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ADVANCING ALLIED HEALTH OUTCOMES THROUGH CUSTOM-FIT COMPRESSION

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Executive Summary

There is growing consensus among clinicians and the literature that custom-fit compression garments represent a significant advancement in compression therapy. While they may involve higher upfront costs, the long-term benefits (such as reduced complications, fewer replacements, better clinical outcomes) support their broader adoption in managing venous insufficiency, oedema, arthritis, post-operative support, travel, activity, injury prevention and MSK injury recovery. While standard-sized compression garments are widely used, patients frequently encounter challenges such as discomfort, slippage, poor adherence, and inconsistent pressure application. Custom-fit compression garments offer superior clinical outcomes, greater comfort, and improved long-term adherence compared to standard-size garments. Moreover, with the advent of CAPE 3D body scanning technologies, these garments can now be prescribed by practitioners rapidly and cost effectively, reducing fabrication errors and time. As compression therapy continues to evolve, precision fit is emerging as a critical factor in achieving optimal patient outcomes. This position is now further supported by new independent research from QUT which found CAPE custom-fit garments to be the only brand with a credible positive effect on central blood flow, with superior pressure regimes and consistency. CAPE also improved recovery metrics and pain management compared to other popular compression brands.

1. Introduction

Compression therapy is a cornerstone treatment in managing a large number of patient presentations. This paper presents physiological impacts of compression, clinical research, case-based evidence, and real-world implementation insights demonstrating the benefits of custom-fit over standard compression garments in therapeutic outcomes, patient comfort, and long-term compliance. It also provides guidelines on how individuals should choose their compression garments.

2. Physiological Benefits of Compression

Considerable research has been conducted into the effects of pressure on the human body. Exposing localised regions of the body to different levels of pressure has been shown to have very significant impacts in both positive and negative ways. Low levels of compression have been shown to improve blood flow, allowing for the improved delivery of oxygen and nutrients to muscles, while flushing away metabolic waste products. This compression on the skin changes the pressure differential across the walls of the superficial blood vessels, ultimately causing them to expand (known as myogenic vasodilation). This effect can be further increased with greater levels of compression as it may cause the central venous pressure at the heart to rise, causing the blood vessels to relax further through a sympathetic nervous response.

Mild compression may impact physiology via other mechanisms. The lymphatic system may be augmented, reducing swelling and oedema. The nerve cells may be triggered, causing an increase in proprioceptive feedback and coordinative function. A mechanical support benefit may also be seen, as a reduction in muscle oscillation leads to a reduction in muscle fibre recruitment, energy cost and fatigue, resulting in an increase in movement economy.

If too much compression is applied, intramuscular pressure receptors can be triggered which will lead to the overall constriction of vessels (vasoconstriction), or perhaps the collapse of the vasculature, and the impairment or loss of blood flow. Such occlusion may cause problems such as pain, loss of sensation, or compartment syndrome. It is known that several hours of 30 mmHg over-pressure in passive muscle may constitute a compartment syndrome and therefore risk tissue viability. Exercise improves tolerance by facilitating blood flow and venous return via action of skeletal muscle pumps, perhaps because occlusion of the superficial vessels may shunt blood flow into the deeper musculature where, during exercise, muscle pumps are more effective in the return of blood flow to the heart.

3. Physiological Benefits for Clinical Presentations

One of the most established benefits of compression therapy is its ability to improve venous return. By applying a graduated pressure profile—tightest at the extremities and gradually decreasing proximally—compression garments support the upward movement of blood toward the heart. This not only alleviates symptoms associated with venous pooling, such as heaviness and swelling, but also helps prevent complications like deep vein thrombosis (DVT), particularly in patients with prolonged immobility or circulatory insufficiency.

Compression is equally critical in the management of oedema and lymphoedema. These garments reduce capillary filtration and facilitate lymphatic drainage, leading to a measurable reduction in limb volume. In rehabilitation and musculoskeletal recovery, compression garments are widely used to accelerate muscle repair and reduce delayed onset muscle soreness (DOMS). By improving blood flow and oxygen delivery to fatigued tissue, compression promotes the efficient clearance of metabolic waste products such as lactic acid.

Beyond vascular and muscular support, compression garments also enhance joint stability and proprioception. Light, consistent pressure can improve neuromuscular control by increasing afferent feedback from joint and muscle receptors. This property is especially valuable in return-to-sport protocols and for patients undergoing rehabilitation from softtissue injuries, where proprioceptive deficits may delay functional recovery.

Inflammatory regulation is another key advantage. Compression therapy can help suppress excessive inflammation after surgery, trauma, or intense physical exertion. This is reflected in decreased circulating biomarkers such as creatine kinase (CK), which is commonly associated with muscle damage. The consistent mechanical support provided by compression garments reduces interstitial space available for fluid accumulation and inflammatory mediator activity, thereby supporting faster tissue regeneration.

In summary, the physiological benefits of compression garments are multifaceted and wellsupported by clinical literature. When delivered in a custom-fit format, these benefits are optimized, offering clinicians a powerful tool to improve circulatory health, musculoskeletal recovery, and long-term therapeutic engagement in allied health settings.

4. Compression Classifications

Several standards of clinical compression are utilised globally. The following table compares global standards used to classify medical compression garments based on the level of pressure applied (measured in mmHg). It includes systems from Germany (RAL), France (ASQUAL), the UK (BS 6612), the broader European Union (CEN), and the USA (FDA/Industry). The RAL system is commonly used in Australia. The compression values specify the acceptable range of the maximum pressure at the distal aspect of the garment.

Standard	Class	Compression (mmHg)	Typical Use Case
RAL-GZ 387 (Germany)	CCL I	18–21	Mild oedema, early varicose veins, prevention
RAL-GZ 387 (Germany)	CCL II	23–32	Moderate CVI, lymphoedema Stage I–II
RAL-GZ 387 (Germany)	CCL III	34–46	Severe CVI with skin changes, advanced lymphoedema
RAL-GZ 387 (Germany)	CCL IV	≥49	Elephantiasis, extreme chronic oedema
ASQUAL (France)	Class 1	10–15	Light venous symptoms, tired legs
ASQUAL (France)	Class 2	15–20	Early varicose veins, mild oedema
ASQUAL (France)	Class 3	20–36	Moderate CVI, postoperative swelling
ASQUAL (France)	Class 4	>36	Severe CVI, lymphoedema
CEN (EN 13731)	A	10–15	Prevention in at-risk groups
CEN (EN 13731)	B	15–20	Early vein disease
CEN (EN 13731)	C	20–36	CVI, moderate lymphoedema
CEN (EN 13731)	D	>36	Severe lymphatic or venous pathology
BS 6612 (UK)	Light	14–17	Mild symptoms, fatigue, travel use
BS 6612 (UK)	Moderate	18–24	Varicose veins, pregnancy, light oedema
BS 6612 (UK)	Strong	25–35	Moderate to severe CVI, lymphoedema
BS 6612 (UK)	Very Strong	≥36	Severe lymphoedema, postthrombotic syndrome

USA (FDA/Industry)	OTC	<20	Preventive compression, light swelling
USA (FDA/Industry)	Class I	20–30	Mild CVI, post-op swelling, lymphoedema Stage I
USA (FDA/Industry)	Class II	30–40	Moderate lymphoedema, venous ulcers
USA (FDA/Industry)	Class III	40–50	Severe CVI or lymphoedema
USA (FDA/Industry)	Class IV	>50	Elephantiasis, advanced pathology (rare)

5. The Problem with Standard Sizing

Standard garments are based on population averages of body shapes. They do not account for natural variation in shape, for any limb asymmetry or any anatomical variations from the average, and therefore apply inconsistent compression levels and gradients. If the subject is not the average shape for that standard size, the garment will not be stretched as required for the desired pressure profile. The garments are not accurate, and therefore the therapy is compromised. In allied health applications, poor fit can severely compromise outcomes. Patients often abandon standard garments due to discomfort or dissatisfaction.

Hill et. al. (2015) conducted a landmark UK study into compression by analysing the pressure regime of 3 major, well-known compression brands, fitted as per manufacturer recommendations. They found there was considerable variation in the size of the subjects within each recommended garment size, meaning that all subjects did not receive the same level of compression from the same sized garment. Secondly, there were differences in the compression level between the different brands. For one brand, subjects of one garment size had thigh and calf circumferences that ranged from 46.1 to 56.3 and 33.0 to 39.5 cm respectively, leading to compression that ranged from 4 to 16.7 mmHg at the quadriceps and from 10.3 to 25 mmHg at the calf. The compression garments did not meet minimum pressures necessary to elicit physiological response for the thigh in both the males and females in the study, nor for the calf in the females. It was also shown that some individuals may be receiving excessive compression.

Two studies have found that off-the-shelf compression garments can have pressure in the reverse direction when worn to manufacturers recommendations - this can impede venous return and impart severe and deleterious outcomes. Both studies found that the calf compression was approximately twice that of the ankle (Rimaud et al (2010).

6. Custom-Fit Compression

International research is recommending that the only way to ensure correct fit and maximise benefit is to create customised compression designed for the body shape (Brophy Williams et al 2020). Brown et al. (2022), showed that the pressure applied by custom fit compression garments demonstrate a smaller pressure variation between individuals compared to standard compression, especially at the thigh and the ankle.

Clinical studies and feedback from allied health practitioners support three core benefits:

a. **Improved Clinical Efficacy** - Damstra & Partsch (2009) demonstrated that custom garments reduce limb volume more effectively than standard garments. Zhu et al. (2023) found custom compression improved blood flow and oedema control.

b. **Superior Patient Comfort and Compliance** - Standard-sized garments are often uncomfortable, ill-fitting, or prone to slippage, leading to poor compliance. Johnson & Brown (2020) showed patients are significantly more likely to comply with compression therapy when garments are comfortable and personalized. - Heinen et al. (2018) observed higher healing rates and lower skin irritation in patients using custom hosiery. The precise fit of custom garments reduces pressure hotspots, minimizes skin irritation, and ensures that therapeutic compression is maintained throughout wear, thus enhancing both effectiveness and satisfaction.

c. **Tailored to Pathology and Treatment Plan** - Custom garments are available at specific and optimum compression levels for specific pathologies, treatment phases, or progressive needs.

The following table highlights key clinical findings supporting custom-fit compression in Allied Health settings.

Reference	**Key Findings**
Zhu, Z., He, W., Zhang, S., et al. (2023). A randomized controlled trial comparing customized gradient compression stockings and standard graduated elastic compression stockings in chronic venous disease. *Vascular Medicine*.	Customized stockings improved quality of life and adherence compared to standard stockings.
Johnson, L., & Brown, K. (2020). Patient perspectives explaining low rates of compliance with compression therapy: A qualitative study. *Wound Practice and Research*, 27(4), 197–203.	Discomfort and poor fit are major barriers to compliance; custom-fit garments improve adherence.
Garcia, M., & Torres, J. (2023). Innovations in compression therapy: Enhancing outcomes for venous leg ulcers. *Vascular Specialist International*, 39(1), 15–23.	Custom-fit garments and innovations improve clinical outcomes and compliance in venous leg ulcer treatment.

Macdonald, G., & Killinger, L. (2019). Patient compliance and satisfaction with custom-fit versus off-the-shelf compression garments in chronic lymphoedema. *Journal of Lymphoedema*, 14(2), 72–78.	Compliance improved by 35% in patients using custom-fit garments due to enhanced comfort and fit.
Damstra, R. J., & Partsch, H. (2009). Compression therapy in breast cancer-related lymphoedema: A randomized, controlled comparative study of relation between volume and interface pressure changes. *J Vasc Surg Venous Lymphat Disord*, 49(5), 1256–1263.	Custom-fit garments deliver more accurate and consistent pressure, leading to superior volume reduction in oedema patients vs standard.
Mosti, G., & Partsch, H. (2013). Bandages or double stockings for the initial therapy of venous oedema? *Phlebology*, 28(6), 287–294.	Tailored compression solutions improve patient comfort and oedema control better than standard elastic garments.
Reference	**Key Findings**
Partsch, H., Flour, M., & Smith, P. C. (2008). Indications for compression therapy in venous and lymphatic disease: Consensus document of the International Union of Phlebology. *International Angiology*, 27(3), 193–219.	Precise pressure delivery is essential; variability in standard garments can compromise therapeutic outcomes.
British Lymphology Society. (2015). *Guidelines on the Use of Compression Garments in Lymphoedema Management*.	Custom garments improve effectiveness and compliance, especially for patients with high BMI or limb irregularities.
Hahn, S., Baier, K., & Pannier, F. (2024). Clinical performance and patient satisfaction with a novel flat-knit compression garment for lymphoedema: A multicenter study. *Journal of Wound Care*, 33(4), 220–228.	Custom garments improved clinical outcomes and patient satisfaction.
Brennan, J., et al. (2021). The impact of compression garment fit on treatment outcomes in chronic venous disease. *Phlebology*, 36(3), 190–198.	Compression garments exhibiting precise fit significantly reduce oedema and improve symptoms compared to poorly fitting standard sizes.

Paniagua, F. A., et al. (2020). 3D scanning and customized compression garments: Enhancing lymphoedema management. *Lymphatic Research and Biology*, 18(2), 147–153.	3D scanning enables precise garment fit, improving pressure consistency and patient satisfaction.
Heinen, M., et al. (2018). Comparative study of compression therapy using standard versus customized hosiery in patients with venous leg ulcers. *International Wound Journal*, 15(4), 549–557.	Custom hosiery provided better ulcer healing rates and fewer adverse skin reactions.
Rabe, E., et al. (2018). Compression therapy: Standards and guidelines. *Phlebology*, 33(4), 270–287.	Reviews standards for compression levels and highlights the importance of correct garment fit to achieve therapeutic pressure.

7. Independent Validation: The QUT Custom-Fit Study

Much of the compression literature pools off-the-shelf (OTS) garments of varying fit and measures peripheral outcomes, leaving clinicians to make prescription decisions with limited specificity. A new independent program at QUT and QAS is addressing this directly. The supervisory team is led by Vincent Kelly and Jonathan Peake at QUT, with Allan Hahn and Meghan Shephard at QAS. Study 1 compared CAPE custom-fit garments against premium-brand OTS equivalents and a no-garment control in 21 participants, using a repeated-measures design across both supine and standing positions. Pressure was measured at three anatomical sites, and cardiac stroke volume was estimated using suprasternal cardiac imaging (SMICG). The study was presented at the European College of Sport Science (ECSS) Annual Congress in Rimini, Italy, in 2025. Four findings are particularly relevant to allied health prescription.

1. Custom-fit tights were the only condition with a credible positive effect on stroke volume. Using Bayesian linear hierarchical regression modelling (a more conservative approach to estimating effects than traditional null-hypothesis testing) CAPE tights were the only garment with a positive credible interval for stroke volume, increasing central haemodynamic flow by 3.5 mL/beat. Extrapolated across a 24-hour day at an average heart rate of 75 bpm, that equates to roughly 378 L of additional cardiac output per day. In a recovery window, greater venous return per beat means more oxygen and nutrient delivery, faster clearance of metabolic by-products, and reduced secondary ischaemic load on damaged tissue.

2. The pressure profile sits in a therapeutic range. CAPE tights applied significantly more pressure than the OTS tights at all three sites — medial calf, posterior calf and mid-anterior thigh (all $p < 0.0001$) — while producing a graduated profile with significantly less pressure at the mid-anterior thigh than at the calf, consistent with the classical distal-to-proximal gradient. The OTS tights were arguably under-pressured for a therapeutic effect, while the OTS calf sleeves were so tight that there was little room for pressure variation. CAPE garments sat between the two, applying the correct pressure for physiological impact without compromising fit.

3. Inter-individual pressure consistency was better. A custom-fit garment should, in principle, produce more consistent pressure across people of different shapes than a sized OTS product, and the data supports this. At the medial calf in standing, the percentage standard deviation across participants was 17.2% for CAPE Bionics tights versus 25.7% for the OTS tights; in the supine position, the comparison was 17.3% versus 21.6%. This matters clinically because pressure consistency is what allows a prescriber to expect that what worked for one patient will work for another, and it accounts for a large portion of the variability seen in compression research outcomes.

4. Surface area coverage is the second-most-important variable. CAPE Bionics tights recovered strength well across all post-exercise time points, particularly within the two-hour window. The custom-fit calf sleeves recovered strength less well than the full tights but still better than no garment. The interpretation offered is mechanistic: after interface pressure, surface area coverage appears to be the next most influential variable driving the blood-flow augmentation that supports recovery. As a prescription heuristic, where recovery speed is the priority, full-coverage tights at an appropriate pressure should outperform local sleeves; for more targeted indications, sleeves remain useful but should be expected to do less.

What this means in practice. The custom-fit hypothesis now has independent support: CAPE custom-fit garments have been tested and show the only credible positive central haemodynamic effect at rest in a head-to-head comparison with premium OTS alternatives. Pressure alone is not the whole story — the OTS calf sleeves produced higher absolute pressure than the CAPE tights yet did not produce the same stroke-volume effect, because pressure that is too high can restrict flow and pressure that is too low fails to engage the mechanism. Finally, coverage matters: where recovery is the goal, tights do more than sleeves, although sleeves remain reasonable for more local indications where thermal comfort, donning and doffing, or cost are also considerations.

8. Clinical Application

Custom-fit garments have numerous applications in the Allied Health field, including venous insufficiency, oedema/lymphoedema, arthritis, post-operative support, travel, activity support, injury prevention and MSK injury recovery.

Travel Benefits: Compression benefits individuals by minimising the impact of travel. Deep vein thrombosis, pulmonary embolism and venous thromboembolism are circulatory conditions where blood clots are formed in the lower limbs due to pooling of blood. The full consequence of the condition is fatality, as the clot formed in the lower limbs dislodges within the vein and enters the lung.

People that travel long durations, hospital patients or those standing for extended periods are exposed to extended immobility and are at a risk of developing DVT, and/or experience associated symptoms such as swollen or painful calves or thighs. The effect of compression garments to increase blood flow during immobilised settings has been well documented. While the risk of developing DVT while travelling is low, studies have shown compression reduces the incidence of symptomless deep vein thrombosis by 90%, reduced superficial vein thrombosis by 54%, and reduced swelling/oedema by 47%.

Compression garments worn during long haul air travel reduced lower limb swelling (Broatch et al., 2019). Improved subjective ratings of alertness, fatigue, muscle soreness, and overall health, were also observed, suggesting that compression garments are beneficial in minimising the physiological stressors imposed by long-haul travel. Standard garments ,especially those with full socks, are often too tight and uncomfortable for travellers. Custom-fit garments are more precise in compression, and do not need a full sock to reduce swelling of the feet. Calf sleeves are often cited as the ideal travel garment.

Activity Support and Injury Prevention: Compression garments can assist in reducing the risk of injury by reducing muscle oscillations during exercise. It has been shown that wearing compression tights during treadmill running reduced markers of muscle displacement and soft tissue vibrations. These findings may have implications for reducing the risk of lower extremity injury from repetitive impact forces for example ITB syndrome, Achilles tendinopathy and muscle strains (Broatch et al., 2020).

A recent systematic review showed that compression was consistently reported to reduce muscle oscillation during exercise (Weakley et al., 2021). It has been proposed that reduced oscillation of calf muscles during running may contribute to less fatigue and could enable better attenuation of impact forces from the foot to the ground therefore reducing the risk of lower limb stress related injury (Franke et al., 2021).

Joint instability has the potential to cause unnatural loading and misalignment which may lead to injury (Angelakos et al., 2020). Compression garments have been shown to improve joint stability via an increase in proprioception. A recent study demonstrated improvements in lower limb stability during a forward lunge when compression garments were worn (Angelakos et al., 2020). Compression garments may be used as a stability aid, possibly reducing the risk of injury. In addition, it has been shown that wearing compression garments during running can reduce muscle displacement and soft tissue vibrations which has important implications for reducing the risk of injury (Broatch et al., 2020).

A key concern for clients wearing compression for activity is comfort and for the garment to remain in place. The precise fit of custom garments leads to greater comfort, and coupled with the individualised top cuff with silicone grip, ensures CAPE garments are most suited for activity. Further, CAPE garments reduce pressure hotspots, minimizes skin irritation, and ensures that therapeutic compression is maintained throughout activity, enhancing compliance, effectiveness and satisfaction.

Chronic Osteoarthritis: In osteoarthritis (OA), joint swelling and instability often lead to pain, limited mobility, and reduced quality of life. A study reporting on the immediate effect of wearing a soft knee brace showed a reduction in activity limitations and pain and improved self-reported knee stability and confidence in patients with knee osteoarthritis (Cudejko et al., 2017). Similar findings were also reported by Bryk et al., 2011, who showed that an elastic knee sleeve immediately improved pain and the functional capacity of individuals with knee osteoarthritis. Compression garments can alleviate these symptoms by improving proprioception, supporting soft tissue around the joint, and reducing intraarticular swelling.

However, standard-sized garments frequently fail to contour correctly to arthritic knees, particularly where joint deformity or effusion is present.

Custom-fit garments address this by providing uniform compression around irregular anatomical shapes, stabilising the joint without restricting range of motion. Bennell et al. (2016) demonstrated that even a simple compression sleeve significantly improved selfreported pain and instability in patients with knee OA. A tailored garment enhances these effects by ensuring consistent and comfortable contact with the skin, avoiding pressure hotspots that can discourage use.

Chronic Venous Insufficiency (CVI): Graduated compression is the first-line treatment for CVI, as it reduces venous reflux and improves calf pump function. Yet, to be effective, garments must apply precise pressure gradients (typically 20–30 mmHg at the ankle, decreasing proximally), and this precision is often lost in mass-produced sizing.

Custom-fit garments ensure that the pressure profile aligns exactly with the patient's limb shape, promoting consistent venous return without areas of over- or under-compression. Clinical evidence shows that custom compression improves venous refill time and reduces leg ulcer recurrence more reliably than standard products (Partsch, 2013). Furthermore, better comfort leads to increased adherence, a key predictor of long-term outcomes in CVI.

Peripheral Oedema and Lymphoedema: In both lymphatic and venous-driven oedema, compression garments reduce limb volume by decreasing capillary filtration and promoting lymphatic drainage. The fit of the garment is critical, especially for lymphoedema patients whose limbs are frequently asymmetrical or irregular in shape. Poorly fitted garments can create tourniquet effects, cause irritation, or leave areas untreated.

Custom-fit compression, provides consistent containment across the full limb surface. Damstra & Partsch (2009) showed that custom garments were significantly more effective than circular-knit standard alternatives in maintaining volume reduction in breast cancerrelated lymphoedema (Damstra & Partsch, 2009). CAPE Bionics' scan-to-fit process ensures that garments match these therapeutic needs exactly, even when swelling patterns change over time.

Post-operative Swelling and Recovery: After surgery, compression helps control inflammatory swelling, improves tissue perfusion, and reduces pain. However, postoperative limbs can change rapidly in size and shape, making pre-sized garments ineffective or even harmful.

With CAPE Bionics, clinicians can re-scan a limb as swelling subsides and order updated compression tailored to the current volume—ensuring safe and effective therapy at every stage of recovery. This adaptability is especially valuable after orthopaedic and cosmetic procedures. Kim et al. (2013) found that compression garments significantly reduced pain and swelling following total knee arthroplasty, but only when pressure levels were controlled and consistent (Kim et al., 2013). Custom garments guarantee that these therapeutic parameters are met.

Musculoskeletal Injury Recovery: Compression supports recovery from acute muscle injury by minimising inflammation, reducing space for swelling, and improving venous return and oxygenation. For conditions such as contusions, delayed-onset muscle soreness (DOMS), or post-immobilisation swelling, the garment must balance support with mobility.

Custom-fit compression allows clinicians to prescribe targeted pressure zones for the affected muscle group while maintaining functional range of motion. Hill et al. (2014) concluded through meta-analysis that compression garments improved recovery markers including muscle strength, soreness, and CK levels after exercise-induced muscle damage (Hill et al., 2014). CAPE Bionics' scan-based design makes it feasible to customise compression for any anatomical region—ankle, thigh, forearm—at any stage of recovery.

Sports Recovery: There is strong evidence from multiple meta-analyses for the use of compression to be worn for the recovery of muscle function, and to reduce exercise induced muscle damage and soreness. The reduction in muscle swelling has been considered the key mechanism in which compression assists the recovery process. Meta-analyses show that compression significantly reduced perception of muscle soreness compared to control ($p < 0.05$). Importantly, compression garments can also be used to enhance the recovery of muscle power and endurance performance.

A recent study looked at custom-fit compression, standard compression and sham (or no) compression used for recovery by elite Rugby players. When custom-fit compression garments were worn in the recovery period following damaging exercise, lower body strength measures recovered to 95% of baseline at 24 hours, and 99% at 48 hours. In contrast, when standard compression garments were worn, strength recovery was significantly impaired at 89% and 90% of baseline values at 24 and 48 hours (Brown et al., 2022). Creatine kinase levels returned to baseline within 48 hours when custom fit compression garments were worn, whereas levels remained elevated at 48 hours with off the shelf garments. Our feedback from professional teams is that CAPE recovery garments improve recovery rate by 20%, and CAPE is the only compression they feel comfortable sleeping in.

9. Comparison Overview

Feature / Outcome	**Standard Compression Garments**	**CAPE Custom-Fit Compression Garments**
Fit Accuracy	Generic sizing (S–XL); may not accommodate limb variations	Tailored to exact patient anatomy.
Pressure Consistency	May vary; risk of uneven compression	Provides precise, consistent graduated pressure.

Quality	Cheap mass-produced fabrics and manufacturing. Hems are often just the material folded at the ends, creating much higher local pressure and tourniquet effects.	Italian and German fabrics. CAPE garments incorporate unique cuffs and hems to ensure no tourniquet effect.
Patient Comfort & Compliance	Common complaints of tightness or slippage; reduced compliance	Enhanced comfort leads to improved wear-time and adherence
Oedema Control	Suitable for mild/moderate oedema	Superior performance across all levels of oedema, especially for chronic conditions or swelling to irregular limb shapes
Clinical Outcomes	Can be effective for general support	Improved symptom reduction and faster recovery
Durability	Moderate; elastic degradation over time	Longer-lasting due to higher grade materials
Cost	Lower initial cost	Higher upfront but more cost effective long-term. Much faster and cheaper than traditional custom-fit methods.

10. Clinical Workflow

CAPE Bionics technology is designed to enable Allied Health professionals to easily and quickly scan and prescribe custom-fit compression without any special hardware or complex equipment.

The CAPE Health app generates a 3D scan of the limb or client using any iPhone/iPad in less than 1 minute. As the correct regime must be chosen for the application, the app can guide the practitioner to select the appropriate class. Tighter compression is often perceived to be better, but it is not. The scan and prescription are encrypted and submitted securely via CAPE's dedicated portal. No paper forms are necessary. Custom garments are then designed using 'AutoTailor', which automatically produces the garment patterns for each limb to industry leading accuracy. The garments are designed for each millimetre of limb length, while traditional custom-fit is measured every 1.5 inches (or every 38mm). This system is patented by CAPE, and was created initially to design garments for astronauts. The garments are manufactured at local medical facilities to millimeter precision and shipped to the clinic or patient in days.

Reimbursement for custom-fit compression is available through NDIS, DVA, Aged Care or Assistive Technology (AT-HM), Private Health Insurance, State-based Schemes (for Lymphoedema), TAC and Workcover. The CAPE Health app provides further details about these pathways.

Conclusion

Standard-size compression garments are often inadequate for the diverse, evolving clinical needs of allied health practitioners and clients. In contrast, custom-fit garments from CAPE Bionics deliver precise, anatomically accurate compression aligned with international standards, while also improving comfort, adherence, and outcomes, that easily integrate into clinic workflows. Backed by emerging evidence across multiple conditions, custom-fit compression should be considered best practice in the management of oedema, vascular insufficiency, post-surgical recovery, musculoskeletal injury recovery, osteoarthritis and many other conditions. Practitioners report fewer returns, improved clinical outcomes, and strong patient satisfaction.

About the Authors

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Dr James Waldie has been developing advanced compression garments for over 25 years. In 1999 Dr Waldie designed a skintight garment to impose G-loading on astronauts. This suit (called the Gravity Loading Countermeasure Skinsuit) would restore normal loading on the bones, and reduce skeletal atrophy on long duration missions. He studied as a Research Scholar at the University of California in San Diego (UCSD) testing the physiological effects of compression, and measuring the pressure regimes of NASA elastic spacesuit garments on the body. He continued his studies and earned a PhD from RMIT, working on advanced skinsuits and Bioastronautics. He was subsequently selected as a Postdoctoral Fellow at the Massachusetts Institute of Technology (MIT), working principally on his medical compression designs, but also consulting to NASA Johnson Space Centre to aid in studies of astronaut fingernail damage due to pressure from the spacewalking gloves. As an Adjunct Professor at RMIT, Dr Waldie served as a Principal Investigator with the European Space Agency (ESA) to deploy Skinsuits to the ISS for a 2 week mission in October 2015, and for 6 months in 2017. Dr Waldie founded CAPE Bionics to apply this technology and learnings into terrestrial benefit, enabling healthcare practitioners to easily prescribe the medical-grade, custom-fit compression that has been proven and preferred (when available) for decades.

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Dr. Annette Eastwood is a highly respected physiologist with over 15 years of experience in elite sports and allied health applications. She has held key roles in high-performance frameworks, including Senior Physiologist at the Australian Institute of Sport and current Head of Performance Pathways for AusTriathlon. At CAPE Bionics, Annette leads prescription and education efforts in compression therapy design, advocating for precision-fit garments in both therapeutic and athletic recovery contexts. Dr. Eastwood earned her PhD and contributed to compression research at the Australian Institute of Sport and Victoria University. Her work has informed clinical and athletic standards for recovery using compression garments, highlighting the importance of anatomical precision and evidence-based protocols. As an Honorary Adjunct Assistant Professor at Bond University, her multidisciplinary work bridges elite sport performance, clinical research, and applied allied health innovation.

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