

Race and Recreational Seating Interfaces
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Introduction

Too often active wheelchair users experience pressure ulcers and other trauma not from activities related to every day seating and mobility, but as a result of trauma during out of wheelchair recreational and competitive sports activities. This instructional session will provide attendees with strategies for protecting skin while enhancing performance in both recreational and highly competitive sports activities. The great thing about athletics for wheelchair users is the potential for carry over for improvement in all areas of function, mobility, health and fitness. If, however, participation in recreational and competitive activities elevates the risk of trauma, then the result can be catastrophic to both everyday activities and recreation. The goal is to support unbridled enthusiasm, over-the-top adventure, and winning performance while mitigating risk of trauma.

General Principles

Regardless of the chosen activity, and level of skill, the foundational elements of stability in support of controlled mobility are the same. Advanced athletes present a greater challenge as they seek to further refine the nature of their relationship to, and their exquisite control of, their “rig” within the arenas where they compete. What is important is to prepare beginners for more advanced training and competitiveness. Let’s start with the basics.

Able-bodied athletics build off of an athletic stance. If the stance is poor, then everything else suffers. Feet are placed shoulder width apart with knees inside the feet so pressure is down and out. Pressure is kept forward on the balls of the big toes. Ankles are dorsiflexed. Shoulders are over the knees, and the knees over the toes. The position should be comfortable and is maintained in static stance and carried forward with movement. Movement is characterized by maintenance of level hips, and restriction of extraneous movement of the shoulders laterally and vertically. The athlete “pushes” the ground away with positive push angles.

Significant differences present themselves when supporting athletes with disabilities that necessitate competing in a seated posture. The able-bodied stance improves the efficiency of pushing the ground away with the legs. By nature, the seated disabled athlete’s ability to lever forces through the lower extremities is impaired, if not completely absent. In most cases, power must be communicated from above the pelvis, through the pelvis, on to the seating interface, and finally transferred to the rig and into the competitive surface, i.e. snow, water, tennis court, etc.... Clearly, the greater the distance from the athlete’s level of functional control AND sensation to the ground, the greater the challenge in communicating the forces of control to the ground, and, in return, receiving sensory feedback from the ground.

Everyone who sits to compete has a compromised base of support relative to their able-bodied peers. Each individual's level of control and sensation above that base of support influences their innate ability to perform. Success in athletic and recreational ventures happens in spite of these limitations and depends on:

1. Personal drive and commitment of the participant.
2. Access to venues, equipment, and activities.
3. Optimal and repeatable support and connection to the equipment.
4. Good coaching.

Base of Support

A person with lower extremity and trunk impairment, sitting on a flat surface, will be pivoting on the very narrow and shallow base of support created by his ischial tuberosities. What a distinct disadvantage this is relative to the shoulder width, actively controlled, athletic stance of his able-bodied peers. Additionally, those ischial tuberosities are at significant risk for breakdown secondary to elevated pressures, heat and moisture, and tremendous forces of shear related to the dynamic element of the activity. Traditional wheelchair seating systems have utilized the principles of pressure distribution to alleviate skin risk, but at the expense of stability. Imagine controlling a downhill sit-ski traveling at 50-60 mph sitting on air or fluid. One alternative, the traditional full contact seat insert, leaves little room for error in position and no tolerance for the dynamic movement of the pelvis inherent in virtually all competitive sports. Historically, full contact inserts have been created using foam-in-place visco-elastic materials that are very hard when cold, and lose supportive qualities as they warm up. The seat interface fatigues as the athlete fatigues. These materials also trap heat and moisture between the sitter and support surface, further elevating the risk for skin breakdown.

The solution must enhance efficiency while mitigating risk for skin and other trauma by addressing the following key issues:

1. Broaden the base of support as much as possible. Shift the base from the ischial tuberosities to the posterior-lateral buttocks in balance with proximal to distal thigh support with lateral and medial contour.
2. Improve efficiency of energy transfer through use of accurate and specific contours and firm materials.
3. Reduce/eliminate pressure and shear at high risk areas.
4. Elevate forces of support at contact areas tolerant of pressure and shear.
5. Use materials with consistent performance throughout the range of temperatures and humidity/moisture that the activity presents.
6. Durability.
7. Consistent and repeatable positioning (especially for the novice participant utilizing program, rather than their own, equipment.)
8. Optimize balance and orientation to enhance forward movement.

Pelvic and Trunk Support

Once again, the greater the distance between a person's functional level of trunk control and their base of support, the greater the challenge in creating an effective interface. Impaired sensation dramatically impacts the athlete's ability to experience the feel of the ground reaction to their movements. Lack of proprioception, in conjunction with poor seating, forces athletes to rely on their vision to monitor body position taking their eyes off the event. Imagine playing basketball while having to maintain vigilant attention to where your feet are. Good luck! One cannot fix proprioception, but strategies can be employed to improve feedback to the athlete.

Trunk support builds off of the base of support interventions outlined above and should be applied as follows:

1. Support to (even above) the level of disability. This is no time for vanity! Stabilization up to an anatomic level that the athlete can feel and control is critical in the communication of controlling forces down to the ground and back up for sensation. Accomplish this, and the athlete will be able to attend to the event trusting his body position, and feeling the ground reaction.
2. Improve efficiency of energy transfer through the trunk support. Remember the trunk has posterior, lateral, and anterior surfaces, all with unique shapes, and all capable of being utilized to enhance control.
3. Consistent material performance throughout the range of temperatures and humidity/moisture that the activity presents. Dry air space around the body helps maintain a safe body core temperature in both hot and cold environments, and reduces fatigue.
4. Durability.
5. Consistent and repeatable positioning(especially for the novice participant utilizing program, rather than their own, equipment.)
6. Optimize balance and orientation to enhance forward movement and influence "the edges", be they skis, tires, blades, whatever.

Summary

Attention to the principles above, regardless of the level of experience of the athlete, will set a person on track for greater performance and success. The personal drive to compete and win at all costs must be balanced with interventions that reduce risk of trauma – simply ask any competitive athlete who has been pulled from competition due to skin breakdown or other traumatic event. Couple the sports interface with equally effective wheelchair seating to promote optimal mobility, postural control and skin care. If the wheelchair and seating is set up correctly, it can influence the healing of trauma incurred out of the wheelchair, accelerate return to competitive or recreational activities, and may even keep competitors out of bed!

If in life a mishap takes you down, know that there is a high probability that a solution exists that will reinsert you back into your active lifestyle. Standard and custom seating options are now available that address many, if not all, of the above mentioned principles in support of everyday wheelchair activities and up to the most challenging of athletic and recreational pursuits.

References:

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