Sitting: weight of the body is transferred to a supporting area

1. Main Contact points (seat)
   - Ischial tuberosities
   - Soft tissues

2. Secondary contact points (other)
   - Feet to floor/chair
   - Back to backrest (trunk)
   - Arms to armrest

What are the advantages of seated posture?

1. Provides stability for tasks that involve high visual & motor control
2. Less energy consuming than standing
3. ↓ stress on lower limb joints
4. ↓ hydrostatic pressure on the lower limb circulation
3 Seated Postures
1. Anterior
2. Middle
3. Posterior
• Reflects the task, chair & individual
• Based on COM of body location relative to the ischial tuberosities
• Affects the proportion of body weight transmitted to different support surfaces
• Affects/reflects lumbar spine curvature

1. Anterior Position
Forward leaning
Achieve position by either:
• Forward rotation of the pelvis & slight simultaneous flexion of the spine
• Flexion of the spine into slight kyphosis & simultaneous rotation of the pelvis
• Sit on a forward-sloping seat surface
COM in front of the ischial tuberosities
Legs supports > 25% of body weight

2. Middle Position
COM directly above the ischial tuberosities
Relaxed $\Rightarrow$ lumbar spine straight/slight kyphosis
Floor supports about 25% of TBW
• Spine in neutral position or, if relaxed, in slight kyphosis (round back)
3. Posterior Position

COM behind the ischial tuberosities
Legs supports < 25% of body weight
Achieve position by:
  • Backward rotation of the pelvis & simultaneous kyphosis of the spine
Back rest

3 Seated Postures

Posture selected/exhibited reflects:
  • Individual seating habits
  • Task demands
  • Height & inclination of chair seat
  • Presence of other types of support (arm rests, footrest)

Definitions of Sitting Anthropometric Dimensions

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sitting height</td>
<td>Vertical distance from the floor to the horizontal midplane of the back portion of the thigh while the seat is in contact with the seat, with the popliteal fold (knee) contact surface, with a knee flexion angle of 90°, and the side of the bare foot flat on the floor.</td>
</tr>
<tr>
<td>2. Elbow height</td>
<td>Vertical distance from the floor to the posterior tip of the olecranon when the arm is flexed to 90° at the elbow and the shoulder is in the 0° position. Can be measured from sitting height.</td>
</tr>
<tr>
<td>3. Thigh height</td>
<td>Vertical distance from the floor to the highest part of the thigh. Can be measured from sitting height.</td>
</tr>
<tr>
<td>4. Patellar height</td>
<td>Vertical distance from the floor to the superior tip of the patella.</td>
</tr>
<tr>
<td>5. Orbital (eye) height</td>
<td>Vertical distance from the floor to the orbit when sitting with the spine straight. Can be measured from sitting height.</td>
</tr>
<tr>
<td>6. Shoulder height</td>
<td>Vertical distance from the floor to the superior aspect of the shoulder. Can be measured from sitting height.</td>
</tr>
<tr>
<td>7. Internal sitting depth (buttock – popliteal)</td>
<td>Sagittal distance from the posterior aspect of the popliteal fold to the posterior aspect of the ischial tuberosities.</td>
</tr>
<tr>
<td>8. External sitting depth (buttock – patella)</td>
<td>Sagittal distance from the anterior aspect of the knee to the posterior part of the buttock.</td>
</tr>
<tr>
<td>9. Abdominal depth (buttock – abdomen)</td>
<td>Sagittal distance from the anterior abdominal wall to the posterior part of the buttock.</td>
</tr>
<tr>
<td>10. Anterior width (sitting breadth)</td>
<td>Maximum transverse distance between the tips of the forearms when the arms are extended.</td>
</tr>
<tr>
<td>11. Shoulder width (biacromial breath)</td>
<td>Maximum transverse distance at the shoulders.</td>
</tr>
<tr>
<td>12. External elbow width</td>
<td>Maximum transverse distance between the tips of the olecranon when the arms are extended.</td>
</tr>
</tbody>
</table>
Comfort

Based on:
1. Observe body posture & movement
2. Observe task performance
3. Direct subjective ratings of general comfort using
   - chair feature checklists
   - body area comfort rankings
   - general comfort rankings

Remains an unexplored concept

Frequently defined as the absence of discomfort

5 minutes as good as 1/2 hour as good as 4 hours to subjectively rate comfort

Clinical aspects of seated posture

Does extended sitting cause lower back pain?

- “Yes”
- and “No”

Seated in a vehicle: “Yes”

- Interaction between lumbar posture & vibration
How does disc pressure change with posture?

Testing effect of lumbar support & backrest

Backrest inclination effects on muscle activity

Back muscle activity

- Back is slumped forward in full flexion
- Arms are supported
- Back rest is used

Back muscle activity not influenced by:

- Lumbar support
Shoulder & Sitting

Back muscle activity

The Legs & Sitting

Leg support during sitting distributes & the load on the buttocks & back of the thigh

Pressure applied close on thighs close to the knees
  - Leg swelling
  - Pressure on sciatic nerve

What office chair do I use?

Many different options & user requirements

4 important seat dimensions:
  1. Height
  2. Width (breadth)
  3. Length (depth)
  4. Pan slope