

What makes a good trunk support?

1. General Principles

Our upper body, based around our trunk, is the most important part of our body when it comes to our overall health, and therefore also our seating considerations. It is also essential to consider sitting, in the same way as walking or standing, to be an activity. So how can we support this functionality?

While taking into account our interactions with the outside world, we also need at the same time to take into consideration that our trunk houses the vital organs responsible for many of our most important physiological functions: breathing, blood circulation, digestion, excretions, and reproduction, to name but a few. So all this activity is going on on the inside, while the trunk is providing the stable base to permit the distal activities provided by our legs, arms, and head. The core for all this is the somewhat mobile and flexible, but ideally fairly straight, spinal column, which in turn is resisting the forces of gravity working to change its shape.

A holistic approach

In a normal healthy body without any impairments all is well within and around the trunk, but what should we do when there is a problem? Traditionally, at least in wheelchair seating, we often fragment our approach, and maybe start with seeing if only a bit of back support will do. But are we clear in what we want to achieve? Do we not want only to control or improve the immediate medical conditions, and prevent further physical 'harm' occurring? This 'medical' model often stops there, and ignores the 'social' model of what else we could do to provide additional interventions for improved functionality and activities of daily living.

Let us consider a different angle by looking at the whole upper body, and not just one part at a time. An example might be where an orthotist is asked to provide an orthosis, maybe to compensate for upper body muscle weakness: the result of their involvement, the end product, might be an orthopaedic brace, which can embrace the whole torso (Figure 1).

What we gain from the design of this type of orthosis is that it treats the torso as a whole, and that all the elements are shaped to conform to the individual. In future articles



Figure 1. An orthotic body brace

we will look at examples of where products that conform well to the body's shape can provide better outcomes for the individual.

Taking this further, should we avoid compartmentalising products into posterior vs lateral vs anterior vs superior supports? Most of the appropriate devices that we prescribe will have aspects of a combination of at least two of these 'touch points'. Most back supports will have some degree of lateral support, for example. Likewise an upper body intervention should not be considered on its own without looking at the effects on other parts of the body. If we then adopt the person-centred approach to, say, the selection of a wheelchair accessory (such as a back support) does it not make sense to size it to the person and not to the wheelchair?



Figure 2. The Tarta Original back support

It was the invention of an orthotist who designed the 'Tarta Original' back support (Figure 2), where I first met the design and sizing of an after-market back support being created around the shape and dimensions of the occupant. In the Tarta, its sizing was designated to be comparable with the person's clothing sizing, e.g. Small, Medium, Large (not quite as clear-cut when it was found that one country's small was very different to another's!), and not the width of the wheelchair onto which the back support was going to be mounted. In later articles we will look at what current and future ISO standards recommend as to how we make use of the individual's measures to prescribe items that will fit the person appropriately.

Support, not rest

Generally in the seating world we do not consider the more simple items that we might apply to a seating system to be an orthosis as such, even though the definition of an orthosis is "an external medical device for supporting, immobilising, or treating muscles, joints, or skeletal parts which are weak, ineffective, deformed, or injured". In truth, this definition encompasses most of the accessories we commonly apply to a seating system: if we bear in mind that any seating assistive product that we prescribe has these functional aspects, then the occupant will benefit. As a basis, at least we will use the term 'support' rather than 'rest', as in 'back support' rather than 'back rest', for example, to reflect the active functional aspects of the device.

Movement and functionality

Being able to move is important for our overall health, through our being able to exercise our muscles and, also, for the health of most of the physiological function encompassed within our torsos. We should never be constricting movement to the degree that it inhibits optimal respiration, for example. Regular muscle activity is also vital for maintenance of bone strength. For the mobility impaired, standing for at least an hour a day provides marked improvement in most physiological functions across the body.

Where an orthosis may be immobilising some parts of the body, we need still to be able to move other parts of our body, to reach items and hence enable optimal functionality around normal day-to-day activities. We need some degree of freedom of movement and postural variation. Postural variation can be a change in posture induced by wheelchair users themselves (we can call this active postural variation) – for example if the occupant's postural muscles fatigue or there is a change in tone, the seating system can adjust to that new alignment and facilitate an optimal posture. Passive postural variation would be where a caregiver changes the occupant's posture depending on his/her postural needs, fatigue, activities, and function.

The elements in a seating system allowing postural variation, in some cases permit free movement, while in other cases they also provide assistance to recover an original position. When an occupant changes posture due to fatigue or tone, a 'dynamic' support is often important, in that a static support will limit movement, and the outcome will most likely be an undesired movement elsewhere, such as sliding (and the occupant is unable to reposition him/herself), or excessive movement of other body segments. Where movement is being facilitated, it is important that the accessory design mirrors the anatomical pivot points of the body – good examples can be found in products like the EPiC seating system from Stealth (Figure 3.), the Hip Grip (regrettably no longer available), the Dynamic Arm Support from Bodypoint, etc.



Figure 3. The EPiC seating system

In future articles we will look at the pros and cons of these different flexible vs static alternatives.

Conclusion

A good trunk support needs to accommodate the internal needs of the torso, as well as answering the external needs of the occupant. We need to take a holistic and multisegmented approach and consider all three dimensions of a potential support solution. How a support system interacts with the body of the occupant is important at the static surface-to-surface support level, as much as with the facilitation of postural variation. Because of the flexibility of the spine, there is always the risk of spinal distortions developing: devices should be prescribed that facilitate the occupant's needs while maximising safety and protecting against adverse side-effects. Deeper consideration of these aspects will be covered in future articles.



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