Understanding Computers in a Changing Society

5e

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Chapter 7
The Impact of Computers on Your Health and the Environment

Learning Objectives

1. Understand the potential risks to physical health resulting from the use of computers.
2. Describe some possible emotional health risks associated with the use of computers.
3. Explain what is meant by the term “digital divide.”
4. Discuss the impact that factors such as nationality, income, race, education, and physical disabilities may have on computer access and use.
5. List some types of assistive hardware that can be used by individuals with physical disabilities.

Overview

- This chapter covers:
  - The impact of computers on our physical and emotional health
  - Strategies individuals can use to lessen health risks
  - Issues related to the access of technology
  - The impact of computers on our environment

Computers and Health

- Physical Health
  - Repetitive Stress Injuries(RSI)
    - Carpal tunnel syndrome (CTS) (keyboard use)
    - DeQuervain's tendonitis
  - Computer Vision Syndrome (CVS)
  - Backaches
  - Heat from laptops
  - Noise-induced hearing loss
    - 60/60 rule
  - Phone and texting-related car accidents
  - Possible radiation risks from wireless devices

FIGURE 7-1
DriveAssist. This product restricts usage of a mobile phone when the car is in motion.

Computers and Health

- What is Ergonomics?
  - The science of fitting a work environment to the people who work there
    - Designing a safe and effective work space
    - Properly adjusting furniture and hardware
    - Using ergonomic hardware
  - Proper work environments can prevent many physical problems

Computers and Health

- Workspace Design
  - Proper placement and adjustment of all furniture and equipment
    - Desk and chair
    - Keyboard and monitor
    - Workplace lighting or glare
  - Using good workspace design principles can help avoid physical problems
    - Contributes to fewer employee absences, higher productivity, and lower insurance costs

Computers and Health

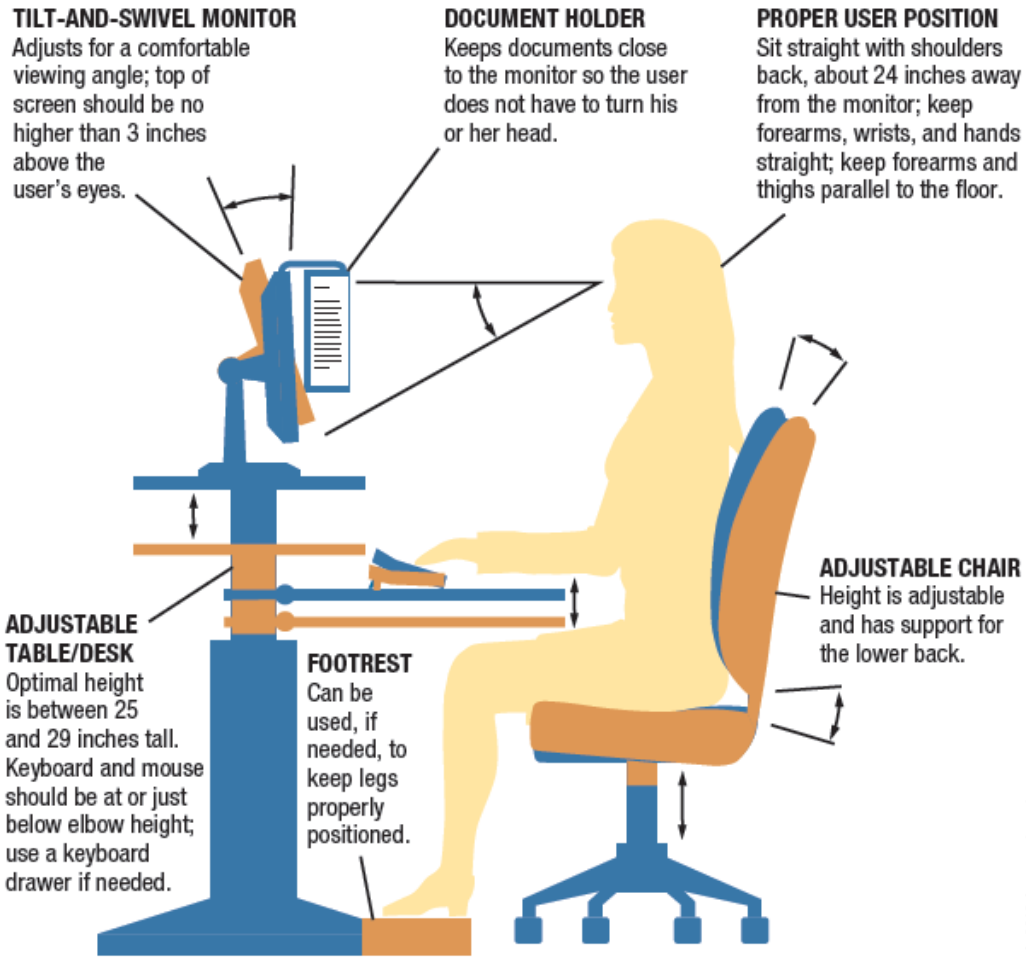


FIGURE 7-2
Workspace design. Shown here are some guidelines for designing an ergonomic workspace.

Computers and Health

- Using good workspace design principles is more difficult with portable computers and mobile devices
  - Attach and use separate mice and keyboards when possible
  - Use docking stations or notebook stands with portable computers
    - » Docking stations connect computers to permanent hardware, such as a keyboards, mice, monitors, etc.
    - » Notebook stand raises a notebook up to a better height

Computers and Health

FIGURE 7-3
Docking stations and notebook stands.

DOCKING STATIONS
Contain a variety of ports; when the portable computer is connected to the docking station, the devices attached to these ports can be used.

NOTEBOOK STANDS
Elevate a notebook's display screen; if the notebook stand does not contain USB ports, devices will connect directly to the notebook stand.

Computers and Health

OCCASIONAL USERS	FULL-TIME USERS
Sit with the computer on a table and position it for comfortable wrist posture. If no table is available, use a laptop desk or notebook cooling stand to protect your legs from the computer's heat.	Sit with the computer on a desk or table and position it for comfortable wrist posture if you won't be using a separate keyboard and mouse.
Adjust the screen to a comfortable position, so you can see the screen as straight on as possible. If you have a portable notebook stand, use it to elevate the display screen for easier viewing.	Elevate the computer so the screen is at the proper height, or connect the computer to a stand-alone monitor instead of using the computer's built-in display; consider using a docking station or notebook stand.
Bring a travel keyboard and mouse to use with the computer, whenever possible.	Use a separate keyboard and mouse, either attached directly to the computer or to a docking station or notebook stand.
When purchasing a portable computer, pay close attention to the total weight of the system (computer, power supply, additional hardware, etc.) if you will be using the computer primarily while traveling; purchase a lightweight system to avoid neck and shoulder injuries when carrying the computer from one location to another.	When purchasing a portable computer, pay close attention to the size and clarity of the monitor, unless you will be using a separate stand-alone monitor, and pay close attention to the keyboard design, unless you will be using a separate keyboard.

FIGURE 7-4
Ergonomic tips for portable computer users.

Computers and Health

- Ergonomic Hardware
  - A variety of devices available that are designed to avoid physical problems due to the use of a computer
    - Ergonomic keyboards and trackballs
    - Document holders
    - Antiglare screens
    - Keyboard drawers
    - Wrist supports
    - Computer gloves

Computers and Health

FIGURE 7-5

Ergonomic hardware.

DOCUMENT HOLDERS

TRACKBALLS

ERGONOMIC KEYBOARDS

ANTIGLARE SCREENS

KEYBOARD DRAWERS

WRIST SUPPORTS

COMPUTER GLOVES

Courtesy of Kensington Computer Products Group; Courtesy Kinesis Corporation; Courtesy of Brown Medical Industries, Inc.

Computers and Health

- Good User Habits and Precautions
  - Finger and wrist exercises
  - Frequent breaks in typing
  - Good posture
  - Relaxation or stress breaks
  - Rotate tasks
  - Close curtains and blinds to reduce glare
  - Computer glasses to combat eyestrain

Computers and Health

CONDITION	PREVENTION
Wrist/arm/hand soreness and injury	➤ Use a light touch on the keyboard. ➤ Rest and gently stretch your fingers and arms every 15 minutes or so. ➤ Keep your wrists and arms relaxed and parallel to the floor when using the keyboard. ➤ When using a device with a small keyboard, type short messages, take frequent breaks, and use a separate keyboard whenever possible. ➤ Use an ergonomic keyboard, ergonomic mouse, computer gloves, and other ergonomic devices if you begin to notice wrist or hand soreness.
Eyestrain	➤ Cover windows or adjust lighting to eliminate glare. ➤ Concentrate on blinking your eyes more often. ➤ Rest your eyes every 15 minutes or so by focusing on an object in the distance (at least 20 feet away) for one minute and then closing your eyes for an additional minute. ➤ Make sure your monitor's brightness and contrast settings are at an appropriate level. ➤ Use a larger text size or lower screen resolution, if needed. You should be able to read what is displayed on your monitor from three times the distance at which you normally sit.
Sore or stiff neck	➤ Use good posture. ➤ Place the monitor and any documents you need to refer to while using your computer directly in front of you. Use a document holder if possible. ➤ Adjust your monitor to a comfortable viewing angle with the top of the screen no higher than 3 inches above your eyes. ➤ Use a telephone headset if you spend a significant amount of time each day on the telephone.

FIGURE 7-6
Good user habits. These preventative measures can help avoid discomfort while working on a computer.

Computers and Health

CONDITION	PREVENTION
Backache; general fatigue	➤ Use good posture and adjust your chair to support your lower back; use an ergonomic chair, if needed. ➤ Use a footrest, if needed, to keep your feet flat on the floor. ➤ Walk around or stretch briefly at least once every hour. ➤ Alternate activities frequently. ➤ When traveling with a computer, bring a lightweight notebook or netbook computer and carry only the essentials with you.
Ringing in the ears; hearing loss	➤ Turn down the volume when using headphones (you should be able to hear other people's voices). ➤ Wear over-the-ear-headphones instead of earbuds. ➤ Limit the amount of time you use headphones or earbuds. ➤ Use external speakers instead of headphones when possible.
Leg discomfort or burns	➤ Use a laptop desk, cooling stand, or other barrier between a portable computer and your legs when using a computer on your lap.

FIGURE 7-6
Good user habits. These preventative measures can help avoid discomfort while working on a computer.

Computers and Health

- Emotional Health
  - Stress of Ever-Changing Technology
    - Many jobs require computer use now that didn't in the past
    - Workers must continually learn new skills to keep up to date

FIGURE 7-7
Many jobs require computer use today.

Computers and Health

- Impact of our 24/7 Society
  - People may feel they are "on call" all the time
    - Cannot get away from work
    - Difficult to relax
    - No distinction between work time and personal time

FIGURE 7-8
Our 24/7 society.

Computers and Health

- Information Overload
  - Use good Internet search techniques
  - Efficiently manage incoming email
    - Delete emails that won't be read
    - Use email filters
    - Open email messages only a limited number of times daily
    - Flag important messages

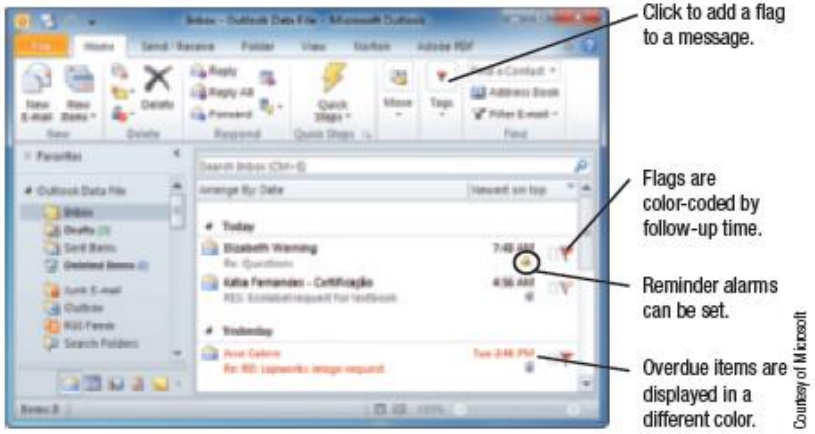


FIGURE 7-9
Outlook reminder flags can help you organize your Inbox.

Computers and Health

- Burnout
  - A state of fatigue or frustration brought on by overwork
    - Reevaluate schedule, priorities, and lifestyle
    - Take a break or get away for a day
    - Say no to additional commitments
    - Eat properly and exercise regularly
- Internet and Technology Addiction
  - The problem of overusing, or being unable to stop using, a computer or the Internet
  - Includes compulsive use of Internet, a preoccupation with being online, lying about or hiding Internet activities, and inability to control the behavior

Computers and Health

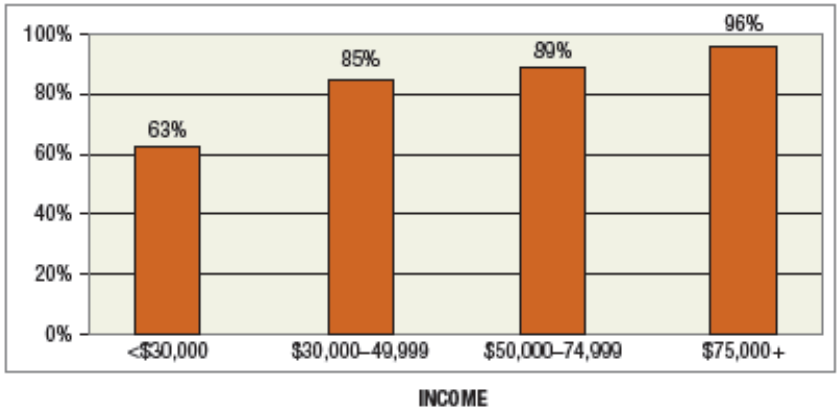
- Considered a serious disorder
- Effects anyone of any age, race, or social class
- Includes addiction to emailing or text messaging, social networking, online gaming, online shopping
- Can result in loss of relationships, job loss, academic failure, health problems, financial consequences, child custody, suicide, and more
- Growing problem in worldwide
- Can be treated similarly to other addictions

Access to Technology

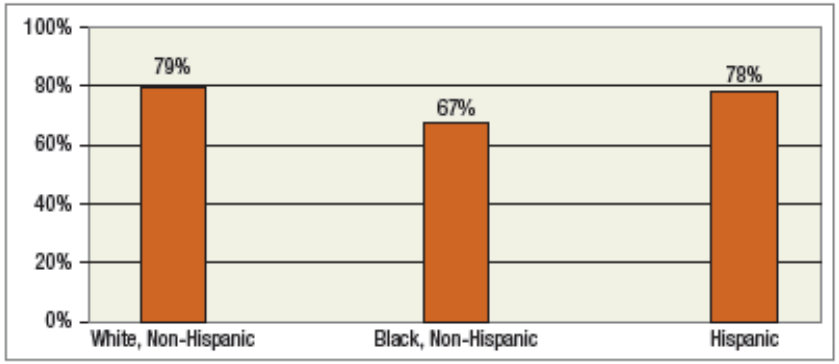
- The Digital Divide
  - The gap between those who have access to technology and those who don't
  - Can have a digital divide within a country, as well as between countries
  - U.S. Digital Divide
    - Indications are that the divide continues to shrink
    - 80% of US population are Internet users
    - Important to ensure all citizens have an equal chance to be successful in this country
    - Some people choose not to use computers or go online

Access to Technology

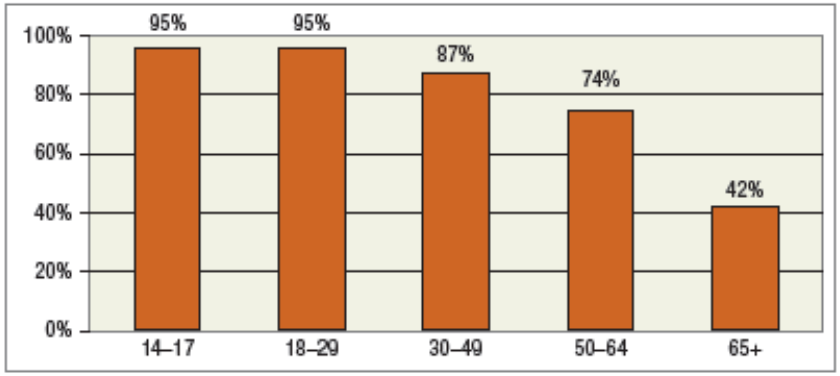
FIGURE 7-11
Key U.S. Internet use statistics. Shows the percent of individuals in each category who use the Internet.



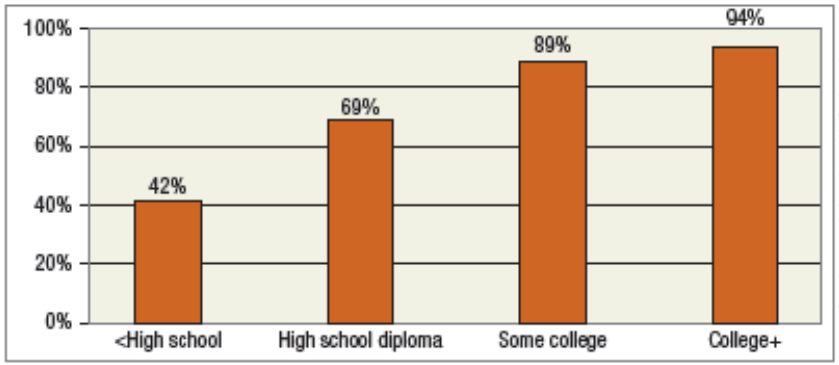
INCOME



RACE



AGE



HIGHEST LEVEL OF EDUCATION OBTAINED

Source: Pew Internet & American Life Project; © 2013 Cengage Learning

Access to Technology

- Global Digital Divide
  - Some countries have access to technology and others do not have the same access
  - Perhaps more dramatic than the U.S. digital divide
    - Only 30% of the world's population is online
    - North America has highest number of Internet users
    - Africa has one of the lowest rates of Internet use
  - Technology can provide telemedicine and education to remote areas

Access to Technology

- New projects are emerging that may help to reduce the global digital divide
  - Variety of wireless internet projects to bring wireless Internet to remote areas
  - One Laptop Per Child (OLPC) program (XO laptop)

FIGURE 7-12
The OLPC XO laptop.

Access to Technology

- Assistive Technology
  - Hardware and software designed for use by individuals with physical disabilities
  - Access has improved due to Section 508 of the Rehabilitation Act and the Americans with Disabilities Act
  - Assistive Input Systems
    - Braille keyboards, keyguards, one-handed keyboards
    - Switches, foot controlled mice, head pointing systems, eye tracking systems
    - Can also be used by general population as desired

Access to Technology

Courtesy of Hoikon Corporation

BRAILLE KEYBOARDS
The keys on this keyboard contain Braille overlays.

Courtesy of Matias Corporation

ONE-HANDED KEYBOARDS
Each key on this half keyboard contains two letters (one set for the keys typically on the right half of the keyboard and one set for the keys typically on the left half) so all keys can be reached with one hand.

Courtesy of Prentke Romich Company

EYE TRACKING SYSTEMS
Cameras track the user's eye movements, which are used to select icons and other objects on the screen.

FIGURE 7-13
Assistive input devices.

Access to Technology

- Assistive Output Systems
  - Screen readers
  - Braille displays
  - Braille printers
  - Windows and Mac OS include a screen reader, on-screen keyboard, speech recognition capabilities, and setting that magnify the scree, change text size and color, etc.

Access to Technology

SCREEN READER SOFTWARE

BRAILLE DISPLAYS

BRAILLE PRINTERS

FIGURE 7-14
Assistive output devices.

Environmental Concerns

- Green Computing
  - The use of computers in an environmentally friendly manner
  - Energy consumption and heat are key concerns today
    - Energy Star Program
      - Volunteer labeling program that identifies and promotes energy-saving devices
      - Developed in 1992
    - Eco-labels
      - Environmental performance certifications

Environmental Concerns

U.S. Environmental Protection Agency, ENERGY STAR program; Courtesy of the European Commission Directorate-General Courtesy of Korea Environmental Labeling Association (KELA); Courtesy of ABNT - ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS; Courtesy Good Environmental Choice Australia

FIGURE 7-15

Eco-labels.

Environmental Concerns

- Energy Consumption and Conservation
  - Power consumption and heat generation by computers are key concerns
  - Today's computers are faster and more powerful and use more energy and run hotter than earlier computers
  - Ways to save energy include
    - Consolidating servers
    - Powering down computers when not in use
    - Using desktop virtualization
    - Utilizing cloud computing

Environmental Concerns

- Energy-saving features
  - Devices that can go into very low-power sleep mode when not in use
  - Low-power consumptive chips and boards
  - High-efficiency power supplies
  - Energy-efficient flat-panel displays
  - Liquid cooling systems
  - CPUs that power up and down on demand
- Energy vampires
  - Devices that use power even when turned off

Environmental Concerns

Courtesy of P3 International Corporation

FIGURE 7-16

Energy usage monitors. This monitor displays in real time the amount of electricity (in kilowatt-hours or approximate cost) a connected device is using.

Environmental Concerns

- Alternate Power
  - Solar power
    - Solar panels
  - Portable fuel cells chargers

SOLAR-POWERED CHARGERS

Courtesy of CrossTac Corporation

HAND-POWERED CHARGERS

SOLAR COMPUTER BAGS

Environmental Concerns

- Green Components
  - Computers today are using more recyclable hardware and packaging
  - Use of toxic chemicals also being reduced
    - Cadmium and mercury are banned
  - Mobile phones are also going green
    - Made out of recyclable plastics

Summary

- Computers and Health
- Access to Technology
- Environmental Concerns