Understanding Cushion Performance Metrics

permobil

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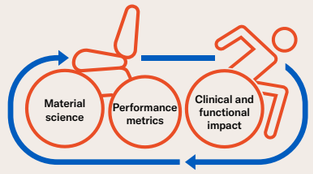
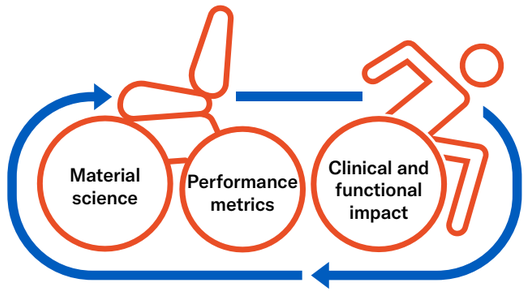
Overview





CLINICAL CONSIDERATION

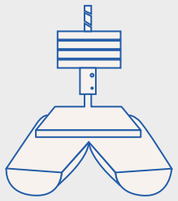
When using individualized performance metrics, this standardized, lab-based data must be considered along with the needs and goals of the individual. Always consider that one metric cannot be used by itself.

Clinical Practice Guidelines[1] state that wheelchair cushion should:

- Minimize pressure and shear in high risk areas
- Provide postural support
- Maintain stability and balance
- Allow completion of an individual's full range of activities
- Be acceptable by the individual

What resources are available when determining a seating solution?

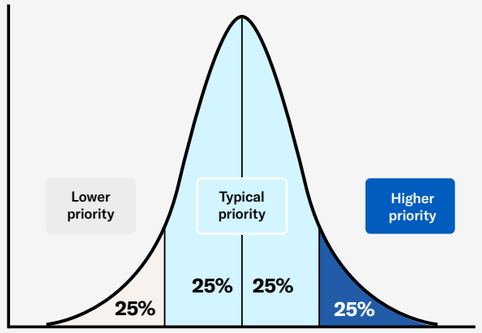
- Individual's self-report
- Clinical evaluation and expertise
- Pressure mapping
- Manufacturer's recommendations
- Published literature
- Performance metrics



What are performance metrics?

- Standardized tests developed in accordance with international standards (ISO)
- Buttock models (indenters) are evaluated in a lab setting for each test
- These tests take out inter-personal differences to provide a baseline for cushion performance
- Except for immersion, there are no performance metrics with pass/fail criteria
- Interpreting and applying these results is only one consideration of many in the cushion selection process.

When utilizing cushion performance metrics for determining a seating solution, the individual remains at the center. Additional factors to consider may include:



The University of Pittsburgh[2] performed lab-based ISO testing on a total of 50 cushions. Permobil statistically analyzed the data for primary performance metrics into quartiles, or four equal groups[3]. For any one performance metric:

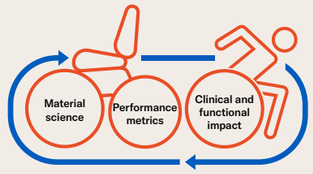
- The 25% cushions with the highest values may be a match for an individual who puts a higher priority on that cushion characteristic.
- The 50% of cushions that are closest to the middle values may be a match for an individual who puts a typical priority on that cushion characteristic
- The 25% of cushions with the lowest values may be a match for an individual who puts a lower priority on that cushion characteristic.

This document is not a substitute for medical advice.

1. *European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel and Pan Pacific Pressure Injury Alliance. Prevention and Treatment of Pressure Ulcers/Injuries: Clinical Practice Guideline. The International Guideline. Emily Haesler (Ed.) EPUAP/NPIAP/PPPIA: 2019.*
2. *www.wheelchairstandards.com*
3. *https://www.permobil.com/clinical-research-1/research-library/scientific-report-guidance-to-individualized-cushion-selection-based-on-performance-metrics*

Understanding Cushion Performance Metrics

Skin and Soft Tissue Protection



Which performance metrics may provide insight as to how a cushion protects skin and soft tissue protection*?

ISO testing In a lab setting may include:

IMMERSION
(ISO 16840-2:20218 Clause 11)1

How deeply the indenter sinks into the cushion.

Immersion = Load distribution = Skin and soft tissue protection

CONTACT AREA
(ISO 16840-6:2015 Clause 14 measured by pressure mapping)1

How much contact is being made between the indenter and the cushion.

Contact area = Load distribution = Skin and soft tissue protection

**Keep in mind that no one metric can be used by itself.*

If skin and soft tissue protection are higher priority for an individual, which performance metrics could we analyze?

IMMERSION

> 45mm

loaded contour depth, where a higher depth indicates more distribution of pressure from the bony areas to the soft tissues.

CONTACT AREA

> 71276mm²

the goal is to achieve as much contact area as possible between the individual and the cushion

Why did Permobil categorize the cushions we manufacture based on priority for an individual?

Although ranking cushions side by side seems like the best way to use this data, using absolute values may not represent how it would impact the individual. Through analysis, cushions were categorized into lower, typical, and higher priority for individual needs. If skin and soft tissue protection are a priority for the individual, looking at performance metrics for immersion and contact area may be a good starting point.

Clinical example:

A 70-year-old with Multiple Sclerosis spends their time out of bed sitting in a typical desk chair that does not protect their skin. As their mobility has declined, they have now developed a Stage 3 Pressure Injury. A power wheelchair with power seat functions and skin protection cushion are recommended.

STAGE 1

Related to cushion selection, part of the clinical assessment may include (but not limited to): Skin integrity, nutrition status, transfer methods or level of independence, additional equipment they may use at home.

STAGE 2

Determining the best match for an individualized seating solution, additionally may consider: Temperature management and tolerance, incontinence, comfort, and pressure management techniques.

STAGE 3

Thinking about which performance metrics to use as part of an individualized seating solution: For this example, the goal is **skin and soft tissue protection** when using a power wheelchair. Consider performance metrics such as immersion and contact area may be a priority for that individual. A starting point for cushion selection may include: ROHO® Single Compartment High Profile, Comfort M2 with GlideWear™.

Always be sure to match the seating solution to the individual's needs and goals, considering all aspects of their lives through a comprehensive evaluation.

Cushions manufactured by Permobil which may match an individuals needs for a higher priority for skin and soft tissue protection (based on set-up by manufacturer guidelines[2]):

Immersion

Comfort Embrace, Comfort M2, Comfort M2 with GlideWear, Comfort Saddle, ROHO Single Compartment High Profile, ROHO MOSAIC, ROHO QUADTRO SELECT High Profile

Contact Area

Comfort M2 With GlideWear, Comfort Saddle, ROHO Single Compartment High Profile, ROHO QUADTRO Select High Profile

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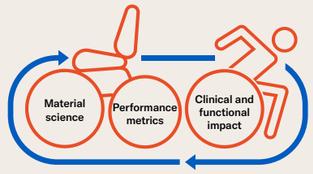
Understanding Cushion Performance Metrics

Stability and Balance



What can performance metrics tell us about stability & balance*?

ISO testing In a lab setting may include:

LATERAL STABILITY
(ISO 15840-13:2021)[1]

A more stable cushion while leaning may help to manage sitting balance.

Average angle of cushion when weight is applied to one side = Support when leaning

HORIZONTAL STIFFNESS
(ISO 16840-2:2018 Annex C)[1]

How much force is required for the indenter to slide forward.

Force needed to move indenter = Stability = Risk of forward movement

**Keep in mind that no one metric can be used by itself.*

If stability & balance are higher priority for an individual, which performance metrics could we analyze[2]?

LATERAL STABILITY

> 4.2°

tilt angle after 60 seconds, where the low angle represents the cushions resistance when leaning to one side

HORIZONTAL STIFFNESS

>161N

peak force, where a higher force indicates more stability

Why did Permobil categorize the cushions we manufacture based on priority for an individual?

Although ranking cushions side by side seems like the best way to use this data, using absolute values may not represent how it would impact the individual. Through analysis, cushions were categorized into lower, typical, and higher priority for individual needs. If stability & balance are a priority for the individual, looking at performance metrics for immersion and contact area may be a good starting point.

Clinical example:

A 25-year-old with tetraplegia has a goal to self-propel a manual wheelchair. With their current cushion, they feel like they are losing their balance when they try to reach for the wheels and move into a posterior pelvic tilt as the day progresses. This makes it more challenging to stay in a MWC all day and is inefficient.

STAGE 1

Related to cushion selection, part of the clinical assessment may include (but not limited to): MAT evaluation for reducible vs non-reducible postural impairments, seated functional reach, wheelchair propulsion test, transfer technique.

STAGE 2

Determining the best match for an individualized seating solution, additional considerations: bladder management, sitting tolerance back support type and height, spasticity, and pressure management.

STAGE 3

Stability and balance is the higher priority for individualized cushion selection. Consider performance metrics such as horizontal stiffness and lateral stability. A starting point for cushion selection may include: ROHO Hybrid Select or Comfort Embrace.

Always be sure to match the seating solution to the individual's needs and goals, considering all aspects of their lives through a comprehensive evaluation.

Cushions manufactured by Permobil which may match an individual's needs for a higher priority for stability and balance (based on set-up by manufacturer guidelines[2]):

Lateral Stability
ROHO Hybrid Select and Comfort Express Comfort Foam

Horizonral Stiffness
Comfort Embrace, Comfort Saddle, Comfort Express Foam

Additional cushions manufactured by Permobil which may match an individual's needs for a typical priority for stability and balance (based on set-up by manufacturer guidelines[2]):

Lateral Stability
Comfort Embrace, Comfort M2, Comfort M2 with GlideWear, Comfort Saddle, ROHO QUADTRO SELECT High profile

Horizonral Stiffness
ROHO Hybrid select, ROHO Mosaic, Comfort M2

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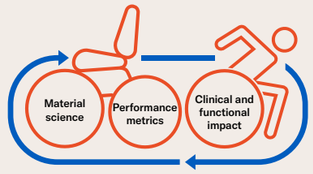
Postural Support and Skin Protection



What can performance metrics tell us about stability & balance*?

ISO testing In a lab setting may include:

OFF-LOADING
(ISO 16840:12:2021)[1]

Allows for immersion and contours around indenter.

Pressure from one area = Pressure on other areas

LATERAL STABILITY
(ISO 15840-13:2021)[1]

A more stable cushion while leaning may help to manage sitting balance.

Average angle of cushion when weight is applied to one side = Support when leaning

CONTACT AREA
(ISO 16840-6:2015 Clause 14 measured by pressure mapping)[1]

How much contact is being made between the indenter and the cushion.

Contact area = Load distribution = Skin and soft tissue protection

**Keep in mind that no one metric can be used by itself.*

If stability & balance are higher priority for an individual, which performance metrics could we analyze[2]?

OFF-LOADING

88%

off-loading of the ischial tuberosities

LATERAL STABILITY

> 4.2°

tilt angle after 60 seconds, where the low angle represents the cushions resistance when leaning to one side

CONTACT AREA

> 71276mm²

the goal is to achieve as much contact area as possible between the individual and the cushion

Why did Permobil categorize the cushions we manufacture based on priority for an individual?

Although ranking cushions side by side seems like the best way to use this data, using absolute values may not represent how it would impact the individual. Through analysis, cushions were categorized into lower, typical, and higher priority for individual needs. If both postural support and skin protection are a priority for the individual, looking at performance metrics for off-loading, lateral stability, and contact area may be a good starting point.

Clinical example:

An 18-year-old with cerebral palsy resulting in right side spasticity, presents with a reducible left pelvic obliquity and a stage 1 pressure injury at the left ischial tuberosity. They use a manual tilt-in-space when not at school, but their current cushion, is not providing enough correction for the obliquity and is not providing enough pressure distribution away from the left ischial tuberosity. This is making it challenging to remain in their wheelchair when returning home from school.

STAGE 1

Related to cushion selection, part of the clinical assessment may include (but not limited to): Skin integrity, effectiveness of pressure management behaviors, lower extremity range of motion and reducibility of left pelvic obliquity.

STAGE 2

Determining the best match for an individualized seating solution, additional considerations: equipment being used at school, sleeping position, back support, recent changes in spasticity, upcoming medical or surgical interventions.

STAGE 3

Both postural support & skin protection are higher priority for individualized cushion selection. Consider performance metrics such as off-loading, lateral stability and contact area. A starting point for cushion selection may include: ROHO QUADTRO SELECT, ROHO Hybrid Select.

Always be sure to match the seating solution to the individual's needs and goals, considering all aspects of their lives through a comprehensive evaluation.

Cushions manufactured by Permobil and categorized when and individual requires higher priority both postural support & skin protection (based on set-up by manufacturer guidelines[2]):

Off-loading
ROHO Single compartment low and high profile, Comfort Saddle and ROHO Hybrid Select (depending on indenter size)

Lateral Stability
Comfort Embrace, Comfort M2, Comfort M2 with GlideWear, Comfort Saddle, ROHO QUADTRO SELECT, High profile

Contact Area
Contact Area: Comfort M2 With GlideWear, Comfort Saddle, ROHO Single Compartment High Profile, ROHO QUADTRO Select High Profile

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