

Introduction to

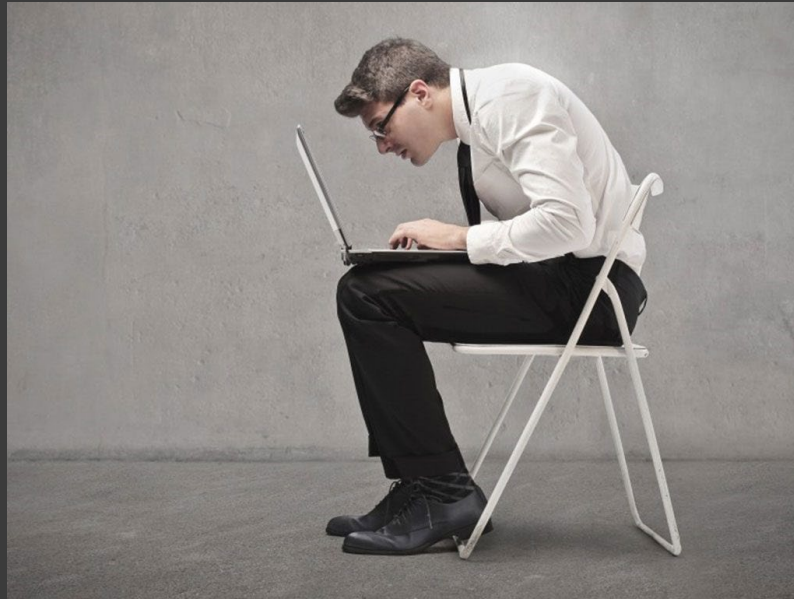
SITTING & ERGONOMICS

List of Topics

- History of Ergonomics
- Sitting –what is it really?
- Sitting in nature
- Sitting – evolution of a behaviour,
- Chairs – design and function
- Revolution without Evolution
- Sitting today – quality and quantity
- Introduction to the work station

History of Ergonomics

The history of ergonomics is determined by the definition attributed to ergonomics

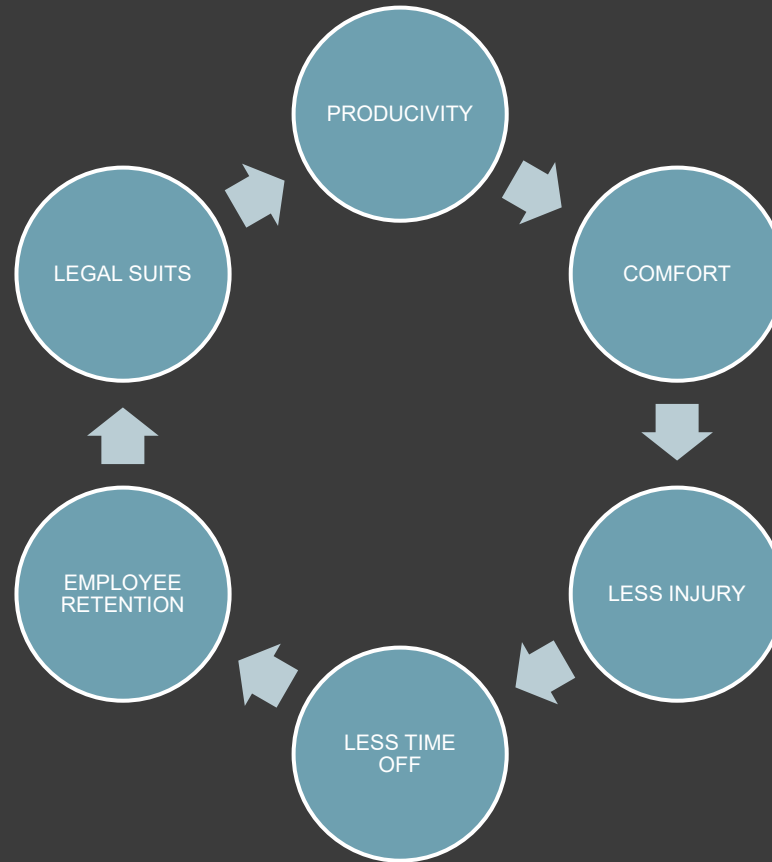


Once we had the ability as a species to work with tools we also started refining the quality of tools



Ergonomics emerged as a scientific discipline in the 1940s as a consequence of the growing realisation that, as technical equipment became increasingly complex, not all of the expected benefits would be delivered if people were unable to understand and use the equipment to its full potential.

The single underlying drive for improved ergonomics at work = PROFIT



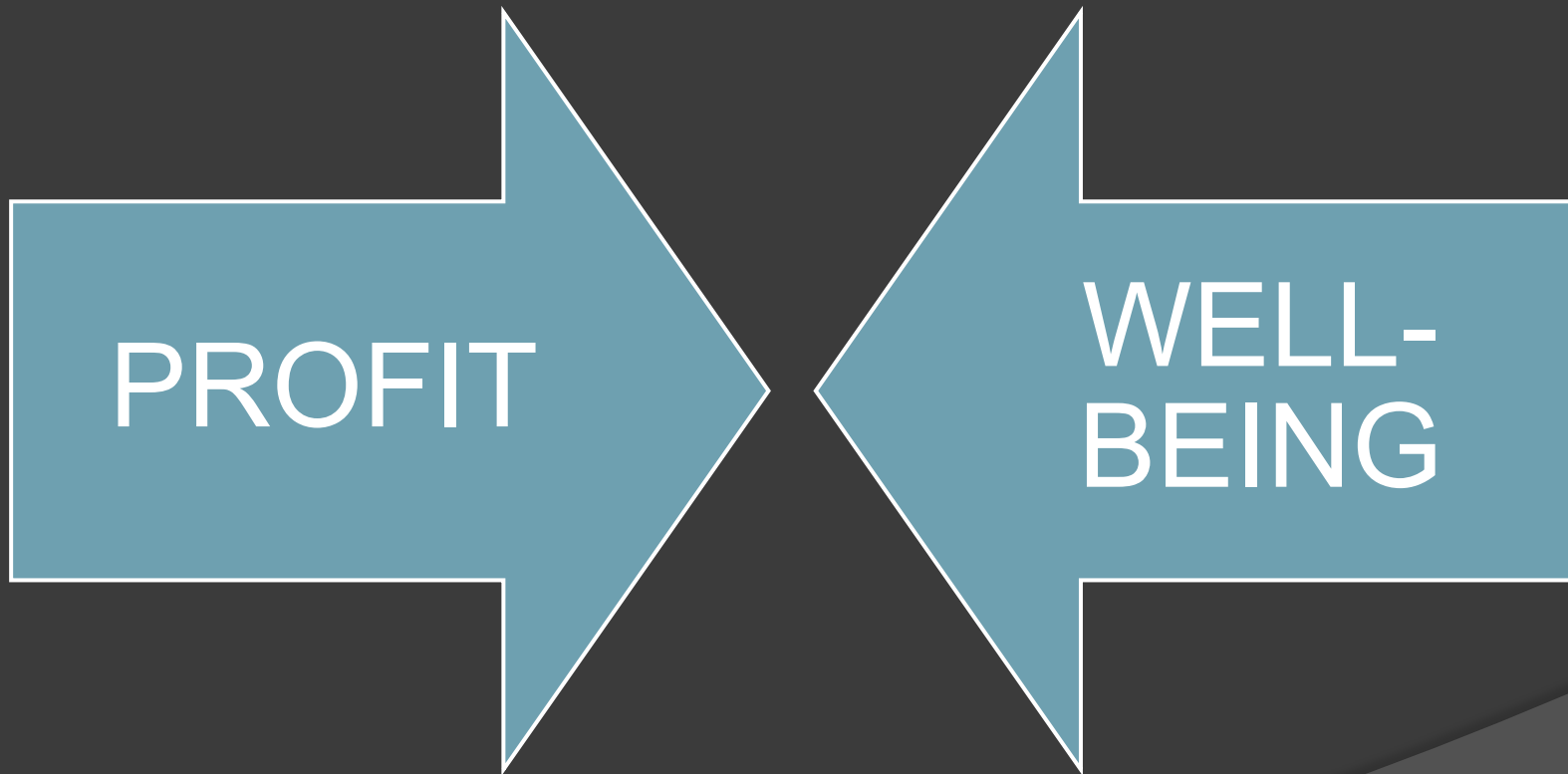
More history

- Wojciech Jastrzebowski created the word ergonomics in 1857 in a philosophical narrative, “based upon the truths drawn from the Science of Nature” (Jastrzebowski, 1857).
- the word "ergonomics" was coined from its Greek roots meaning work (ergon) and principal or law (nomos) ?origin
- Refer to <https://ergoweb.com/revisiting-the-roots-of-ergonomics/>

Ergonomics vs Human Factors

In the USA the term human factors took on the same meaning as ergonomics in the UK. Although the two terms have been and remain synonymous to professionals, popular usage has recently accorded different shades of meaning to the terms. As a consequence, human factors may be considered to imply the cognitive areas of the discipline (perception, memory etc) whereas ergonomics may be used more specifically to refer to the physical aspects (workplace layout, light, heat, noise etc). In 2009, following a vote by the membership and approval from Companies House, the ES was renamed the Institute of Ergonomics and Human Factors (IEHF) to reflect the popular usage of both terms and to emphasise the breadth of the discipline.

THE TWO DRIVERS IN OFFICE ERGONOMICS



Sitting – what is it really?

For being the main position adopted in our daily life we surely don't give it much thought

What defines sitting? A hen sits too



The Latin root word **sid** and its variant **sed** both mean “sit.” These roots are the word origin of many English vocabulary words, including **sedative**, **sediment**, **president**, and **reside**. For instance, a **residence** is a place where its residents are able to “sit” back; a **sedentary** person likes to “sit” around a lot instead of being active. (<https://membean.com/rootcasts/sid-sit>)

In Brief – to sit is to stay put... no other specifics!

Types of sitting

Sitting based on furniture e.g
sitting on a chair
sitting at a desk

Sitting defined by task:

sitting to dine,
sitting to rest
sitting to work
sitting to socialise etc

Sitting in nature

Sitting is very common in all the animal kingdom

Resting position

Energy efficient

Balance efficient

Less mental strain

Less pronounced

Less risk of injury



Sitting – evolution of a behaviour,

Think of the past farmers, hunters etc,
think of 'why' they sat and 'how' they sat.

We have gone from a being that sits in
between activity to being active in between
sitting.

Revolution without evolution

- ⦿ First Revolution – Industrial (1760-1840)
 - ⦿ Second Revolution – science/electricity / mass production (1870 – 1914)
 - ⦿ Third Revolution – Technological / electronics/ digital (1950 – 2020)
 - 1947–1969: Origins
 - 1969–1989: Invention of the Internet, rise of home computers
 - 1989–2005: Invention of the World Wide Web
 - 2005–present: Web 2.0, social media, smartphones, digital TV
 - ⦿ Fourth Revolution – A.I. enhanced (2020)
-
- ⦿ Where does our physical body fit in all this?
 - ⦿ Less and Less Physical awareness

How much do we sit?

It is now believed that the average office worker sits from 9-13 hours per day

What reasons could contribute to this gradual increase / shift in behaviour?

By understanding why we sit so much we also start to understand the importance of sitting well.

Sitting today – quality & quantity

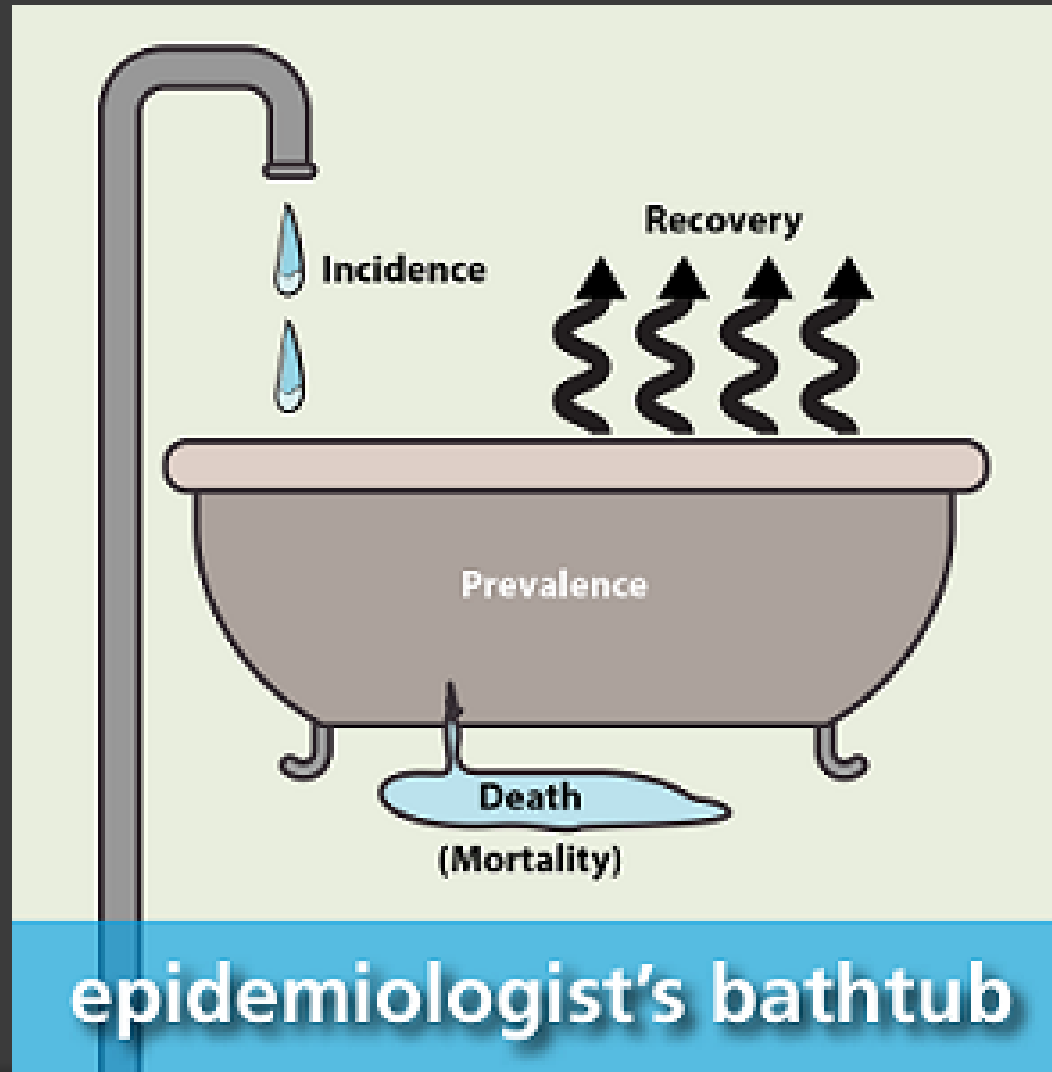
Other than work, what are the activities that require sitting?

Why do you think we sit so poorly?

Why is all this important?

- ① **Epidemiology:** the study of the distribution (frequency, pattern) and determinants (causes, risk factors) of health related states in specific populations.
- ② **Prevalence:** the number of individuals with the disease/condition either at a specific point in time (the point prevalence) or over a specified time period (the period prevalence). The key concept about the prevalence is that it includes both new and existing cases of disease
- ③ **Incidence:** the number of new cases during a specified time period.

Epidemiology explained



Epidemiology of poor sitting

- Bhanderi, D., Choudhary, S., Parmar, L., & Doshi, V. (2008). **A study of occurrence of musculoskeletal discomfort in computer operators.** *Indian journal of community medicine : official publication of Indian Association of Preventive & Social Medicine*, 33(1), 65–66. <https://doi.org/10.4103/0970-0218.39252>
- Key points:
 - 419 individuals using computers were studied

Musculoskeletal discomfort (MSD) was considered when one or more of the following symptoms were reported by the respondents: neck or shoulder stiffness; neck or shoulder pain; tingling/numbness in hands, thumbs or fingers during work or many hours after stopping work; hand and wrist pain; backache; headache; leg cramps; leg stiffness; numbness in ankles and feet; swelling in ankles and feet; reduction in strength of hand and difficulty in grasping objects.

- **Overall prevalence of any MSD was 75.2% (315/ 419).**

Daneshmandi, H., Choobineh, A., Ghaem, H., & Karimi, M. (2017). **Adverse Effects of Prolonged Sitting Behavior on the General Health of Office Workers.** *Journal of lifestyle medicine*, 7(2), 69–75. <https://doi.org/10.15280/jlm.2017.7.2.69>

Key points:

Study Aim: to survey the prevalence of sitting behaviour and its adverse effects among Iranian office workers.

Methods: 447 Iranian workers assessed via questionnaire

Results: Participants spent an average of 6.29 hours of an 8-hour working shift in a sitting position.

The results showed that 48.8% of the participants did not feel comfortable with their workstations and 73.6% felt exhausted during the workday.

Additionally, 6.3% suffered from hypertension, and 11.2% of them reported hyperlipidemia. The results of the NMQ showed that neck (53.5%), lower back (53.2%) and shoulder (51.6%) symptoms were the most prevalent problem among office workers.

Shikdar, A. A., & Al-Kindi, M. A. (2007). **Office ergonomics: deficiencies in computer workstation design.** *International journal of occupational safety and ergonomics : JOSE*, 13(2), 215–223. <https://doi.org/10.1080/10803548.2007.11076722>

Key Points:

Aim of the Study: to study and identify ergonomic deficiencies in computer workstation design in typical offices

Methods: Physical measurements and a questionnaire were used to study 40 workstations.

Results: Forty-five% of the employees used nonadjustable chairs, 48% of computers faced windows, 90% of the employees used computers more than 4 hrs/day, 45% of the employees adopted bent and unsupported back postures, and 20% used office tables for computers.

Major problems reported were eyestrain (58%), shoulder pain (45%), back pain (43%), arm pain (35%), wrist pain (30%), and neck pain (30%).

Baker, R., Coenen, P., Howie, E., Williamson, A., & Straker, L. (2018). **The Short Term Musculoskeletal and Cognitive Effects of Prolonged Sitting During Office Computer Work.** *International journal of environmental research and public health*, 15(8), 1678.

<https://doi.org/10.3390/ijerph15081678>

Key Points:

Aim of Study: to investigate changes in discomfort and cognitive function (sustained attention and problem solving), along with muscle fatigue, movement and mental state following a period of two hours of sitting-based laboratory computer work.

Results: Over time, discomfort increased in all body areas (total body IRR [95% confidence interval]: reaching clinically meaningful levels in the low back and hip/thigh/buttock areas. Creative problem solving errors increased ($\beta = 0.25$ [0.03–1.47]) while sustained attention did not change

Baker, R., Coenen, P., Howie, E., Lee, J., Williamson, A., & Straker, L. (2018). **A detailed description of the short-term musculoskeletal and cognitive effects of prolonged standing for office computer work.** *Ergonomics*, 61(7), 877–890.
<https://doi.org/10.1080/00140139.2017.1420825>

Aim of Study: to investigate changes in discomfort and cognitive function, along with muscle fatigue, movement, lower limb swelling and mental state during prolonged standing as an alternative to sitting.

Results: Over time, discomfort increased in all body areas (total body IRR [95% confidence interval]: 1.47[1.36-1.59]). Sustained attention reaction time ($\beta = 18.25[8.00-28.51]$) deteriorated, while creative problem solving improved ($\beta = 0.89[0.29-1.49]$).

The importance of technique



Technique allows you to do a task effectively/properly, repeatedly, efficiently and in a sustainable manner.

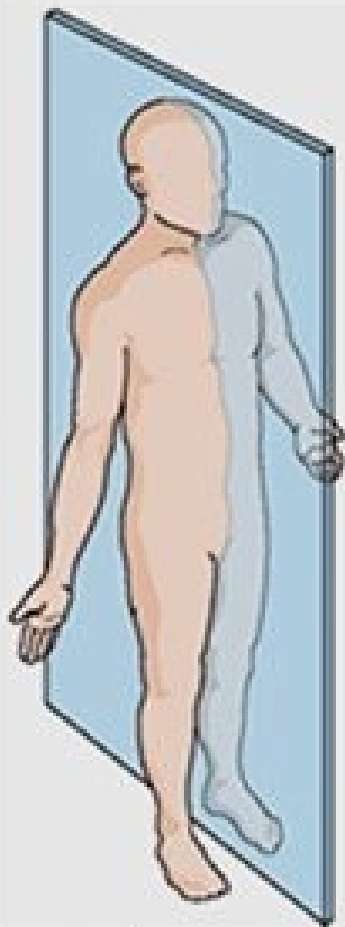
What is the technique for sitting?

No simple answer folks 😊 we have to be **concept** driven not **rules-bound**

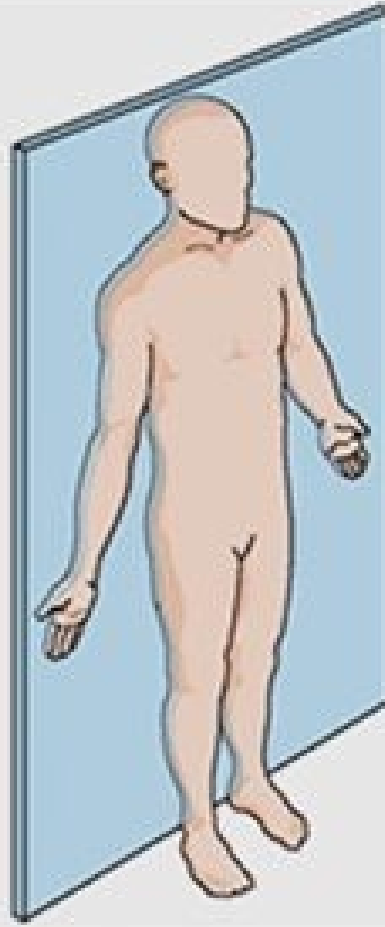
The best sitting posture is the one that satisfies the most criteria at a given moment.

However there are certain things to keep in mind.

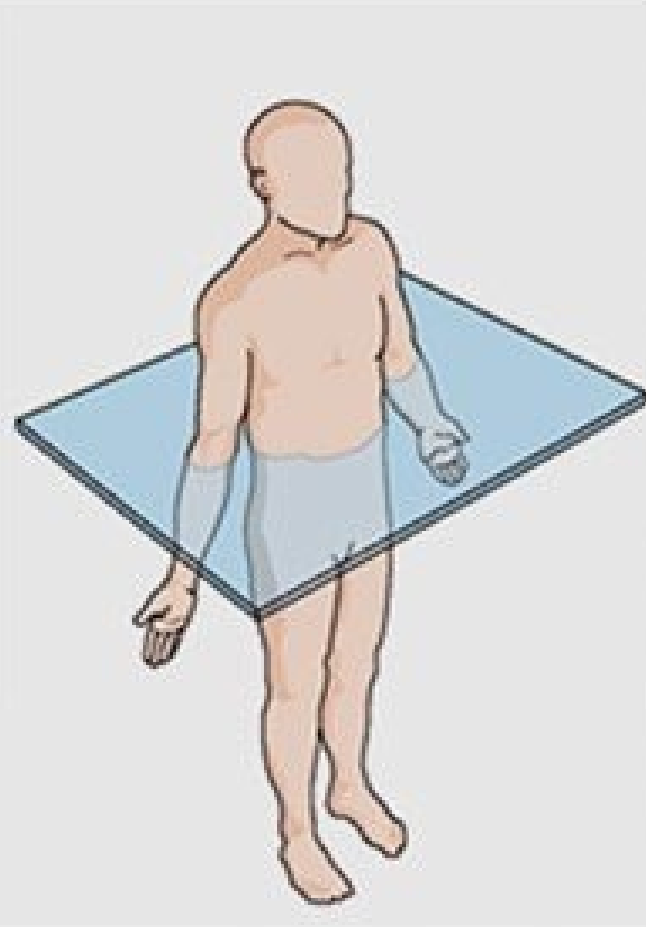
Terminology – planes of motion



Saggital Plane

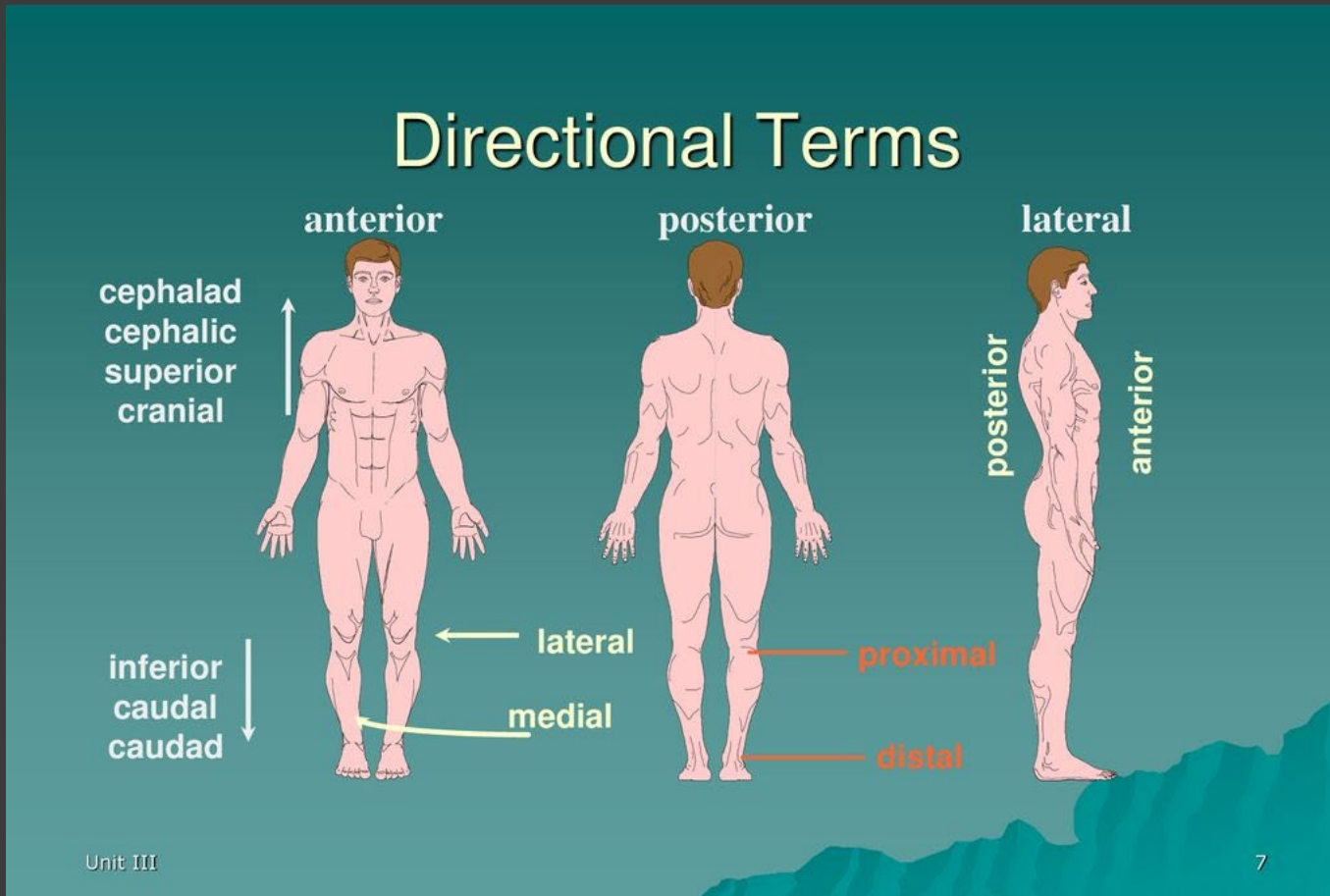


Frontal Plane



Horizontal Plane

Terminology – directional terms



What are the determinants of sitting?

1. Available equipment
2. The stature of the person
3. The task in question
4. The duration of the task
5. Any underlying pathologies
6. Level of engagement
7. Environmental Factors (light, sound, temperature, aesthetics of furniture)

Guidelines for prolonged sitting.

- Upper neck balanced over lower neck
- Lower neck balanced over thorax
- Lumbar spine in neutral
- Shoulder alignment
- Compromise on the hips and knees not on the spine
- Feet touching the ground taking some of the body's load and offering stability
- Equipment within reach (physical and visual)

The element of habit

- More in the lecture about psychology of sitting
- Habits require repetition
- Habits re-write what is considered 'second nature'
- Once a habit is formed it sustains itself



Chairs – design and function

The design of chairs has always been driven by form over function. Aesthetics over Biomechanics.

The evidence supporting good ergonomics is on the rise for 2 main reasons:

- human rights / legislation
- productivity / costs

* Ergonomics is an investment in assets not liabilities

Technology/ design is finally catching up with the evidence. What lags behind now is the general consensus of people buying chairs.

Comfortable chair according to Google



Introduction to the workstation

How many of you think that a workstation refers to the furniture ?



A workstation is a special **computer** designed for technical or scientific applications. Intended primarily to be used by a single user, they are commonly connected to a local area network and run multi-user operating systems. [Wikipedia](#)

Remote working – for how long?

- ⦿ Advantages of working from home?
 - No fixed setup
 - What else?
- ⦿ Disadvantages of not having the correct equipment
 - What can you think of?
- ⦿ Education helps more than products

Concept not product

The concept of ergonomics is to put the body into a sustainable and effective position from which to carry out a task,



End of Session 1

- ⦿ Any questions relevant to this lecture?
- ⦿ Any questions relevant to the course in general?
- ⦿ Thank you for your attention and see you next week for your second lecture
- ⦿ Any queries forward them to :
- ⦿ carlo@maxima-concept.net