

Objective Analysis of STAR Cushions Goals

The effectiveness of a cushion outcome is directly linked to the anticipated goals.

The primary goals for the STAR cushion Range would be as follows:

STAR Standard Air	STAR Stabil Air	StarLock
Immersion & envelopment	Immersion & envelopment	Immersion & envelopment
Increased redistribution area	Increased redistribution area	Increased redistribution area
Reduced peak pressures	Reduced peak pressures	Reduced peak pressures
Postural stability	Postural stability	Postural stability
	Bottoming out protection	Postural correction
		Pressure free zones

INTERFACE PRESSURE TESTING

Interface pressure measurement is an increasingly common tool used to judge a cushion's ability to manage pressure over bony prominences. The most common interface pressure measurement systems comprise a series of sensors configured into a mat that interfaces into a computer, which then produces a digital profile of the client's seated pressure distribution.

There is a qualitative relationship between interface pressure and the incidence and time to development or healing of Pressure Injuries 1.

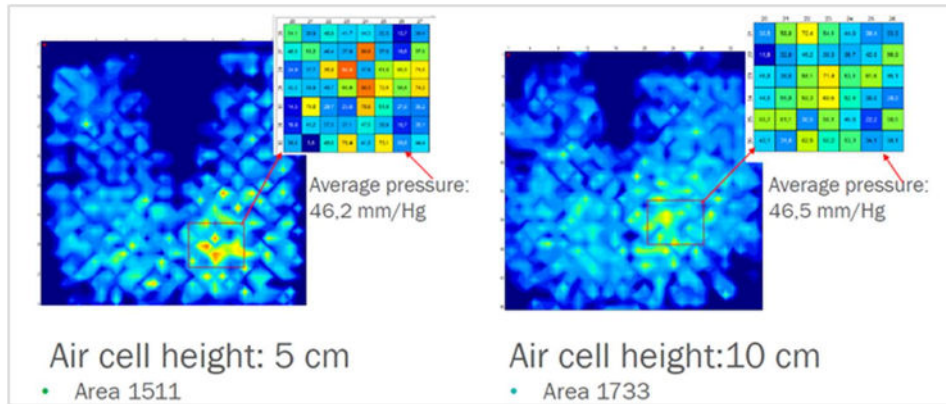
Interface pressure mapping can be used to reinforce cushion effectiveness and to provide education to the client on the effects of sitting on the cushion that is ultimately chosen 2.

Bradley et al 3 determined that used on a firm chair the Multi Cell Air Cushion performed better in interface pressure effectiveness than a single bladder air cell cushion, foam, dry gel, gel/foam, gel or no cushion.

INCREASED PRESSURE REDISTRIBUTION AREA

Increased immersion and envelopment facilitate a larger surface area or pressure redistribution area, increasing the breadth of skin used to distribute the gravitational body weight (force) in sitting.

There is extensive literature supporting the significance of load distribution to pressure injury risk. Immersion and envelopment are representative of the potential for load distribution. The standard test methods have been shown to differentiate performance levels of a range of available products and therefore should be a primary consideration for pressure injury prevention and treatment 4.



The 10cm high STAR cushion facilitated an increased surface area of 1733cm² over the 5cm cushion with 1511cm² surface area.

This finding demonstrates that increased cushion depth results in increasing surface area available to support the force of the body.

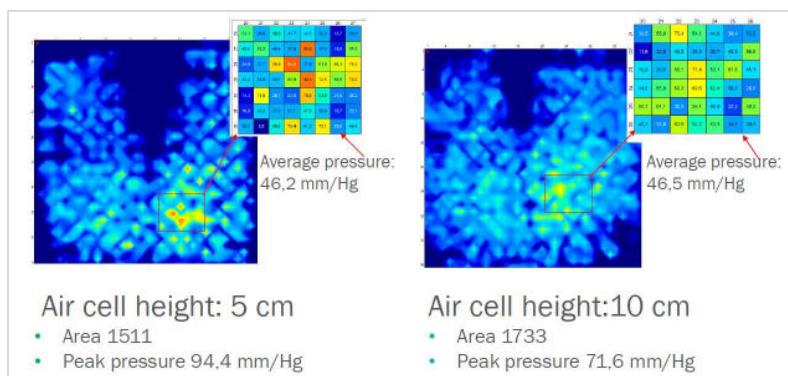


REDUCED PEAK PRESSURES

The peak surface interface pressure is the highest pressure over a small contact area (usually over bony prominences). The average surface interface pressure is calculated by the computer and depicts the full-body surface average interface pressure. The pressure redistribution is the peak pressures over a small area being dispersed or redistributed over a larger area in order to relieve higher pressure areas.

Reduced Peak pressures are attributed to distribution of a load across a greater surface area.

Pressure equals force divided by area ($P=F/A$). The equation shows that pressure is directly proportional to force, but inversely proportional to area. At a constant area, pressure increases as the magnitude of the force applied increases. Conversely, with an increasing area exposed to the same force, the pressure will be reduced.



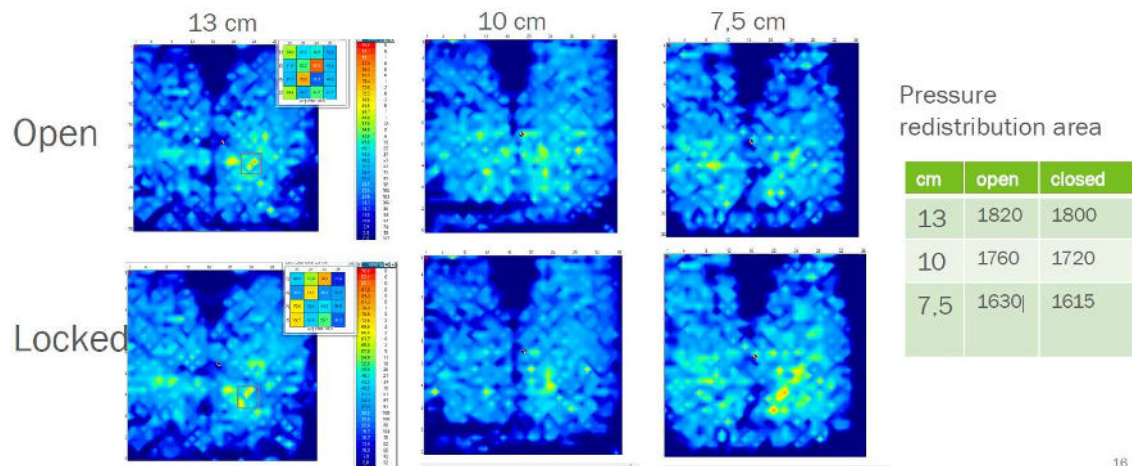
These results demonstrate that increased pressure redistribution area and consequent reduction in peak pressure is associated with an increased cushion depth.

As such the peak pressures recorded with the 10cm cushion are less than the 5cm cushion directly associated with increased immersion and envelopment providing a greater surface area.

AVERAGE PRESSURE

Maintaining average pressure readings is indicative of the validity of the two comparable measurements under varied circumstances. It ensures the user and other environmental factors are kept standard throughout the testing.

Pressure Redistribution:

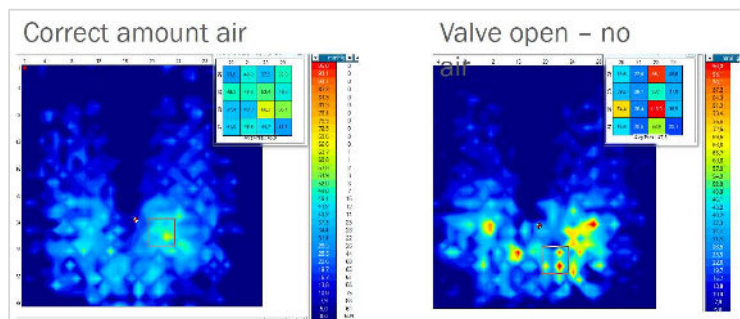


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Increasing cushion depth increases immersion and envelopment demonstrated by larger pressure redistribution area. This remains correct when the multizoned Starlock cells are open or locked.

These findings highlight that the use of the STARlock mechanism to lock sitting position/posture does not compromise the immersion or envelopment qualities of the cushion when loaded with a body.

BOTTOMING OUT



STAR Stabil-Air System assists in mitigating the effect of a poorly maintained Air Cell Cushion. With the Cushion valve opened, draining of air, some pressure care qualities are maintained by use of the contoured inner cell foam core.

COVER EFFECT

The addition of a cushion cover can impact on the outcomes of pressure redistribution if not designed to maximise the therapeutic benefits of the internal cushion.

	Without Cover	With Cover
STARlock 5cm	Avg Pres. 27,8 Peak Pres. 83,8 Min Pres. 5,0 Area (cm ²) 1288,71	Avg Pres. 29,5 Peak Pres. 78,1 Min Pres. 5,0 Area (cm ²) 1311,29
STARlock 10cm	Avg Pres. 26,9 Peak Pres. 68,9 Min Pres. 5,0 Area (cm ²) 1553,23	Avg Pres. 28,1 Peak Pres. 58,1 Min Pres. 5,0 Area (cm ²) 1487,1
STARlock 13cm	Avg Pres. 27,9 Peak Pres. 80,4 Min Pres. 5,1 Area (cm ²) 1704,84	Avg Pres. 26,8 Peak Pres. 69,2 Min Pres. 5,0 Area (cm ²) 1704,84

This allows for the conclusion that the addition of a cushion cover may minimally alter the cushion surface contact area with the body, however peak pressures are in fact minimised with use of the cushion cover.

Summary:

All STAR air cell cushions have excellent properties to support the healing process of Pressure Injuries in all categories and for prevention. The higher the cells, the better pressure redistribution properties. A stable sitting position is important to minimise the risk for shear and maximise sitting tolerance.

The selected cushion should support and facilitate daily activities and take into account the user's entire life situation. When selecting a seat cushion, supplementary instructions for pressure redistribution, total offloading and recommended sitting time / day are also important parameters to take into account.

A therapeutic and positioning cushion should be prescribed by an experienced Therapist and be preceded by a comprehensive risk analysis including use of a validated risk assessment tool (Waterlow, Braden, Norton).

Product ↓	Reduced risk for tissue deformation	Positioning*	Stability	Improved sitting tolerance
StarLock 5"/13 cm **	* * * * *	* * * * *	* * * * *	* * * * *
StarLock 4"/10 cm	* * * *	* * * *	* * * *	* * * *
StarLock 3"/7,5 cm	* * *	* * *	* * * *	* * * *
StarLock 2"/5 cm	* *	* *	* * *	* * *
Standard Air 4"/10 cm	* * * *	* *	* *	* * * *
Standard Air 2"/5 cm	* *	*	* *	* *
Stabil Air 3"/7,5 cm	* * *	* * *	* * *	* * * *

A stable position facilitates activity and is essential for pressure ulcer prevention and treatment. The STAR Cushion range specifically focuses on stability as an adjunct to a holistic pressure care program.

Product	Compartments	Stability	Properties
StarLock	Locks the air flow between each cell	Corrective	A highly stable, individually adjusted seat position <ul style="list-style-type: none"> Provides excellent pelvic - thigh stability and correction, also for users with spasticity Provides excellent pelvic - thigh stability adjusted for foot propulsion Pain-sensitive areas can be totally off loaded by blocking single air cells
StabilAir	1	Concealed	Built-in soft foam cylinders adapted in height to provide an anatomical shape <ul style="list-style-type: none"> Adapted to support a symmetrical seating position To compensate for pelvic obliquity, the cushion can be supplemented with a wedge applied directly to the underside of the cushion with self-adhesive Velcro Easy setup and handling
Standard Air	1	Dynamic	4"/10 cm cell height: Stimulates the buttock muscles and improves sitting tolerance for immobile users in multifunctional wheelchairs 2"/5 cm cell height: Excellent preventive pressure ulcer and pain relieving properties. Less dynamic than with 4"/10 cm cell height <ul style="list-style-type: none"> Easy setup and handling

Postural support is an additional benefit of The STAR Cushion range. This can be used to facilitate correction of flexible postural abnormalities or to provide support, stability and pressure care for those with fixed postural deformity.

Product →	StarLock* Corrective stability	StabilAir Concealed stability	Standard Air Dynamic stability
Issue ↓			
Posterior pelvic tilt	* * * * *	* * *	*
Pelvic obliquity	* * * * *	* *	* *
Pelvic rotation	* * * * *	* *	*
Prominent IT:s	* * * * *	* *	* * *
Pain	* * * * *	* * *	* * *
Spasticity	* * * * *	* *	* * *
Immobile multifunctional wheelchair users	* * * * *	* * * *	* * * * *
Simplicity Adjustment/handling	* * *	* * * * *	* * * * *

References:

1. Reenalda J, Jannink M, Nederhand M, et al. Clinical use of interface pressure to predict pressure ulcer development: a systematic review. 2009. In: Database of Abstracts of Reviews of Effects (DARE): Quality-assessed Reviews [Internet]. York (UK): Centre for Reviews and Dissemination (UK); 1995.
2. Alexander TA, Nelson LM. An Atlas of Orthoses and Assistive Devices (Fifth Edition), 2019
3. Brealey G, James E & Hay K. Pressure cushions in a home environment: How effective are they at reducing interface pressure and does the chair surface count? Wound Practice and Research Volume 25 Number 4 December 2017
4. Morello S, Jordan R, Lafleche P, Brienza D. Immersion and Envelopment Performance Tests. Immersion & Envelopment Small Working Group Members, Support Surface Standards Initiative, National Pressure Injury Advisory Panel, 2019
5. Teleten O, Kirkland-Kyhn H, Paine T, Ballesteros RJ. The Use of Pressure Mapping: An Educational Report. Index Wounds 2019;31(1):E5-E8.