ERGONOMICS

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- Ergonomics (European) and Human Factors (US) are the same disciplines.
- Ergonomics came from ‘ergon’ or ‘ergos’ (Greek word for work) and ‘nomos’ or ‘nomikos’ (Greek word for laws).
- Ergonomics is the “science of work”
- Ergonomics is multidisciplinary and uses multiple methods.
- Ergonomics is user focused
- **If it doesn’t affect design in some way, it isn’t ergonomics.**

WHAT IS ERGONOMICS?

- **Ergonomics is the scientific study** of how people interact effectively with products, equipment, facilities, procedures and environments used at work and in everyday living.
- **Ergonomics seeks to match the design of machines**, jobs and workplaces with the capabilities, limitations and needs of people.
- **Ergonomics seeks to maximize ease of use** and optimize operator productivity, comfort and health.

DEFINITION

- Ergonomics is defined as the scientific study of the **man-machine-working environment relationship** and the application of anatomical, physiological, and psychological principles to solve the problems arising from the relationship.

- Ergonomics is related to the comfort between the man and machine while operating the machine.

- The objective of ergonomics is to make the machine fit for the user rather than to make the user adapt himself or herself to the machine.

SIX PILLARS OF ERGONOMIC DESIGN

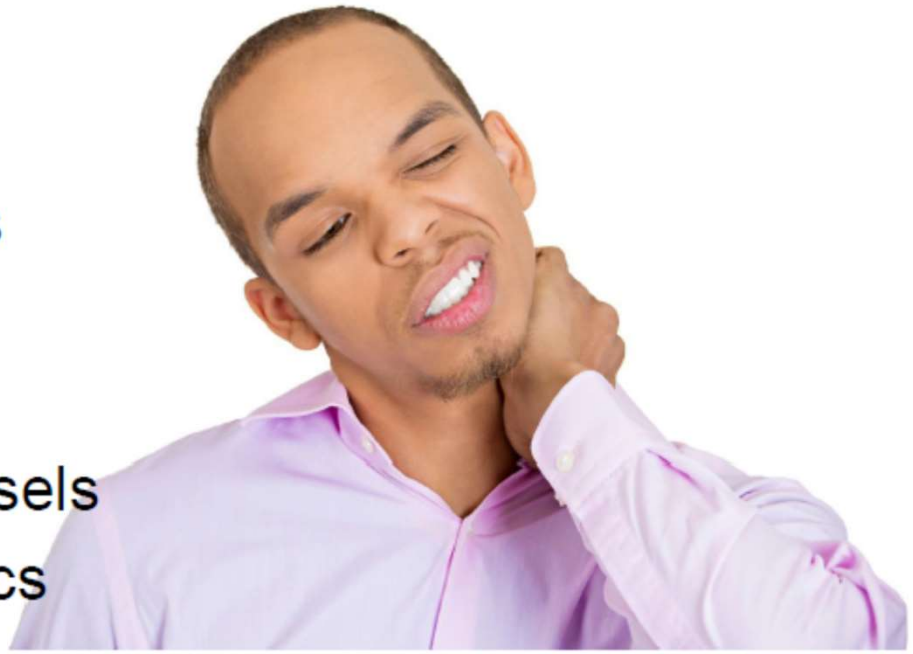
1. ***User Orientation:*** Design and application of tools, procedures, and systems must be user-oriented, rather than just "task" oriented
2. ***Diversity:*** Recognition of diversity in human capabilities and limitations, rather than "stereotyping" workers/users
3. ***Effect on Humans:*** Tools, procedures, and systems are not "inert", but do influence human behaviour and well-being

4. ***Objective Data:*** Empirical information and evaluation is key in design process, rather than just use of "common sense"
5. ***Scientific Method:*** test and retest hypothesis with real data, rather than "anecdotal" evidence or "good estimates"
6. ***Systems:*** object, procedures, environments, and people are interconnected, affect one another, and do not exist in "isolation"

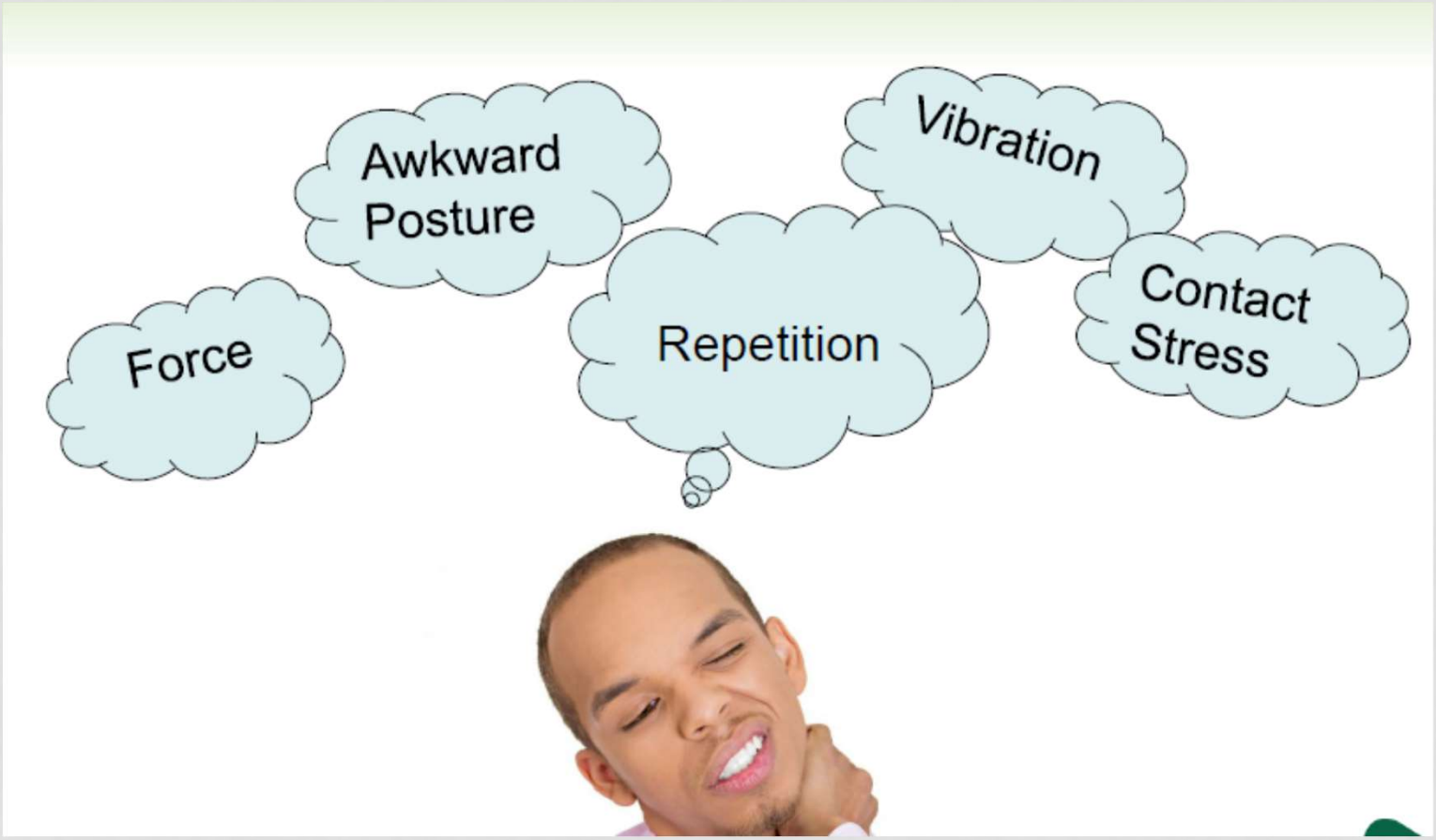
WHAT ARE ERGONOMIC CONDITIONS?

Disorders of the soft tissue – specifically:

- Muscles
- Nerves
- Tendons
- Ligaments
- Joints
- Cartilage
- Blood vessels
- Spinal discs

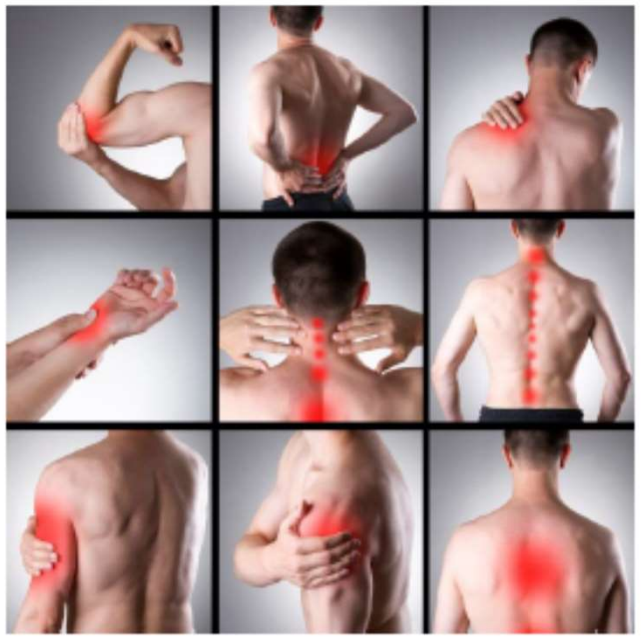


POSSIBLE CAUSES



Common ergonomic symptoms include:

- Pain
- Swelling
- Tingling
- Tenderness or numbness
- Sometimes difficulty moving or using the extremity



ERGONOMIC RISK FACTORS

Environment -

Risks found in your work environment

Equipment -

Risks associated with the equipment you use

Risks caused by work requirements, processes or procedures

Individual –

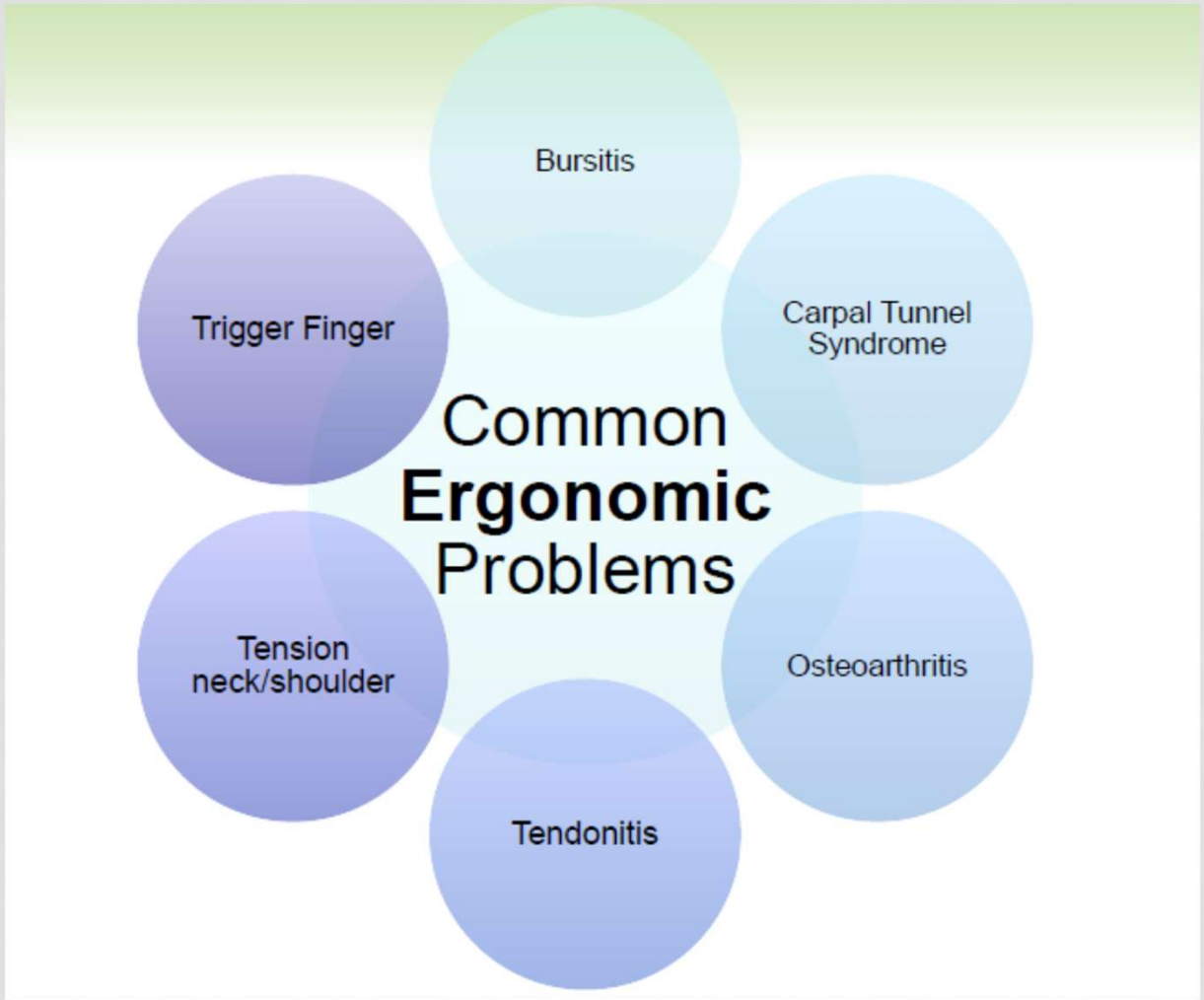
Risks that are unique to you as an individual, such as physical characteristics, habits and behavior

REPETITIVE MOVEMENT

Non-strenuous or strenuous repetitive movement can cause ergonomic conditions.

Some conditions can be brought on by:

- Sudden increases in your workload
- Introduction of a new process to your work routine
- Use of vibrating tools
- Maintaining a rigid posture


Bursitis
Trigger Finger
Carpal Tunnel Syndrome
Common
Ergonomic
Problems
Tension neck/shoulder
Osteoarthritis
Tendonitis

- **Bursitis**- **a painful condition that affects the small, fluid-filled sacs — called bursae (bur-SEE) — that cushion the bones, tendons and muscles near your joints**
- **Trigger Finger-** Trigger finger is **a condition in which one of your fingers gets stuck in a bent position**.
- Tendonitis - is **inflammation or irritation of a tendon**
- **Carpel Tunnel syndrome-** Carpal tunnel syndrome is **caused by pressure on the median nerve**. The carpal tunnel is a narrow passageway surrounded by bones and ligaments on the palm side of the hand.
- **Osteoarthritis**- Osteoarthritis is **the most common form of arthritis**

ERGONOMIC SOLUTIONS

Help minimize & possibly eliminate ergonomic risk factors:

- ✓ Talk with your supervisor about what to do if you are experiencing pain in the soft tissues
- ✓ Talk with ergonomic experts to identify what is causing your pain and to find a solution
- ✓ Reduce the pace of work, alternating repetitive tasks with non-repetitive tasks at regular intervals
- ✓ Increase the number of breaks from repetitive work

Taking appropriate steps means you will experience fewer injuries and fewer lost work days.

ERGONOMICS – PHYSICAL DESIGN

- Who are the users?
- How does technology fit different user dimensions?
- How does technology fit user anatomy?
- How does technology fit user strength?
- How does technology fit different user abilities?
- How safe is the technology (health, comfort, performance)?
- How do users interact with technology?

ERGONOMICS – COGNITIVE DESIGN

- How do users expect the technology to work?
- How is information displayed?
- How well are stereotypical expectations met?
- How complex is the interface?
- How much training is required?
- What user knowledge assumptions are met?
- How does information facilitate learning and memory?

ERGONOMICS - LAYOUT

- Are the work items optimally positioned in terms of comfort, convenience, and frequency of use?
- How well does the layout support the work flow?
- Who can be accommodated by the layout?
- How flexible is the layout when work content changes?

ERGONOMICS - AMBIENT CONDITIONS

- Physical environment conditions at work
- What are the prevailing climate conditions that could effect the work (thermal, luminous, acoustic, vibration, air quality, electromagnetic field)
- What are the exposures?
- What protection is required?

ERGONOMICS – WORK CONTENT

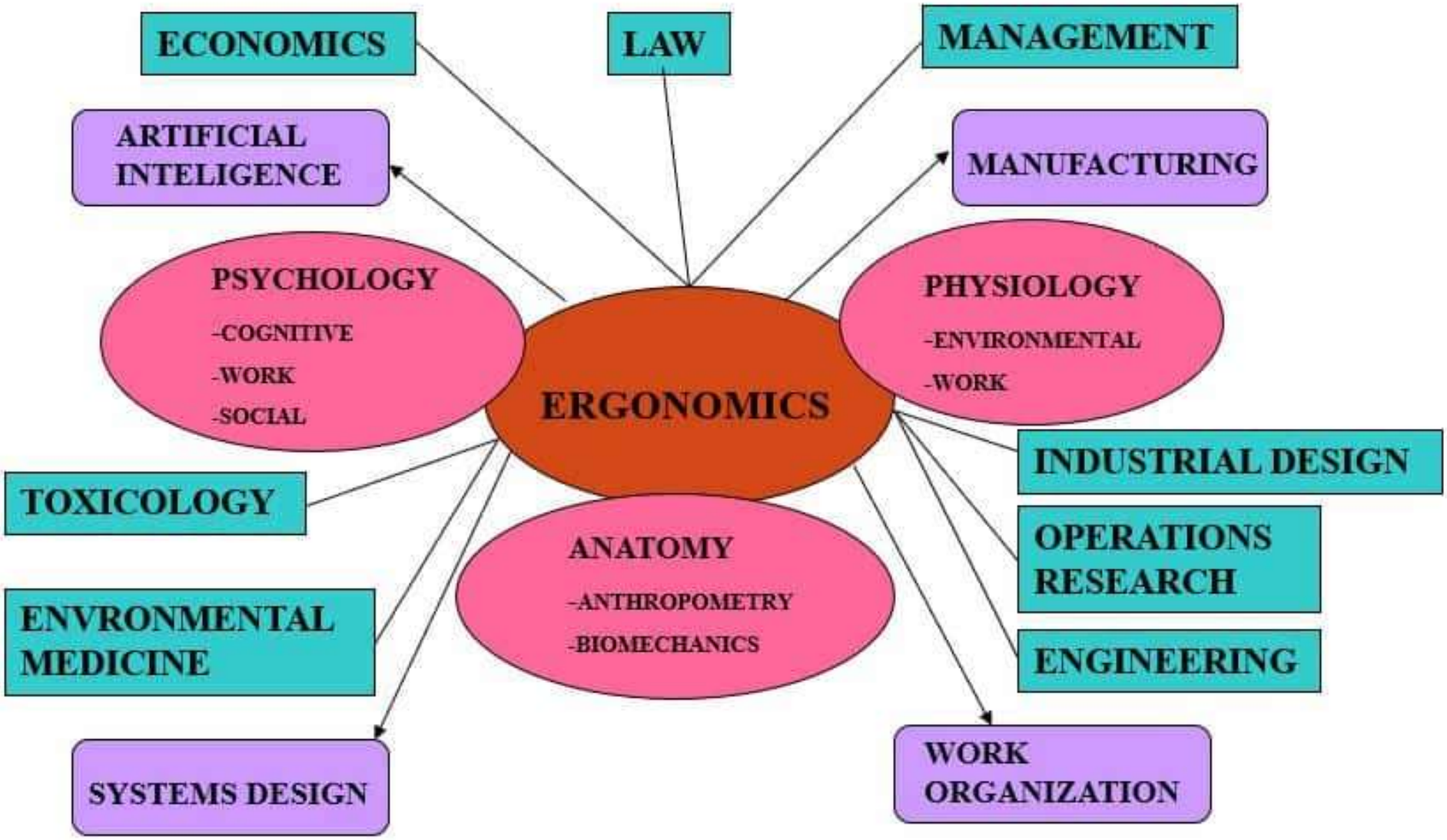
- Job design selection and training
- What are the work patterns (shifts etc.)
- What are the work tasks?
- What are the required skills (Physical, Cognitive, Social)?
- What are the training needs?

SOME CASES

- I) For assembly jobs, material should be placed in a position such that the worker's strongest muscles do most of the work.
  ii) For detailed work which involves close inspection of the materials, the workbench should be lower than for heavy work.
  iii) Hand tools that cause discomfort or injury should be modified or replaced. Workers are often the best source of ideas on ways to improve a tool to make using it more comfortable. For example, pliers can be either straight or bent, depending on the need.
  iv) A task should not require workers to stay in awkward positions, such as reaching, bending, or hunching over for long periods.

- v) Workers need to be trained in proper lifting techniques. A well-designed job should minimize how far and how often workers have to lift.
  vi) Standing work should be minimized since it is often less tiring to do a job sitting than standing.
  vii) Job assignments should be rotated to minimize the amount of time a worker spends doing a highly repetitive task since repetitive work requires using the same muscles again and again and is usually very boring.
  viii) Workers and equipment should be positioned so that workers can perform their jobs with their upper arms at their sides and with their wrists straight.

DISCIPLINES IN ERGONOMICS



WHAT IS GOOD POSTURE?

UCDAVIS
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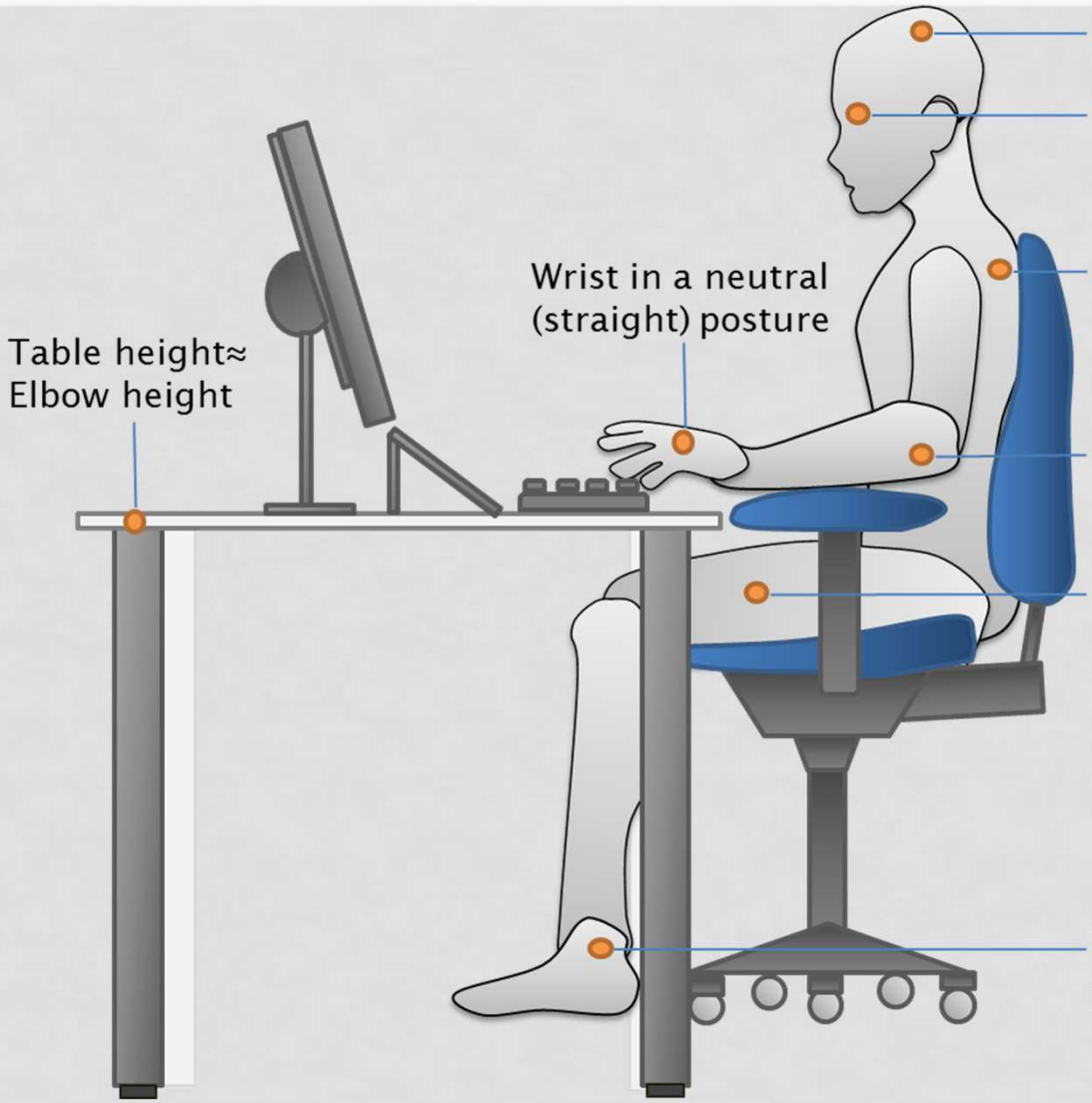
HEALTH SERVICES



Head upright and over your shoulders

Eyes looking slight downward without bending from the neck

Backrest should support the natural curve of the lower back

Elbows bent at 90˚, forearms horizontal
Shoulders should be relaxed, not raised

Thighs horizontal with a 90˚-110˚ angle at the hip

Feet supported and flat on the floor
If this isn't possible, then feet should be fully supported by a foot rest