

Comparing Seated Pressures in Daily Wheelchair and Sports Equipment and Investigating the Skin Protective Effects of Padded Shorts

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Purpose

Participation in adaptive sports is beneficial for individuals with SCI as a way to prevent cardiometabolic diseases and improve quality of life. Currently, sport specific adaptive equipment (AE) lacks the skin protective cushioning of daily wheelchairs (DW), and may expose individuals to high seated pressures. This study compared average and peak seated pressures in multiple types of AE in both static and dynamic conditions, with and without the presence of a padded bicycle short. Hypothesis: Seated peak and average pressures will be greater in AE than DW, and a padded bicycle short will decrease seated pressures in AE.

Participants/Methods

Participants were a convenience sample of adaptive sport athletes without current skin breakdown or any ability to ambulate. A TekScan Pressure Mapping System recorded 60-second dynamic and static pressure readings in the following conditions: DW, AE without padded short, AE with padded short. The participants simulated sport-specific movements for dynamic readings. Eight athletes were tested in ten pieces of AE including: hand cycle, quad rugby chairs, basketball chairs and mountain hand cycle.

Results

AE showed significantly **higher average and peak pressures in the static condition** and significantly **higher average pressures in the dynamic condition** when compared to DW. **No significant difference was found for dynamic peak pressures between AE and DW.** The presence of a padded bicycle short had no significant effect (Fig. 1)



Image 1. Mountain hand cycle (Left) and Basketball wheelchair (right) used in single subject follow up.

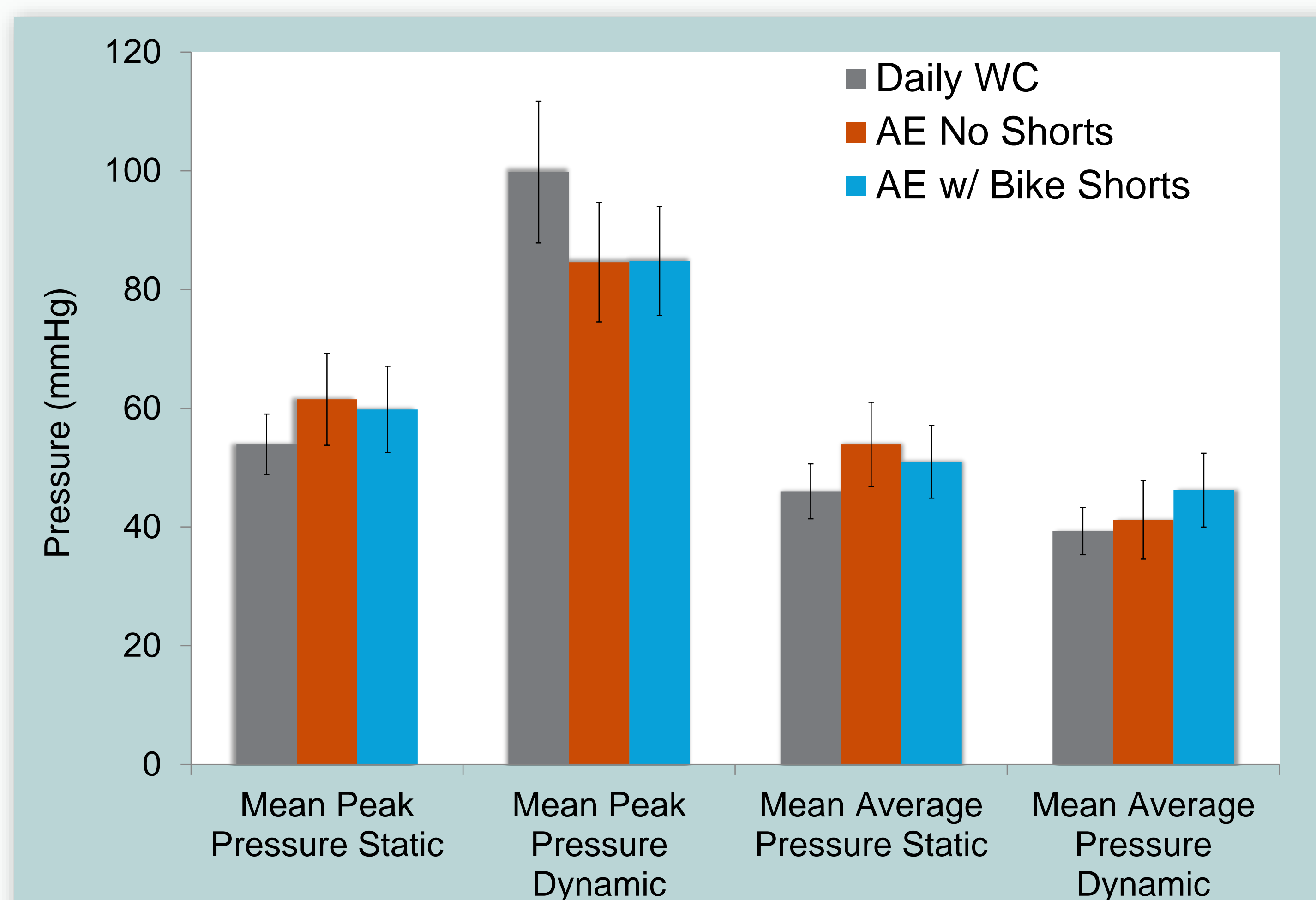


Fig 1. Peak and average pressures in daily use wheelchair compared to adaptive equipment with and without shorts under static and dynamic conditions. *Dynamic peak pressures in DW are NOT significantly higher than AE with or without bicycle shorts.

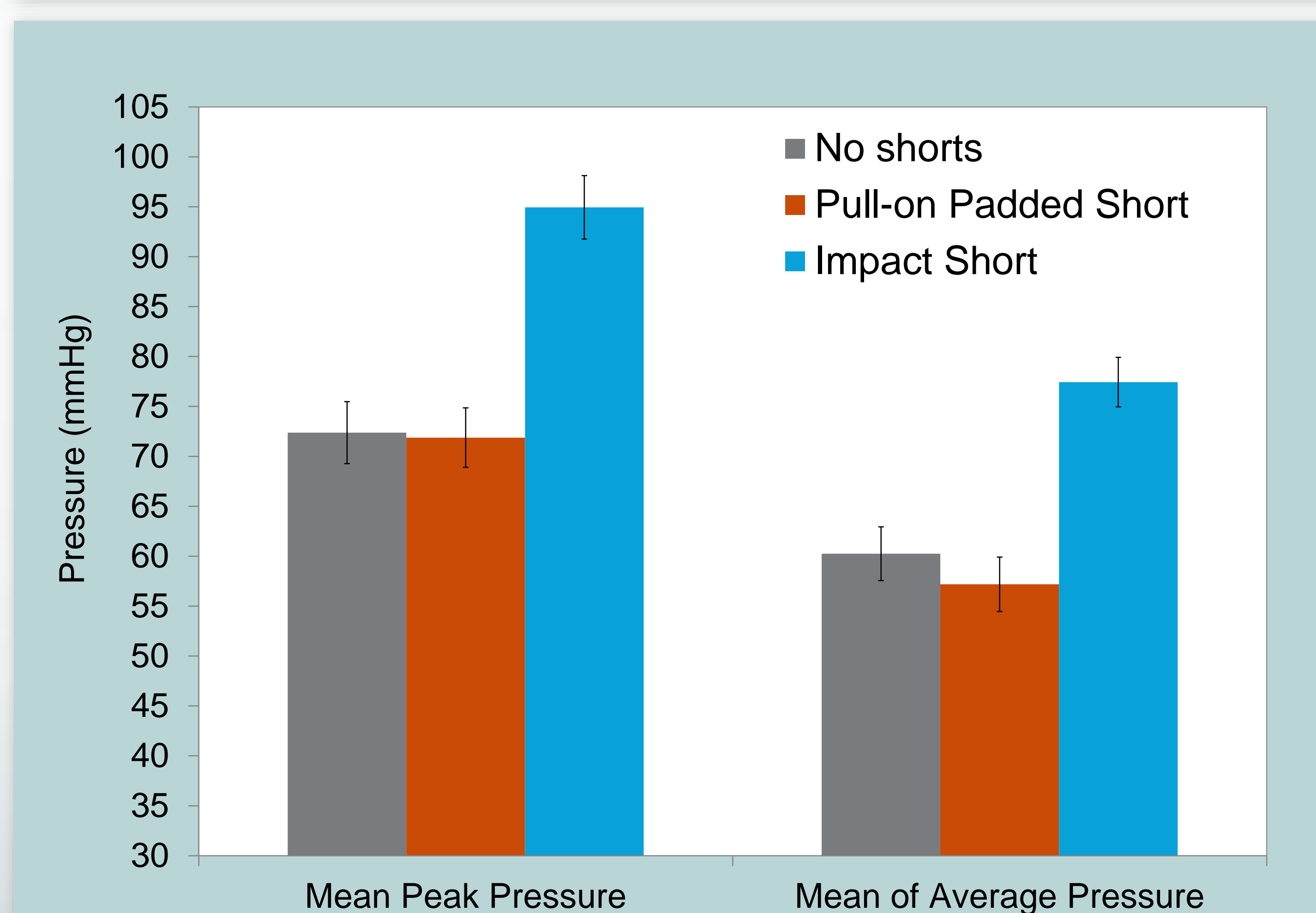


Fig 2. Static peak and average seating pressures on a hand cycle wearing no shorts, padded Shorts, and impact shorts in able-bodied participants.

Follow-Up

Finding no benefit with the padded bicycle short, two other types of padded short were mapped on able bodied subjects in a hand cycle. Static readings were taken with a pull-on padded short, an impact short, and no short. The impact short showed **increased peak and average pressures**, while the pull-on padded short showed **decreased average pressures** when compared to no short (Fig 2). We then measured pressures with the pull-on padded short in one individual with T5 SCI in static and dynamic conditions in a basketball wheelchair and a mountain hand cycle (Image 1). The padded short **increased peak and average pressures in the basketball chair** and **increased peak pressures in the mountain bike** but **decreased average pressures in the mountain bike**. Thus, in one person with SCI these pull on padded shorts had similar effects as measured with our able bodied participants when in the hand cycle position. The positional difference between the legs forward in knee extension in the hand cycle, and the hip and knee flexion in the basketball chair, is likely significant in determining the effect of the shorts.

CLINICAL BOTTOM LINE:

Adaptive sport equipment exposes athletes to higher pressures than daily use wheelchairs. AE appears to be safer during dynamic use and athletes should avoid prolonged inactivity while in sport equipment. Pressure mapping is an imperative evaluation tool necessary to determining the effect of using padded shorts with sports equipment.

References

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