

WHAT'S IN A BACK?

JANE FONTEIN, OT

Dynamic Health Care Solutions and Motion Composites

This hands on workshop (depending on the size of the group) will explore the properties of back supports and their impact on seating and positioning. Through demonstration and trial, the attendees will assess the differences from sling upholstery, tension adjustable, and rigid backs. . A review of back properties and their clinical implications will be discussed. Is a tall back needed if the client is tall? Where is support needed? What angles and lateral supports are required? How to improve propulsion with back support.

Often when a referral for a skin injury is sent to a therapist the referral will request the therapist to change the cushion. When this occurs the therapist should reply “no” I need to do a full seating assessment. Yes perhaps go and look at the cushion to see if it is in correctly and fits the client, but after that it is important to determine the cause of the skin injury, it could be from a transfer, or lack of nutrition, or from the commode seat and the actual cushion may be fine. When it comes to skin health the cushion is only one aspect of the seating system and needs to be looked at in combination with the back, as well as other aspects of the seating system, including but not limited to the footplate height, the overall fit and set up of the wheelchair. In fact the back support is an integral part of the seating system and needs to be considered as an equal partner to the cushion as according to Jacqueline Macauley ¹ “The prescription process is only two thirds complete when the mobility base and cushion have been chosen”

Once a seating assessment has been performed, it is important to list the properties of the seating system that is required, in conjunction with the goals of the client.

When looking at a back system there are pros and cons (as generalizations) for having sling seat vs adjustable tension vs rigid and it will depend on the client as to the choice. As in a cushion there is no one back for everyone as there is no one cushion.

The purpose of back supports are to support the pelvis and trunk but allow movement of thoracic area. Back supports can provide lateral stability and if a head support is needed allows for the attachment of the head support. How the pelvis and trunk are supported will depend on the structure of the back and cushion combined. As mentioned in a study by Kersti Samuelsson et al. “The results show that a lumbar support and a shaped seat cushion are the most effective way to support the pelvic towards a neutral position. Most effective was a lumbar support” ². The method of support is determined by the type of back support.

Generally, a sling back that comes standard with a chair does not allow for pelvic support and allows the pelvis to move into posterior pelvic tilt, which often leads to a kyphotic posture. Sling back supports will stretch over time as well depending on the fabric. The advantage of a sling back is that if the chair is folded frequently it eliminates the step to remove a rigid back.

A tension adjustable back, allows tightening and loosening of straps to accommodate for the posture of the user. It can give more support at the pelvis but may not prevent posterior pelvic tilt. Like the sling seat it allows for easy folding of the chair, but does add a little weight and also has to be maintained if the straps loosen. “ The Velcro™-adjusted back support in our study formed a better support for pelvic position than the traditional sling back .” ²

There are many different types of rigid backs that come in many different shapes and sizes so it is difficult to make a statement about all rigid backs. However due to being rigid there is more ability to support the pelvis to help maintain a neutral position. Depending on the material used to

interface with the client – the back can also help accommodate a variety of shapes including kyphosis, lordosis and scoliosis. Depending on the design the removability for folding varies from very simple to more difficult. In a study by Yu-Sheng Yang et al. “Wheelchairs in this study were equipped with sling backrests. Studies have shown that the use of a sling backrest in a wheelchair can have a negative impact on posture and can be less supportive than a rigid back. In a recent study we investigated differences between a rigid backrest and the standard sling backrest on wheelchair propulsion variables in 26 MWUs with paraplegia. Under similar propulsion conditions as this study, the rigid backrest kept the trunk more up right, reduced non tangential propulsion forces, and increased MEF. Consequently, there may be added benefits of pushing a wheelchair with a low rigid backrest instead of one with a low sling backrest.”³

When looking at back supports there are several dimensions to be determined including the height (or length), width and lateral support required. Studies have shown that a back to high can limit shoulder movement³ and thus limit propulsion, it can also force a client into forward flexion. Too low, may limit the support provided and can lead to skeletal deformities. Determining the height will be part of the seating assessment however for independent propulsion it is better to have the height of the support below the lowest part of the scapula. Yu-Sheng Yang et al concluded that “Using a backrest height lower than 40.6cm (16in) afforded MWUs more freedom of arm movement, increased stroke angles, and decreased cadence. As a result, this simple modification in wheelchair setup could help decrease the risk of developing upper-limb overuse related injuries. The improvements found when using the low backrest were regardless of slope type. Consistent with findings in prior studies, pushing uphill demanded significantly higher resultant and tangential force, torque, MEF, and cadence. Ideally the backrest height should provide adequate postural support while affording as much freedom of arm movement as possible. Future studies should be directed on rigid backrests, as they come in various sizes and shapes and provide added benefits related to propulsion effectiveness and posture.”²

The following is a list of some of the potential properties to consider when looking at rigid back supports, depending on the needs of the client the priorities of which property is more important can change. Some of these properties will be reviewed in the workshop as well as discussing their clinical implications.

- Pelvic support – how is it achieved
- Seat to back angles available
- Lateral support – positions, depth, adjustability, fixed contours or removable, swing away.
- Back height (length)- sizes
- Removability - ease
- Weight – including hardware
- Width sizes – some rigid backs fit different sizes of wheelchairs
- Angle adjustability within the back support
- Comfort (individual)
- Maintenance required
- Aesthetics
- Colour options

- Head support mounting options
- Shoulder strap mounting options
- Insert options for rigid backs, ie Foam or other materials... gel, air
- Hardware – ease of mounting, adjustability, weight, reliability
- Crash tested

References:

1. Macauley, Jacqueline PT., ATP .”Do You Have Your Client’s Back?” 27th International Seating Symposium March 3-5, 2011
2. Kersti /Samyeksiibm, Marrut Bjork, Ann-Marie Erdugan, Anna-Karin Hansson & Birgitta Rustner “The effect of shaped wheelchair cushion and lumbar supports on under-seat pressure, comfort, and pelvic rotation”, Faculty of Health Sciences, Department of Clinical and Experimental Medicine, Rehabilitation Medicine, Linköping, Sweden, and Clinical Department of Rehabilitation Medicine, University Hospital, Linköping, Sweden Disability and Rehabilitation: Assistive Technology, September 2009; 4(5): 329–336
3. Yu-Sheng Yang, PhD, Alicia M. Koontz, PhD, Shan-Ju Yeh, BS, Jyh-Jong Chang, PhD.” Effect of Backrest Height on Wheelchair Propulsion Biomechanics for Level and Uphill Conditions” Physical Medicine and Rehabilitation, April 2012Volume 93, Issue 4, Pages 654–659
4. Yang YS, Lin SA, Chang JJ. The biomechanical analysis of effect of rigid backrest on wheelchair propulsion among people with spinal cord injury. Taiwan J Occup Ther Assoc 2010;28:1-13.
5. Waugh K and Crane B., A clinical application guide to standardized wheelchair seating measures of the body and seating support surfaces (Rev. Ed). Denver, CO: University of Colorado, Denver (363pgs) 2013. Available from: www.assistivetechologypartners.org
6. ISO 16840. Wheelchair Seating, Section 1 – Vocabulary, reference axis convention and measures for body posture and postural support surfaces, International Organisation for Standardization, TC-173, SC- 1, WG-11., 2006
7. Birt, Jennifer, OT Reg (MB), Specialized Seating and Mobility Clinical Specialist Rehabilitation Day Program, Health Sciences Centre, Winnipeg, Manitoba ©Jennifer Birt mail to: JLBirt@exchange.hsc.mb.ca

Speaker Bio:

Jane Fontein, OT, has been an Occupational Therapist for more than 30 years, working in a variety of areas including long-term care and rehab, as a manufacturer educator and as a supplier. She worked at GFStrong Rehab Centre on the spinal cord unit and coordinated the out-patient seating programme. Jane has provided education seminars and in-services across North America and internationally for both wheelchair manufacturer, and seating companies. She has spoken at many conferences: ISS, RESNA, Medtrade and CSMC. Jane is currently self-employed and working as a manufacturer educator for Dynamic Health Care Solutions and Motion Composites.