INVACARE® MATRX®

CLINICAL SEATING & POSITIONING GUIDE

matrx® SEATING SERIES

INVACARE® Yes, you can.®

Clear and comprehensive clinical tool that highlights the most commonly seen postural asymmetries with potential solutions designed for function and comfort.

Retired Marine Corps Staff Sgt. Ronnie Jeffrey Jimenez is a medal-winning hand-cyclist and swimmer. He encourages fellow disabled veterans to give adaptive sports a try. "It's great to be able to compete again and have fun," Staff Sgt. Jimenez said. "You can do anything your heart desires despite your injury, disability or sickness." When he isn't competing, Staff Sgt. Jimenez stays active using his küschall® K-Series *attract*™ Wheelchair with Invacare® Matrx® Libra™ cushion and MX2 Back.

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Stephanie Royster is Ms. Wheelchair Ohio USA 2017.

She is currently working toward her Bachelor's in Psychology and enjoys modeling, skiing, kayaking, and painting in her free time. Stephanie is very active in her community with her fundraising efforts. *"My community has done so much for me and I strive to give back!"* she said.

QUICK REFERENCE - OVERVIEW

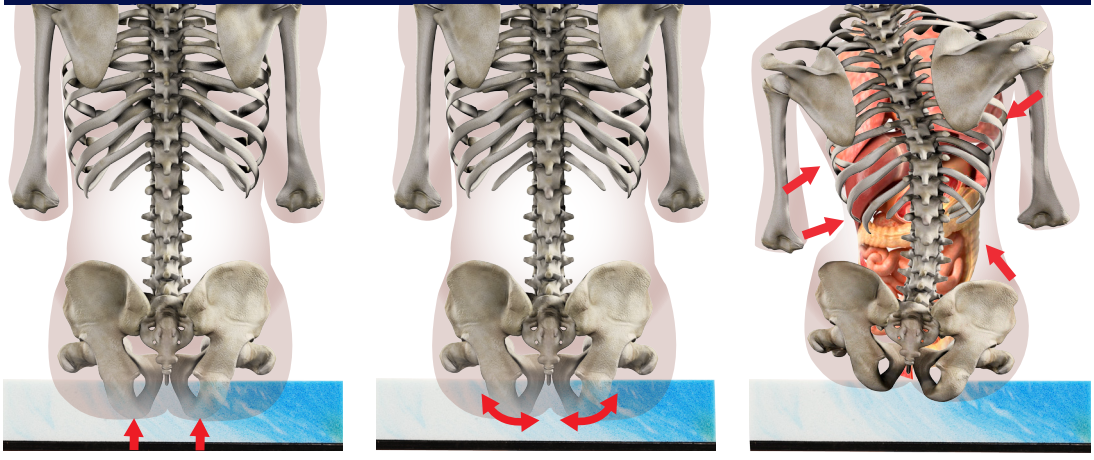
INVACARE MATRX SEATING OBJECTIVES

- Facilitate postural stability while allowing purposeful movement to promote effective function and support healthy resting postures.
- Respect 3 dimensional anatomical shapes, working to match contours for optimal support and pressure redistribution.
- Wherever possible, support postures from within the contours of the seating system in order to maintain skin integrity and to promote stability, balance and function, complemented with additional external components as needed.

INVACARE MATRX GUIDING PRINCIPLES

- The effect that seated posture has on breathing and swallowing should be a primary concern.
- Long term sitting can cause secondary complications such as tissue trauma, back and neck pain, postural deformities and joint contractures.
- A comprehensive evaluation, including a physical assessment in both supine and sitting, is the foundation of all effective seating solutions.
- The position of the pelvis directly impacts the spine, which in turn influences the position of the head and extremities.
- The pelvis is the foundation for seated function and the PSIS (posterior superior iliac spine) must be supported in order to achieve postural control.
- Determining if a posture is fixed or flexible is vital for selecting appropriate seating solutions.
- The opportunity to trial seating solutions in static and dynamic situations is important for identifying the most effective overall seating solution.

EXTERNAL FORCES



PRESSURE

A vertical force that occurs at a 90° angle.

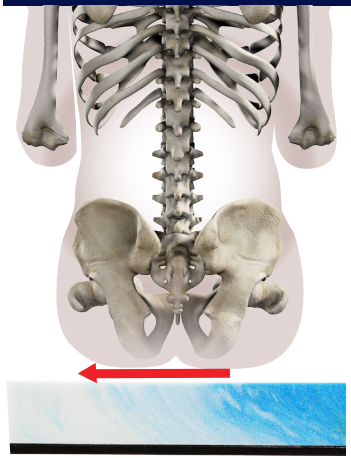
SHEAR

Parallel forces, sometimes described as stretching forces occurring within the tissues near bony prominences.

COMPRESSION

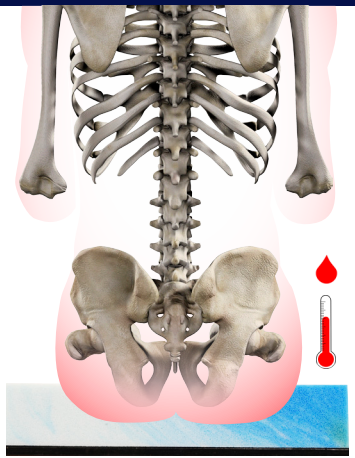
Postural collapse that can impede the function of the internal organs.

EXTERNAL FORCES



FRICTION

The resistance that arises when one surface rubs against another.



TEMPERATURE/MOISTURE

Raised body temperature and higher humidity that can contribute to tissue damage.

CUSHION DESIGN FEATURES

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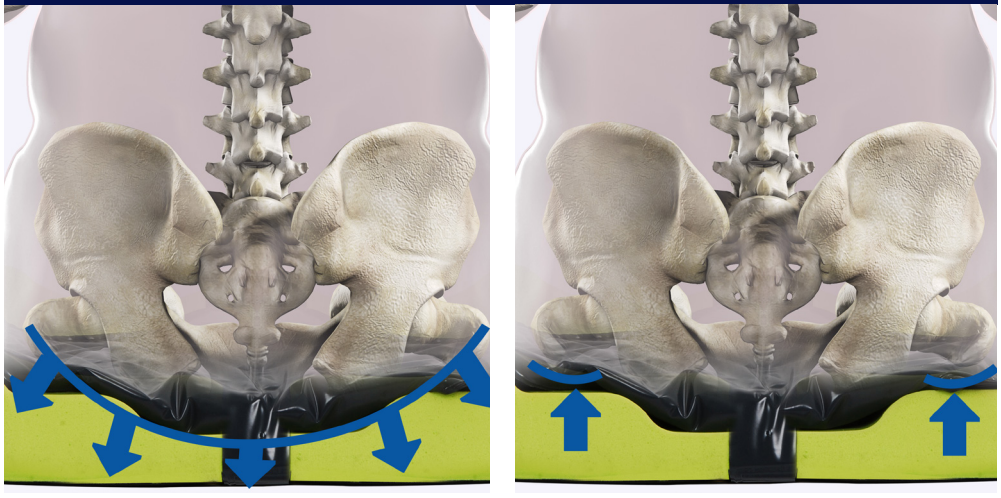

IMMERSION

Maximizes surface contact area in order to reduce peak pressures.

Pressure = Force/Area.

OFF-LOADING

Transfers forces away from the ischial tuberosities with greater weight bearing on the trochanters, hips and thighs.

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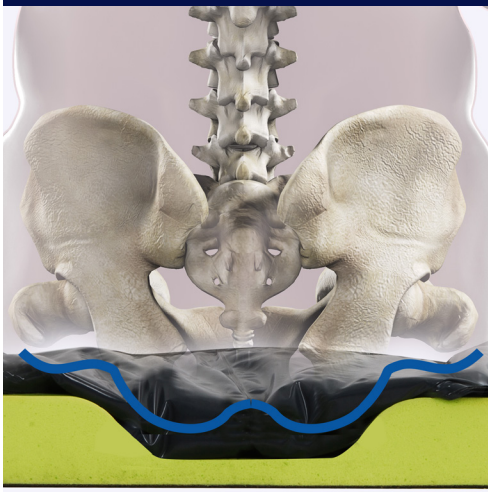

ENVELOPMENT

Fluid sac completely surrounds the bony prominences, even during position changes.

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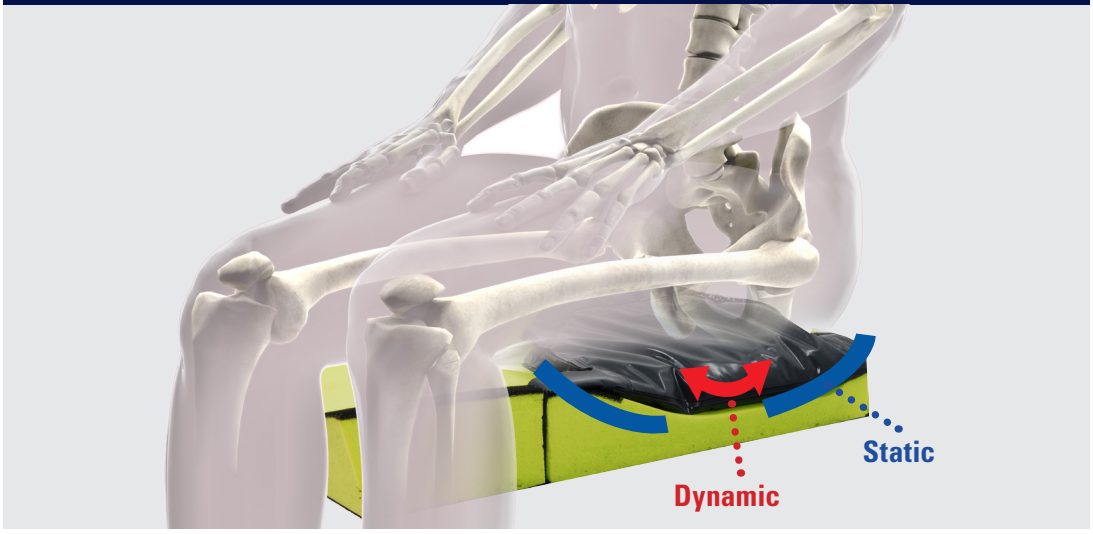

SHEAR MANAGEMENT

Static: Support surface contour that prevents sliding and downward migration of the pelvis.

Dynamic: Flow of materials surrounding the bony prominences during functional activities, wheelchair propulsion, accommodating movement within a specific range.

MATRX - UNIQUE DESIGN

PELVIC STABILITY

Contouring of the pelvic well provides lateral trochanteric support and anterior/ posterior pelvic stability, promoting spinal extension for improved upper extremity function, head control and physiological function. Adjustable rigid back support with contact at PSIS to maintain optimal pelvic position.

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ANTERIOR (FRONT) WEDGE(S)

- Use on both sides to help prevent sliding
- Use on one side only to facilitate foot contact on the low side and foot support on the high side *eg. Hemiplegic client*
- Can be used to accommodate hip flexion limitation

TAPERED WEDGE(S)

- Use under front corner to encourage adduction
- Use under rear corner to address pelvic obliquity

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LATERAL (SIDE) WEDGE(S)

- Can be used to create deeper contour

ABDUCTOR

- Promotes abduction of thighs

SUPPLEMENTAL FLUID SAC

- Secure by threading on to lateral strap of fluid overlay and positioning on trachanteric shelf (not in well)
- Can be used to address pelvic obliquity, alone or in combination with tapered wedge, or bilaterally to create deeper contour

POSTERIOR PELVIC TILT WITH KYPHOSIS

POTENTIAL CAUSES

Wheelchair Fit

Seat depth too long/short

Foot support position

No support for PSIS

In manual wheelchair, location of rear wheel not optimal for reach

Seat-to-floor height too high/low for foot propulsion

Clinical

High or low tone in trunk

Lacks true 90 degrees of hip flexion

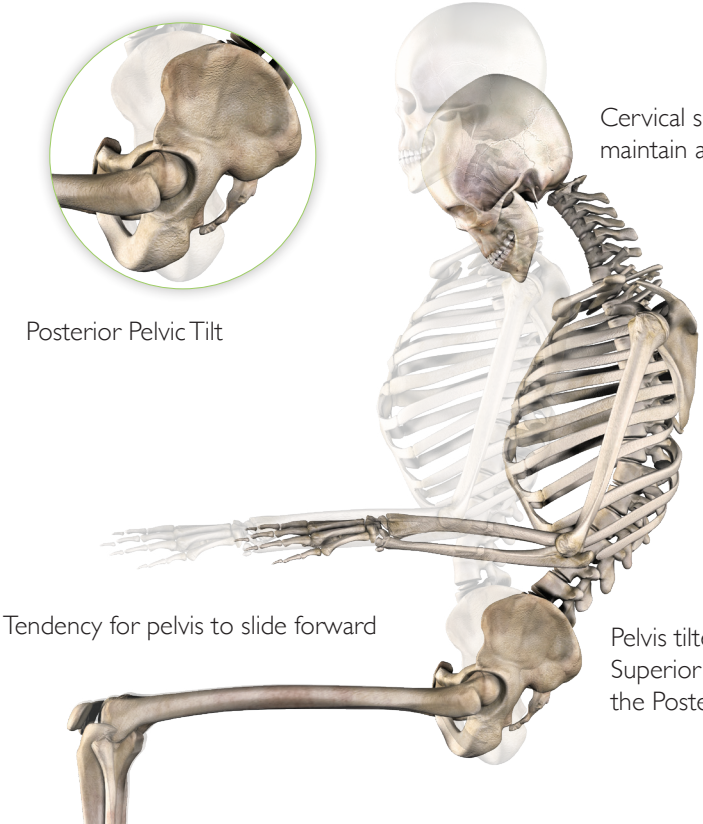
Weak abdominals/back extensors

Shortened/tight hamstrings

Assumes position for increased postural stability

CLINICAL PRESENTATION

Posterior Pelvic Tilt



Cervical spine may hyper-extend to maintain a functional visual field

Scapula may protrude posteriorly

Flattened Lumbar Spine and increased Thoracic Kyphosis ("C" shape Thoracic curve)

Tendency for pelvis to slide forward

Pelvis tilted posteriorly with the Anterior Superior Iliac Spine (ASIS) higher than the Posterior Superior Iliac Spine (PSIS)

POSTERIOR PELVIC TILT WITH KYPHOSIS

POTENTIAL SOLUTION - FLEXIBLE POSTURE

Consider anterior chest support

Consider postural support tray

Trial contoured cushion to help stabilize the pelvis in a neutral position

Firm back support that stabilizes from the PSIS up to slightly above the apex of the kyphotic curve

Place pelvic positioning belt beneath the ASIS with line of attachment below the pelvis 45-60 degrees

POTENTIAL SOLUTION - FIXED POSTURE

Use tilt to achieve a more upright position and improve functional visual field/head position

Provide a contoured back support to match shape of spine

If spinal process or ribs are prominent, increase backrest depth for greater immersion

Contoured cushion to support the pelvis

For a unilateral limitation in hip flexion, modify the cushion to split the sagittal seat angle to accommodate and try to achieve a level pelvis

ANTERIOR PELVIC TILT WITH HYPERLORDOSIS

POTENTIAL CAUSES

Wheelchair Fit

Back support too upright

Excessive lumbar contouring

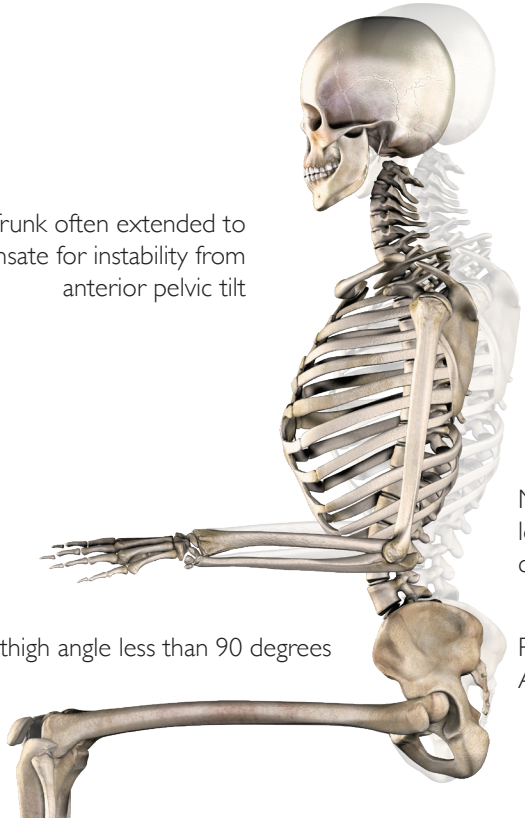
Clinical

Tight quadriceps/hip flexors/paraspinal muscles

Weak abdominal musculature

Obesity

CLINICAL PRESENTATION



Trunk often extended to compensate for instability from anterior pelvic tilt

May present with shoulder retraction

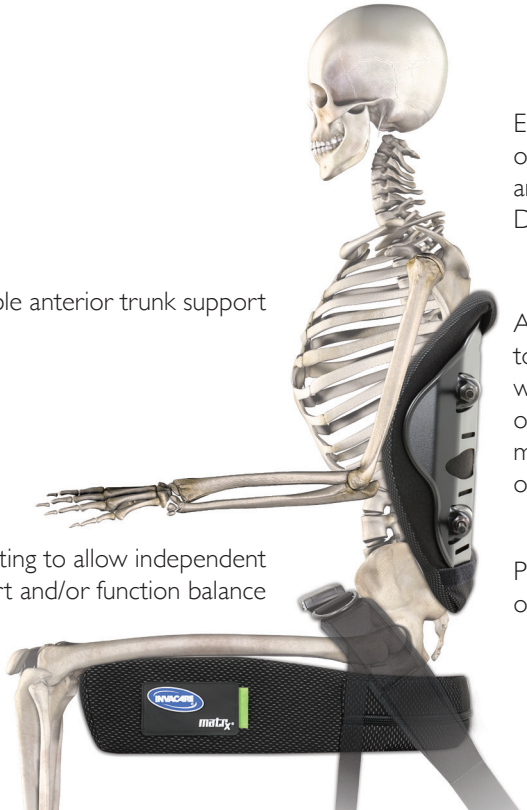
May present as exaggerated lumbar lordosis and result in decreased contact with the back support surface

Pelvic to thigh angle less than 90 degrees

Pelvis tilted anteriorly (forward) with ASIS lower than the PSIS

ANTERIOR PELVIC TILT WITH HYPERLORDOSIS

POTENTIAL SOLUTION - FLEXIBLE POSTURE



Each client will differ in preference of sagittal seat and back support angles, especially those with Muscular Dystrophy and Spina Bifida

Possible anterior trunk support

Assess small incremental changes to seat slope, angle adjustment of wheelchair back frame and/or the angle orientation of the back support to move the pelvis and spine into a neutral orientation

Early use of powered seating to allow independent adjustment for comfort and/or function balance

Provide back support at level of PSIS to reduce lordosis

POTENTIAL SOLUTION - FIXED POSTURE

Lumbo-sacral insert can be added to increase contact with the spine

Angle adjustable back support

Angle rear of the seat lower than the front to balance trunk over the pelvis

POTENTIAL CAUSES

Wheelchair Fit

Sling or stretched seat upholstery
Seat width too wide and/or arm supports too low to support upper extremities
Cushion does not provide effective support for greater trochanters
Wheelchair seating angles and/or foot support position does not accommodate hip range limitations
Power wheelchair joystick or manual wheelchair rear wheel location not optimal for reach
Back support too wide

Clinical

Asymmetrical pain or discomfort
Asymmetrical Tonic Neck Reflex (ATNR)
Asymmetrical muscle tone/weakness in trunk and/or lower extremities
Limitations of hip flexion, abduction, adduction, internal or external rotation
Structural bony deformity in spine or surgery
Asymmetrical upper extremity strength with manual propulsion

CLINICAL PRESENTATION

The obliquity is referred to by the lower side of the pelvis. The spine is influenced by the oblique pelvis, resulting in a scoliosis. The spinal curve will be convex on the oblique (lower) side of the pelvis

One shoulder often elevated on the oblique side lower/weight bearing side

Increased risk of pressure ulcer on the oblique (lower) side

One side of the pelvis is lower then the other notably at the ASIS or PSIS

PELVIC OBLIQUITY AND SCOLIOSIS

POTENTIAL SOLUTION - FLEXIBLE POSTURE

Lateral supports

Lateral supports

- Ensure lateral depth is deep enough to support the lateral trunk. Lateral trunk supports can be used to provide either 3 or 4 key points of control to support or minimize progression of scoliosis
- Alternate approach - Deep contoured back support with lateral contour positioned to support ribcage
- If flexible, build up the cushion under the lowest ischial to encourage a level pelvis

POTENTIAL SOLUTION - FIXED POSTURE

Ensure lateral depth is deep enough to support the lateral trunk

If fixed, build up support under the highest ischial tuberosity to increase weight bearing on high side

Foam in Place Kit may be used for additional support for mild to moderate postural asymmetries

A contoured back with integral lateral support

PELVIC ROTATION

POTENTIAL CAUSES

Wheelchair Fit

Poor wheel placement on manual chair

Seat-to-floor height too high for foot propulsion

Clinical

Limited hip flexion, abduction, adduction

Leg length discrepancy may be caused by dislocated or subluxed hip

Unequal buttock/thigh depth, leg length discrepancy

CLINICAL PRESENTATION

One ASIS and therefore hip is further forward in the seat than the other

One hip is abducted and the other adducted

One knee may appear further forward in the presence of a leg length discrepancy or dislocated hip joint

PELVIC ROTATION

POTENTIAL SOLUTION - FLEXIBLE POSTURE

Align pelvis in neutral and accommodate asymmetrical lower extremity posture

Use a pelvic positioning belt to bring hips back in alignment

In order to maintain head and shoulder in a neutral position for function, you may need to maintain some asymmetry in the pelvis. In this case, use an anterior trunk support on the forward side

POTENTIAL SOLUTION - FIXED POSTURE

Contoured back support rotated to accommodate any mild to moderate trunk rotation to support the spine and distribute pressure

Accommodate limited hip flexion by opening seat to back angle

If present, measure the leg length difference. Order cushion for longer leg length and specify amount to cut-back on shorter side

HIP ABDUCTION

POTENTIAL CAUSES

Low or high tone

Surgeries, LE Abduction due to excessive abdominal tissue

Inadequate seat depth

Movement of the femur away from midline

Can be unilateral or bilateral

Lower extremities are separated further apart from neutral

HIP ADDUCTION

POTENTIAL CAUSES

Sling upholstery without solid seat insert

Low or high tone, decreased range of motion and/or strength of hip abductors

Movement of the femur toward the midline

Can be unilateral or bilateral

POTENTIAL SOLUTION - FIXED POSTURE

HIP ABDUCTION

Flexible: Try to align femurs in neutral using contoured cushion

Try distal lateral thigh supports

Fixed: Accomodate with custom contoured seating

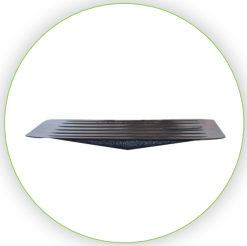
HIP ADDUCTION

Flexible: Use seat ridgidizer or solid seat pan

Try distal medial thigh support or contoured seating

Fixed: Accommodate with custom contoured seating

Contoured Cushion to align lower extremities



Cushion ridgidizer contoured to eliminate "hammock effect" of sling upholstery

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