

Enhancing Evidence-Based Clinical Practice in Wheelchair Cushion Selection through ISO 16840 Testing.

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Aims and Objectives

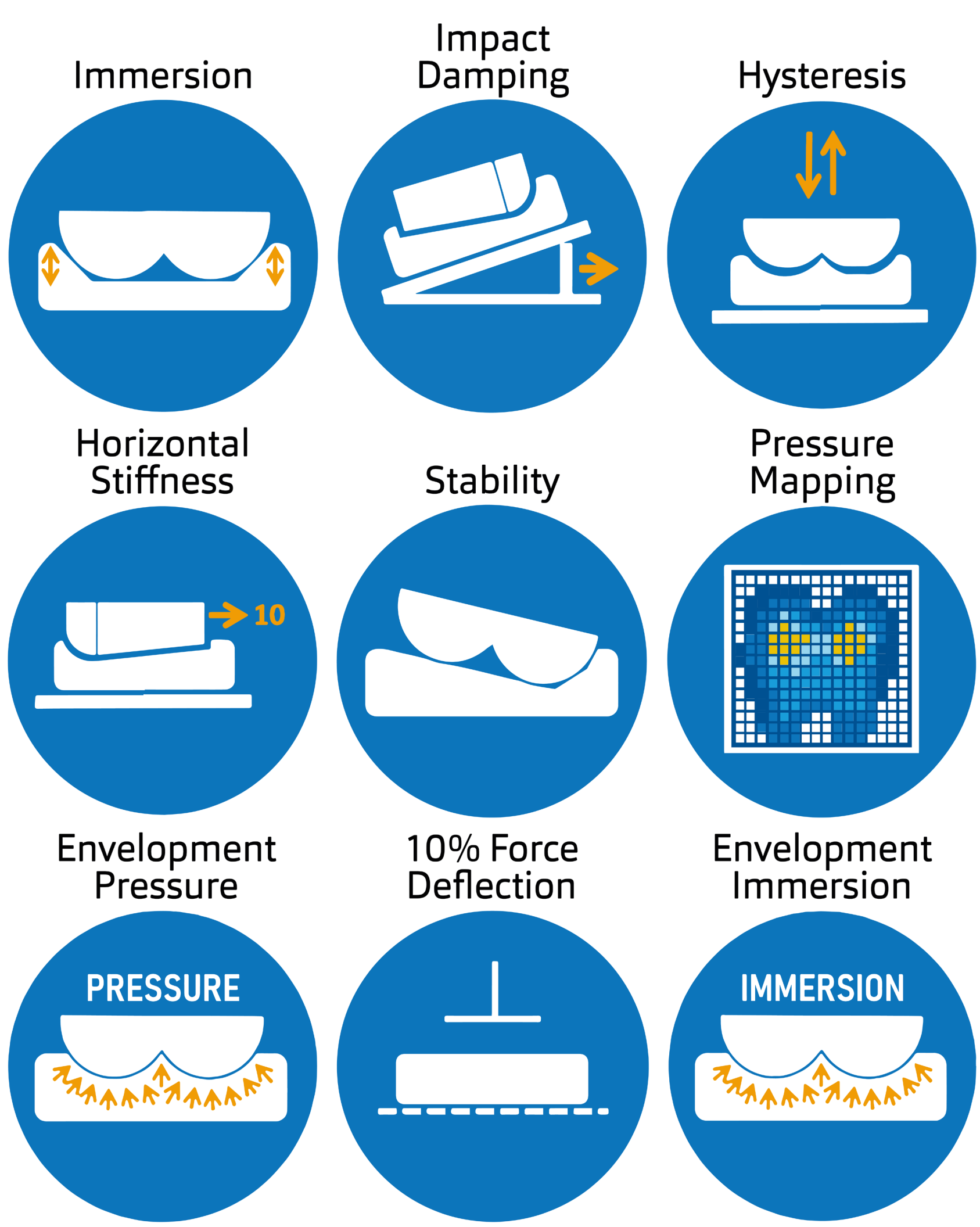
The aim is to improve clinical cushion selection by using ISO 16840 tests to supplement subjective judgment with objective data. These tests identify and rank key cushion features (e.g., skin integrity, stability), enabling informed choices based on user-specific needs.

Background

Wheelchair cushion support posture, protects the skin and underlying tissue, offers stability and comfort (De Jonge, 2007; Brienza et al., 2010; Uehara and Larson, 2019). Selection was traditionally based on clinician preference, lacking objective validation. ISO 16840 now allows standardized testing (The International Organization for Standardization (ISO), 2018). The Rehabilitation Engineering Research Center (RERC) of the University of Pittsburgh tested ~50 commercially available cushions, including Vicair Vector O2 and Adjuster O2, supporting evidence-based decisions (Pittsburgh University).

Technique

- Nine ISO 16840 tests assess performance features of the cushions:
- (Envelopment) Immersion/Loaded Contour Depth: Measures how deeply a person sinks into the cushion.
 - Pressure Mapping: Assesses pressure distribution on a 51kg load.
 - Envelopment: Evaluates the cushion's ability to conform to the body and redistribute load.
 - Horizontal Stiffness: Tests resistance to sliding forces.
 - Lateral Stability: Measures side-to-side support.
 - Impact Dampening: Evaluates shock absorption.
 - Hysteresis: Indicates energy loss and shape retention after loading/unloading.
 - 10% Force Deflection: Measures how much force is needed to compress the cushion by 10%.



Standards/Guidelines

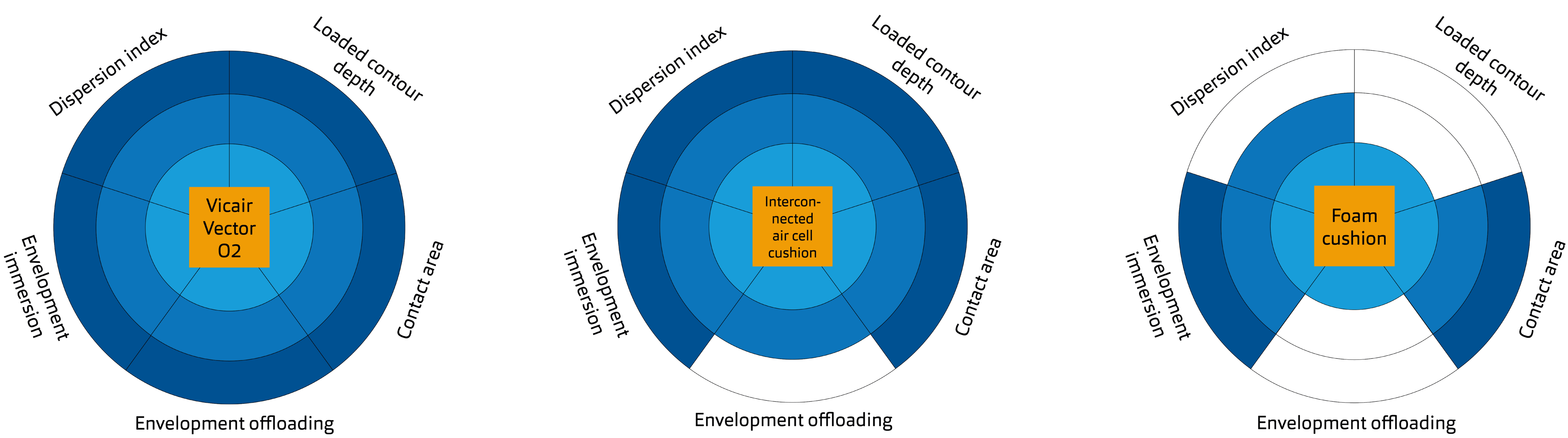
All tests follow ISO 16840, ensuring reliable, consistent results. Relevance is tied to user needs like skin protection, posture, comfort, and safe movement. Each test links to a specific clinical goal, e.g., envelopment for skin integrity, horizontal stiffness for posture control.

Results and testing

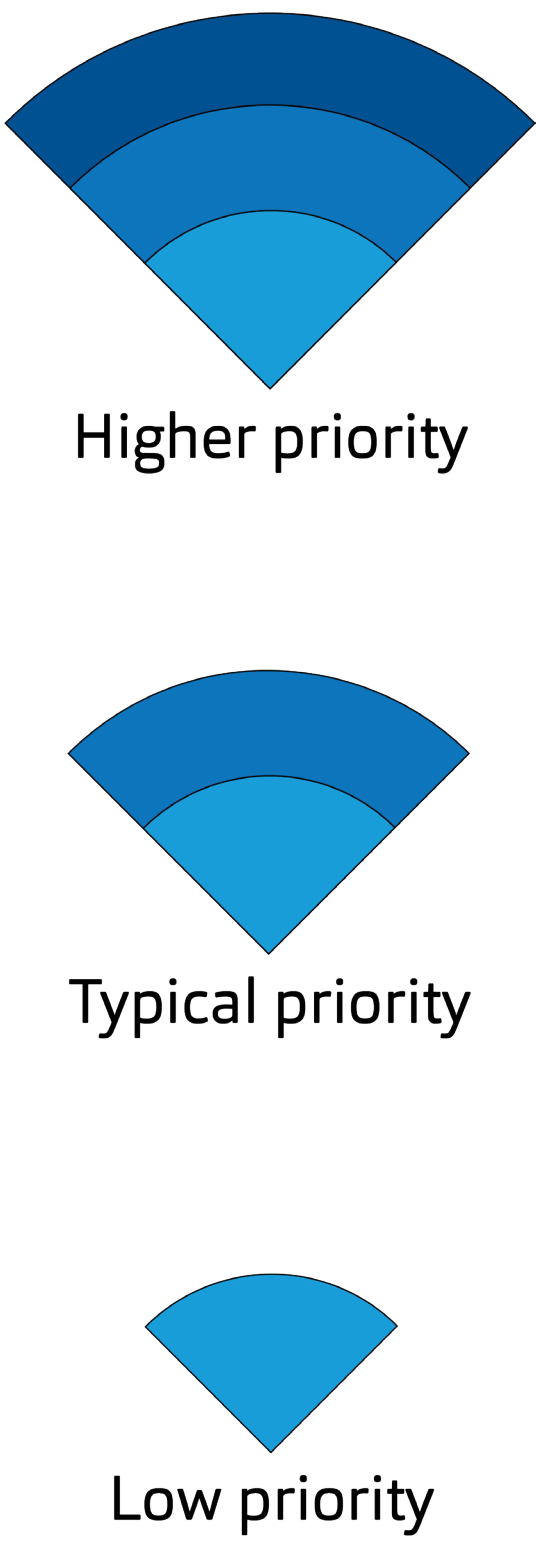
Cushions varied in performance. High immersion improved pressure distribution and reduced tissue stress; horizontal stiffness reduced sliding; Superior lateral stability offers better stability and postural control. Optimal impact damping ratios reduced force transfer, enhancing comfort. Consistent hysteresis results indicated better shape retention and durability.

The Vicair Vector O2 and Adjuster O2 cushions exhibited strong performance across multiple tests, offering balanced support for various clinical priorities. The pie charts illustrate how different cushion types have distinct profiles, which can support informed decision-making based on the client's needs.

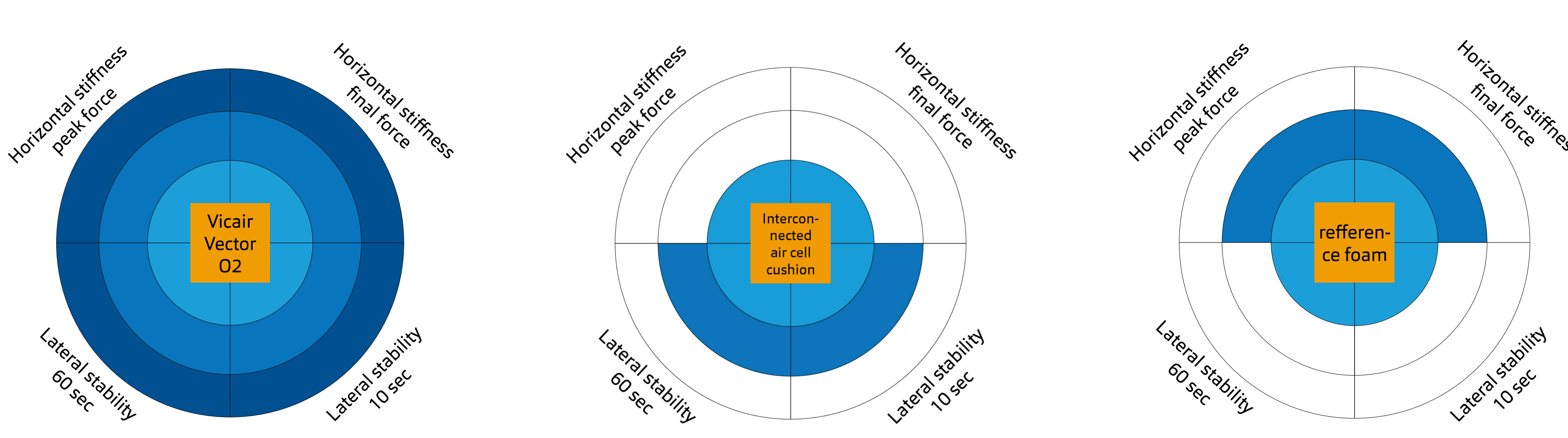
Skin protection



Test results are categorized using interquartile ranges of the whole tested cohort: the bottom 25% indicate lower priority, the middle 50% typical priority, and the top 25% higher priority



Stability



Discussion

Using ISO 16840 tests improves clinical decision-making in cushion selection. These tests offer reliable, objective data for tailoring cushion choices to individual users. Clinicians are encouraged to use them to improve care quality. Future research should link test outcomes to long-term clinical benefits.

References

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