legs/feet under work surface and does not interfere with height adjustability of work surfaces.
Computer Accessories	
Document Support/Holders	• Document support should be of a size that accommodates the size of the documents and raises reference materials to a height that allows for the neck to be in a neutral position.
Footrests	• Where users must position their seat height higher at a fixed height work surface to reach their keyboard / mouse, a footrest should be provided. • Footrests should enable users to achieve neutral ankle position (at angle close to 90 degrees). • Footrest may allow adjustable angles between legs and feet as means of providing variations in work postures or ankle positions. • Footrest should adequately support feet, have sufficient surface size, non-slip surface, and adequate friction against floor to provide sliding.
Cable Management	• Cables should be placed to allow correct and safe operation of workstation components and devices. • Cable length sufficient to accommodate user needs; excess

	length should be secured/tucked away to not obstruct or interfere with users. • Allow easy access for maintenance and cleaning.
Adjustable Under-Desk Keyboard/Mouse Support Tray	• Keyboard / mouse tray can be used if the work surface cannot properly accommodate a keyboard/mouse and monitor (i.e., the surface is too high or too shallow).
Monitor Risers or Blocks	• Monitor risers or blocks can be used to increase the height of the monitor if the monitor is too low.

Wrist or Palm Rests	• Palm support can be:
	  a) Incorporated into design of input device; or
	  b) Separate from the input device.
	• Palm support should not result in wrist extension or deviation (from anchoring the wrist). These devices allow the wrist to 'rest' periodically when not actively typing or mousing.
	• Avoid leaning on wrist rests and bending wrists; instead keep an open wrist, allowing blood to flow.

Telephone Headsets	• Where telephone use is extensive and simultaneous with keyboarding or writing, the telephone should be equipped with a headset.
Posture and Work Habits	

General	• Job and task organization should allow for postural variety.
	  1. Alternating between sitting and standing, or variations on sitting and standing postures (e.g., reclining, forward tilting, and semi-standing), are encouraged to avoid the negative effects of prolonged sitting or standing in one posture.
	  2. There is no uniquely correct working posture that fits a user for an extended period of time and/or accommodates every personal work habit.
	  3. Some approaches to achieving postural variety include changes in tasks, individual work practices, and the use of alternative workstation layouts and adjustable furniture, equipment, and accessories.

Sitting Posture	• Knees at 90 degree angle. • Thighs horizontal, lower legs vertical, with feet resting firmly on the floor or supported on a footrest. • Erect/upright spine. • Straight (not twisted) upper torso. • Upper arms hanging vertically alongside torso with shoulders relaxed, forearms horizontal, and elbows close to body. • Straight (not bent) wrists. • Neck upright.
Standing Posture	• Head, neck, torso, and legs approximately in line and vertical (one leg may be raised intermittently on foot

	- support). - Upper arms hanging vertically with forearms horizontal, and elbows close to body. - Straight (not bent) wrists.
Alternating Work Postures Between Sitting and standing	- Where required by the work task, work organization, or the user, the furniture, accessories, and equipment should accommodate the need to alternate between sitting and standing postures. - Sit-stand furniture/accessories may be used to achieve appropriate postures when alternating between sitting and standing.
Others	
Lighting	Refer to **Lighting Ergonomics Guideline** for more information.
Hand-Held Mobile Devices	- Mobile technology use should be for very limited durations before a change in posture. External equipment should be used with the mobile technology where longer durations of work will be required. - Limit duration of work time spent on mobile technology and take appropriate rest breaks. - Consider using a docking station where possible with separate monitor or separate keyboard and mouse in conjunction with mobile device. - Holding a static posture while viewing/inputting on a mobile phone/tablet should be limited to 10 minutes or less. Use external equipment where longer durations of work will be required. - Consider the following measures: - Use hands-free devices for long phone calls. - Use neutral grip when holding device (keep wrists straight). - Alternate between using thumb and other fingers to type. - Keep text entries short and use. abbreviations/shortcuts/predictive text to reduce keystrokes. - Maintain neutral upright spine posture. - Alternate hands when holding device. - Use external keyboard for typing. - Use a stylus.
Laptops	- Where laptops are used for extended durations, user should be provided with either: - Docking station with external monitor, keyboard, and mouse; or - External keyboard and mouse, with laptop screen used as the monitor and positioned accordingly (i.e., on a laptop stand).

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7.0 Further Information

CSA-Z412-17 Guideline on Office Ergonomics (Canadian Standard Association):
https://subscriptions-techstreet-com.myaccess.library.utoronto.ca/products/776308#

Computer Ergonomics (Ontario Ministry of Labour, Immigration, Training and Skills Development)
https://www.ontario.ca/page/computer-ergonomics

Ergonomics in the Workplace: Understanding the Law: https://www.ontario.ca/page/ergonomics-workplace-understanding-law

Health and Safety Guidelines: Rest Breaks for Computer Operators (Ontario Ministry of Labour, Immigration, Training and Skills Development), March 2008:
https://www.publications.gov.on.ca/health-and-safety-guidelines-rest-breaks-for-computer-operators

MSD Prevention Guideline for Ontario (Centre of Research Expertise for the Prevention of Musculoskeletal Disorders): https://www.msdprevention.com/

Office Ergonomics (Canadian Centre for Occupational Health and Safety):
https://www.ccohs.ca/oshanswers/ergonomics/office/