



Are you sitting comfortably?

What is comfortable for me may not be so for you. What is comfortable now, may not be so half an hour from now. Comfort is a subjective concept, but what can we do to optimise it for each individual?

Most of us will have experienced sitting down at a meeting or conference where the chair we are sitting on seems OK when we first sit down. However, after a short time we get to fidget because we are no longer feeling comfortable. Most of the readers of this article may well be able to adjust their position to decrease the discomfort, but there are many in wheelchairs, or indeed static seating, who do not have this luxury – so what can we do with the equipment prescription to ensure maximum comfort for the longest time possible?

First of all, what is comfort, or possibly more importantly, discomfort? There are mental and emotional aspects relating to comfort, but in this article we will concentrate on the physical elements.

Dr Barbara Crane, as part of her work for her doctoral dissertation at the University of Pittsburgh, created in 2004 a Tool for Assessing Wheelchair disComfort (TAWC)¹. In this the individual is first asked a number of questions, the answers to which give scores for their comfort, but also their discomfort. This General Discomfort Assessment (GDA) brings out scores, separately, for discomfort for example from: poor positioning; being in one position for too long; aches, stiffness, or soreness; pressure in parts of the body; and/or too hot, cold, or damp.

The second part of the interview to create a Discomfort Intensity Score (DIS) identifies for each part of the body the intensity of the discomfort at that point. In the results of one published study using these scores with mainly a spinal injured population, it was the individuals' backs which came out with the highest scores, while general discomfort came second, and discomfort at the buttocks came third².

Time and creep

Discomfort is a time-related phenomenon (the TAWC looks at the individual's experience during the previous four

hours). While we are seated, there is 'creep' in the set up: we settle into our support surface as it reshapes around our buttocks. At the same time, our skin tissues rearrange themselves, distorting their cells, and occluding capillary vessels, with the potential eventually of tissue death if the forces are not redistributed. With time this escalates to being painful, and not just uncomfortable.

The degree to which this damage occurs will depend in part on the material properties of the support surface, and the degree of envelopment that can be achieved to spread localised pressures and shear forces as widely as possible, and in part the health and elasticity of the skin tissues. We have to find the compromise between high levels of envelopment with its benefit of reducing localised pressures, against the restrictions of movement that can result. The best compromise is to redistribute the pressures away from around bony prominences, such as the tail bones and coccyx, to more appropriate load-bearing tissues such as under the thighs.

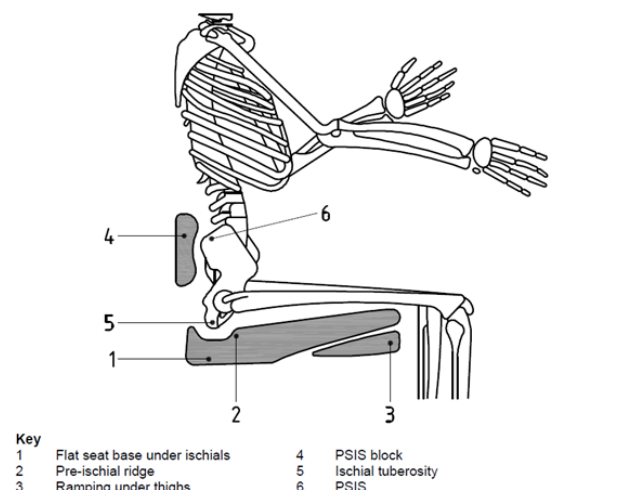


Figure 1. Pressure redistribution through ramping under the thighs

A wedge placed under the cushion under the thighs has been shown to be effective at redistributing pressures away from the buttocks, while still allowing the foot supports on the wheelchair to be positioned at a suitable height from then floor (Figure 1).

Alternatively, a custom-fitted system can provide the greatest surface contact, but as our body morphology (or

even our seasonal clothing) needs change, it's ideal if the system can be adjusted to our changing needs. Symmetric Design's FreeForm system (Figure 2) is ideal for this.

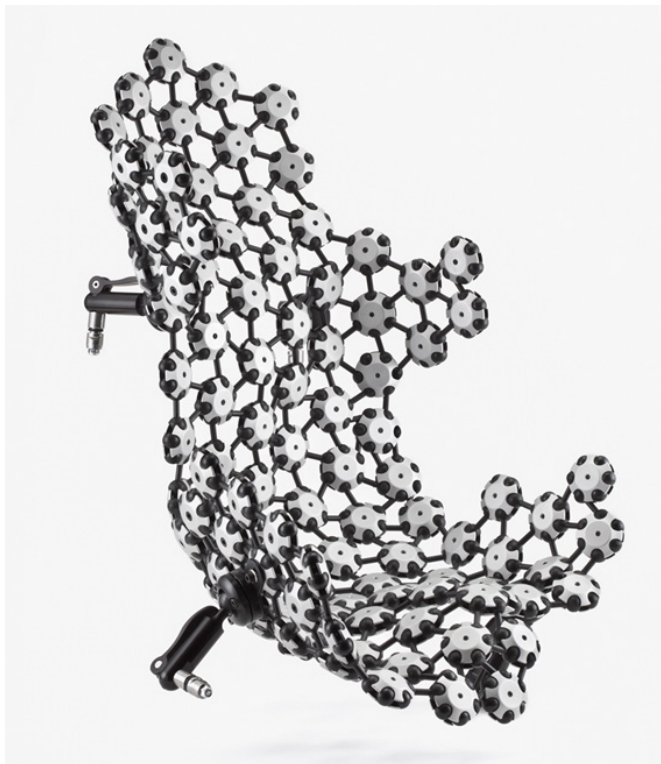


Figure 2. The FreeForm customisable conformable seating support

Microclimate

If your seating system does not have good air circulation near the skin, there is risk of discomfort arising from the build up of moisture, or of temperature, or of both. Moist skin is at greater risk of tissue damage from frictional and shear forces. A 1° rise in temperature leads to a 13 % increase in metabolic demand – more nutrients and oxygen needed, and more metabolites to get rid of.



Figure 3. Varilite Evolution cushion with breathable cover materials

The make up of your cushion cover will have a major impact on controlling this source of discomfort. For over 30 years, Varilite cushions (Figure 3) have had a layer of reticulated foam between the cover and the air-foam cushion to allow moisture and temperature control.



Figure 4. NEST cushion with breathable spun polymer core

Alternative breathable materials are available these days in the form of spun polymer cores, such as in the NEST cushion (Figure 4) which allows the air in the cushion to circulate freely. A further alternative is a medical sheepskin cover (Figure 5) where the wool can absorb up to a third of its weight in water vapour without feeling moist.



Figure 5. Shear Comfort sheepskin Cushion-Its



Figure 6. Respira climate management back support

For back supports, consider Symmetric Design's Respira back support (Figure 6), where the air flow through the

back support is greater than normal anyway, but with the optional added air pump leaves the occupant cooler and dryer.

Movement

The damage from the absence of regular movement has been documented: impaired dynamic sitting stability is associated with pressure ulcer development³. It is the sensory feedback of the effects of pressure and shear forces on our skin that gives us the feelings of discomfort, and encourages us to move to alleviate these feelings – and it's this regular movement that allows our tissues to recover. Observed (in one study) over a 70-minute period, 'normal' individuals performed spontaneous movements on average every six minutes as viewed from the side, and every nine minutes when viewed from the front⁴. In contrast, in another study of a group of paraplegics, 21 % moved once/hour or less and 55 % moved in cycles shorter than 1 hour – and more than half of the study population developed a pressure ulcer⁵.

Some movements are contraindicated, such as sliding down one's seat, which can induce friction and shear-related skin damage, and result in longer-term skeletal malformations. In our July article (No.73) in this series, we look in more detail at the effects and causes of sliding, and management possibilities.

Freedom of movement

It is important that pelvic positioning belts are positioned in front of the greater trochanters for those with a tendency towards a posterior pelvic tilt (Figure 7). Not only is this a safety matter, to ensure the belt length is sufficiently short to prevent submarining under the belt, but also allows sufficient forward movement to unload the tail bones, and also permits greater reach.

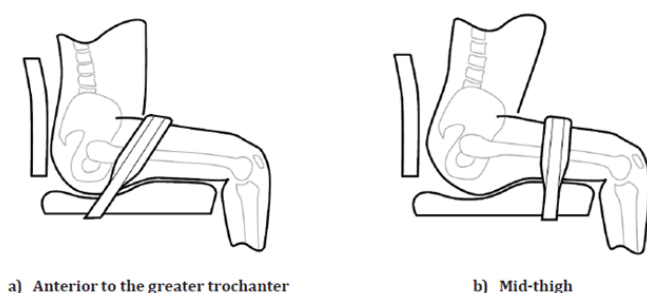


Figure 7. Pelvic positioning belt placement (Fig 1. from ISO/TS 16840-15⁶)

Freedom of movement, while also redistributing pressure related forces, not only provides increased functionality, but also improved physiological functions such as breathing, digestion, cardiac output, etc. To this end, it is also

recommended that wheelchair occupants should spend at least an hour each day in a standing position.

We need different postures for different functional day-to-day activities, such as typing, eating, social interactions, relaxing, etc. The choice and placement of support devices on a chair which permit or assist these postural variations can be important. Going back to the discomfort measures, for comfort and functional reasons, some people will have greater need to move their feet, their hands, or their heads, than others.

As covered by previous articles in this series, 'dynamic' elements permit or support movement of parts of the body – these can be elasticated shoulder supports, arm supports (such as the Bodypoint Dynamic Arm Support – Figure 8), leg supports, or reclinable back supports. Please remember that the pivot point of the flex or extension movement needs to be lined with the related pivot point in the body (for example, see the Stealth EPiC seating system for back support recline – Figure 9) which pivots level with the person's hip joint, rather than at the joint between the back support and seat.



Figure 8. Bodypoint Dynamic Arm Support

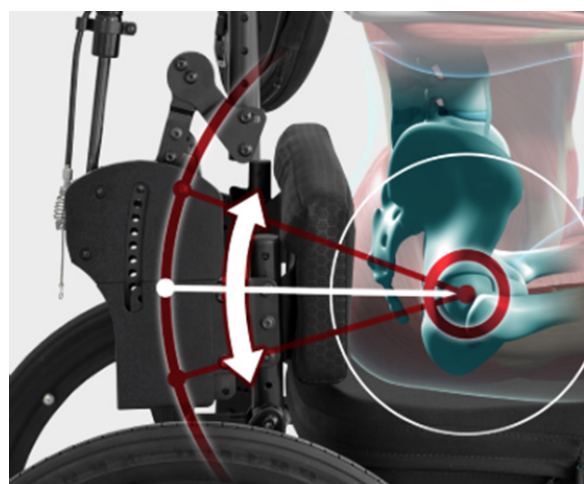


Figure 9. Stealth's EPiC Seating System

External influences

Discomfort can come from vibrations working their way through the chair, and these can be very fatiguing. Air-foam cushions have been shown to be better at vibration absorption than pure air or gel cushions. There are new wheel designs in the marketplace which are energy absorbent, some even to the degree that they can assist curb-climbing (Figure 10). Frog Legs have had their shock-absorbing caster mounts around for a number of years – their new Whisper casters additionally offer energy-absorbent tyres (Figure 11).



Figure 10. The Korea Institute of Machinery and Materials 'morphing' wheel



Figure 11. Frog Legs' Whisper caster and mounting system

In conclusion, there is much that can be done to make long-term seating more comfortable!

1. The Tool for Assessing Wheelchair disComfort (TAWC) is downloadable from <https://www.icare.nsw.gov.au/-/media/icare/unique-media/treatment-and-care/what-we-do/guidelines-and-policies/media-files/files/download-module---wheelchair-downloads/comfort-tool.pdf>
2. Hong E et al, 2014, Comfort and stability of wheelchair backrests according to the TAWC <https://pmc.ncbi.nlm.nih.gov/articles/PMC8152044/>
3. Karatas et al, 2008, Center of pressure displacement during postural changes in relation to pressure ulcers in spinal cord injured patients. *Am J Phys Med Rehabil* 87: 177-82
4. Linder-Ganz E et al, 2005, Summer Bioengineering Conference, June 22-26 Vail Cascade Resort & Spa, Vail Colorado
5. Stockton et al, 2002, Pressure relief behavior and the prevention of pressure ulcers in wheelchair users in the community. *J Tissue Viability*, 12: 84, 88-90, 92
6. BS ISO/TS 16840-15:2024 Wheelchair seating — Part 15: Selection, placement and fixation of flexible postural support devices in seating
7. www.kimm.re.kr/sub0504/view/id/20386#u



B | E | S
HEALTHCARE

0117 966 6761
info@beshealthcare.net
www.beshealthcare.net

