



Personalized Blood Flow Restriction

Device for Sarcopenia Improvement

個人化血流限制增肌系統

有效改善肌少症



Personalized Blood Flow Restriction
個人化血流限制增肌系統

+

Low-Intensity Training 低強度訓練

≈

High-Intensity Training 高強度訓練



Muscle Strength 肌肉力量 ↑ ^{1,2}

Muscle Cross Section Area 肌肉橫截面積 ↑ ¹

VO₂ Max 最大攝氧量 ↑ ³



A Personalized Approach with Predictable results

Our newest development, the **PTS Personalized Tourniquet System for Personalized Blood Flow Restriction (PBFR)** has been specifically designed to safely regulate and control tourniquet pressure for Personalized Blood Flow Restriction applications.

The patented technology in the **PTS for PBFR** is based on Delfi's proven surgical tourniquet instruments and cuffs, and includes advanced personalization and safety features developed specifically for PBFR applications.

The **PTS Personalized Tourniquet System for PBFR** facilitates the safe use of proven PBFR rehabilitation training methods and helps provide optimal clinical outcomes. Featuring preset upper and lower limb therapy protocols recommended by Owens Recovery Science for strength, endurance, and cyclic PBFR make set-up quick and easy.

(Intended for use on those patients for whom a physician or physician's designated licensed health care practitioner has indicated perioperative blood flow restricted exercise.)



A Revolution in Muscle Recovery

System Features

Safe Personalized Pressure

Delfi's patented Limb Occlusion Pressure (LOP) technology allows a patient specific LOP to be measured and automatically calculates the patient's Personalized Tourniquet Pressure (PTP) as percentage of LOP.

PBFR Pressure Application Timer

An easily adjusted PBFR pressure application timer controls the length of time that the cuff will remain pressurized, and for safety automatically deflates the cuff when the application time elapses. A clearly visible digital display of pressurization time remaining is shown.

Advanced Pressure Regulation for Safety

The same advanced pressure regulation technology as used in our surgical tourniquets maintains the cuff near the selected pressure during limb movement.

12 Preset Protocols

Preset upper and lower limb therapy protocols recommended by Owens Recovery Science for strength, endurance, and cyclic PBFR make set-up quick and easy. Key parameters can be adjusted on the spot for automatic personalization.

Interval Timer

User activated timer counts down pre-programmed rest time intervals between sets, visual and audio signals alert user to begin next set.

REPS Indicator

Monitors progress in a protocol by displaying the number of exercise sets and reps as completed.

Intuitive User Interface

Easily verify key parameters and therapy session progress. A responsive touch-screen with graphical interactive elements simplifies operation and adjustments.

Session History

Automatically records key tourniquet parameters including: Limb Occlusion Pressure, Personalized Tourniquet Pressure, cuff inflation pressures, pressure application time and number of pressurization cycles.

Reperfusion Timer for PBFR

After a PBFR cuff pressurization cycle is completed, a programmable reperfusion timer prevents the cuff from being pressurized again until the reperfusion time has elapsed, helping ensure adequate time between pressurization cycles for limb reperfusion.

Safety Alarms

Audio and visual alarms warn of cuff over and under pressurization. Self test and calibration test on start-up verify proper instrument operation.

Integrated Leak Testing

Cuffs, tubing and connectors may be automatically tested for leaks before or after use.

Battery Backup

Up to 4 hours of operation with a tested cuff.

What is PBFR Training

PBFR Training means to perform low intensity training with dynamic control and restrictions of blood flow in / out from muscle.



Video: Owen's Recovery Science:
What is Personalized Blood Flow Restriction exercise?



How PBFR achieves its benefits

PBFR training can lead to muscle temporary hypoxia, triggering type 2 muscle fibers to perform anaerobic respiration, thereby stimulating synthetic pathways that can lead to muscle growth like Growth Hormone^{↑2}, IGF1^{↑6}, Satellite Cell Proliferation^{↑7}, Mammalian Target of Rapamycin Complex 1^{↑4,5}, Muscle Protein Synthesis^{↑4,5}, Myostatin^{↓8} and even more discovering.

Training target on PBFR training

- ◆ Successful Ageing
- ◆ Rapid muscle gain after surgery/injury
- ◆ Fall prevention
- ◆ Improve the quality of life



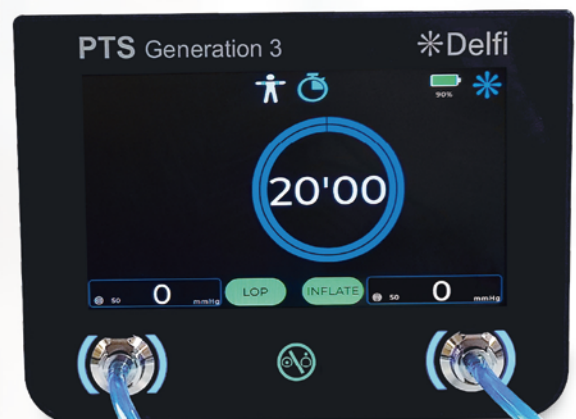
Who is recommended to have PBFR training

- ◆ Elderly
- ◆ Pre / Post operation (ACL reconstructions / Total Joint replacement, etc.)
- ◆ All people who are not able to perform high intensity training

Users in Hong Kong

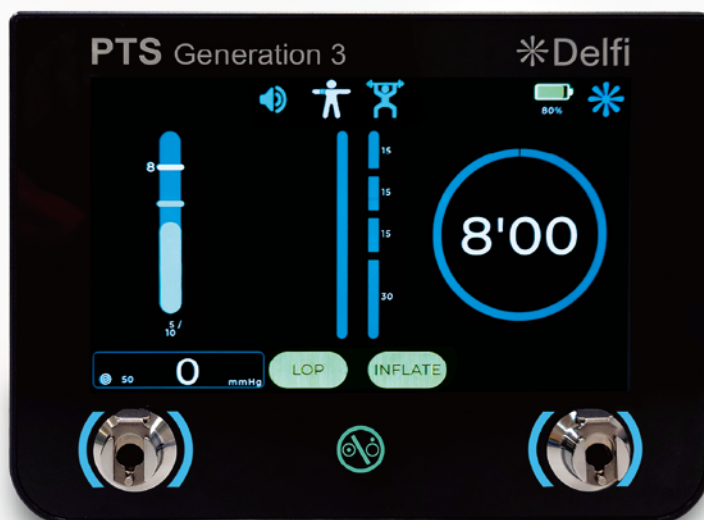
- ◆ More Than 20 Hospitals
- ◆ Elderly Home
- ◆ Care & Attention Home
- ◆ Nursing Home
- ◆ Day Care Centre for the Elderly
- ◆ Day Rehabilitation Centre
- ◆ District Health Centre
- ◆ Hong Kong Sport Institute
- ◆ Private Healthcare Professionals
- ◆ Outreaching Team
- ◆ University

*Certificated Training is provided with purchase



Dual Channel PBFR

with sEMG
Biofeedback



Dual Channel System Features

- ◆ Independent Bilateral BFR
- ◆ Personalized Pressures (LOP) Technology[^]
- ◆ Basic and Advanced Customizable Protocols[^]
- ◆ Pressure Application Timer
- ◆ Advanced Pressure Regulation
- ◆ Repetition Guidance & Counter
- ◆ Interval Timer
- ◆ Reperfusion Timer
- ◆ sEMG Biofeedback Capability, up to 4 channels⁺
- ◆ Session History
- ◆ Advanced Safety Features
- ◆ Integrated Leak Testing
- ◆ Intelligent Touch Interface
- ◆ 7" High Resolution Screen
- ◆ Dual Lithium -Ion Battery
- ◆ Portable w/ Tilt Pole Mount
- ◆ USB Drive Firmware Update

[^]Pat.: www.delfimedical.com/patents

⁺Optional items. sEMG sensors can be order separately.

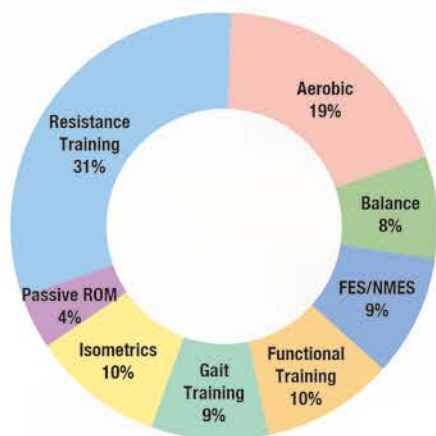


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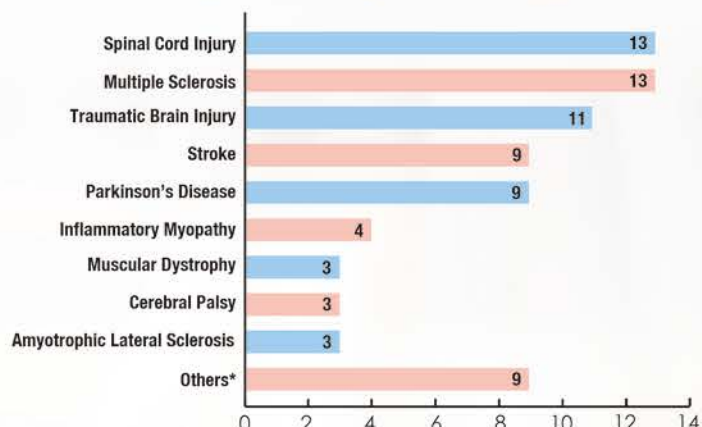
1. Loenneke, J. P., Wilson, J. M., Marin, P. J., Zourdos, M. C., & Bemben, M. G. (2012). Low-intensity blood flow restriction training: a meta-analysis. *Eur J Appl Physiol*, 112 (5), 1849-1859. doi: 10.1007/s00421-011-2167.
2. Takarada Y, Takazawa H, Sato Y, Takebayashi S, Tanaka Y, Ishii N. Effects of resistance exercise combined with moderate vascular occlusion on muscular function in humans. *J Appl Physiol* 88: 2097-2106, 2000.
3. Abe, T., Fujita, S., Nakajima, T., Sakamaki, M., Ozaki, H., Ogasawara, R., Ishii, N. (2010). Effects of Low Intensity Cycle Training with Restricted Leg Blood Flow on Thigh Muscle Volume and VO2MAX in Young Men. *J Sports Sci Med*, 9(3), 452-458.
4. Fujita, S., Abe, T., Drummond, M. J., Cadenas, J. G., Dreyer, H. C., Sato, Y., et al. (2007). Blood flow restriction during low-intensity resistance exercise increases S6K1 phosphorylation and muscle protein synthesis. *J. Appl. Physiol.* 103, 903-910.
5. Fry, Christopher S., et al. "Blood flow restriction exercise stimulates mTORC1 signaling and muscle protein synthesis in older men." *Journal of Applied Physiology* 108.5 (2010): 1199-1209.
6. Abe T, Yasuda T, Midorikawa T, et al. Skeletal muscle size and circulating IGF-1 are increased after two weeks of twice daily KAATSU resistance training. *Int J Kaatsu Train Res.* 2005;1: 6-12.
7. Nielsen, J. L., Aagaard, P., Bech, R. D., Nygaard, T., Hvid, L. G., Wernbom, M., Frandsen, U. (2012). Proliferation of myogenic stem cells in human skeletal muscle in response to low-load resistance training with blood flow restriction. *J Physiol*, 590(Pt 17), 4351-4361. 773-782.
8. Laurentino, G. C., Ugrasowitsch, C., Roschel, H., Aoki, M. S., Soares, A. G., Neves, M., Jr., Tricoli, V. (2012). Strength training with blood flow restriction diminishes myostatin gene expression. *Med Sci Sports Exerc*, 44(3), 406-412.
9. Lau, C. W., Leung, S. Y., Wah, S. H., Yip, C. W., Wong, W. Y., & Chan, K. S. (2023). Effect on muscle strength after blood flow restriction resistance exercise in early in-patient rehabilitation of post-chronic obstructive pulmonary disease acute exacerbation, a single blinded, randomized controlled study. *Chronic Respiratory Disease*, 20. <https://doi.org/10.1177/14799731231211845>
10. Mañago, M. M., Kimbrell, K., Hager, E. R., Dwight, H., Owens, J., & Bade, M. (2022). Clinical use of blood flow restriction in people with neurologic conditions: a cross-sectional survey. *Journal of Physical Therapy Science*, 34(4), 275-283. <https://doi.org/10.1589/jpts.34.275>
11. Hughes, L., Swain, P., Lai, T., & McEwen, J. (2024). It's time to regulate – The importance of accurate surgical-grade tourniquet autoregulation in blood flow restriction exercise applications. *Physical Therapy in Sport*, 67, 41-46. <https://doi.org/10.1016/j.pts.2024.02.001>

Types of neurologic conditions treated using blood-flow restriction¹⁰

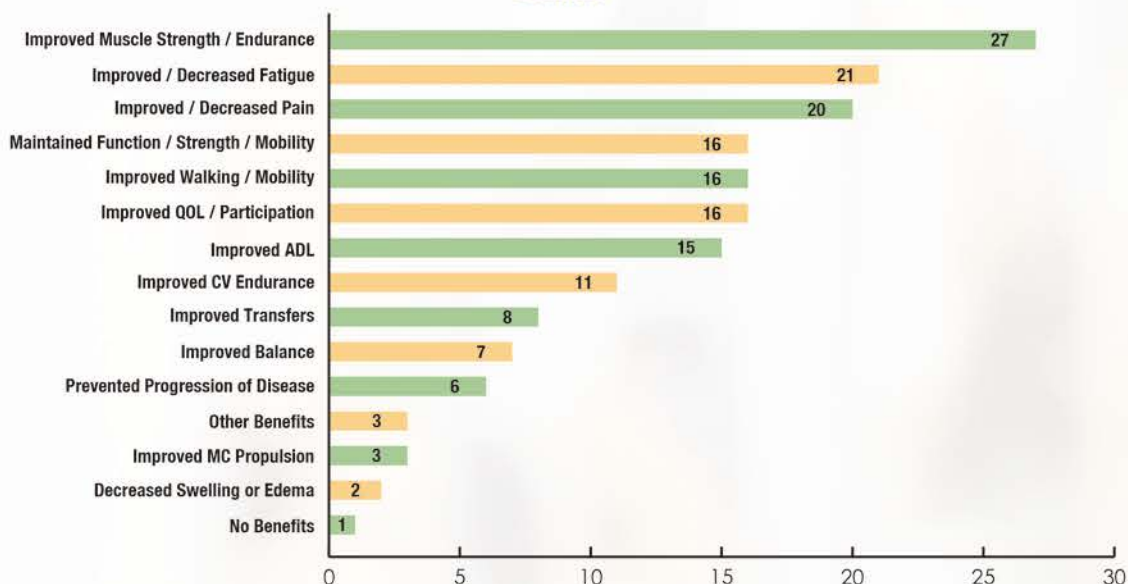
Exercise selection



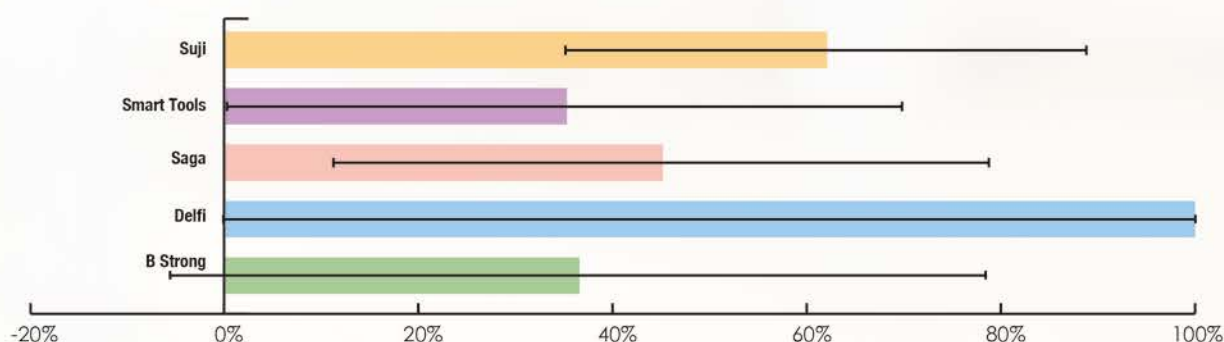
Type of neurologic conditions applied



Benefits



Brand differences in Accurate BFR Cuff Pressure during training¹¹



Safety related Studies



Neurological



Oncological



Heart Disease &
Heart Failure



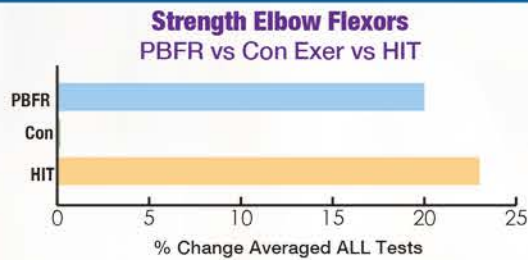
Hypertension

Delfi PBFR system, the FDA Approved Medical Device for PBFR

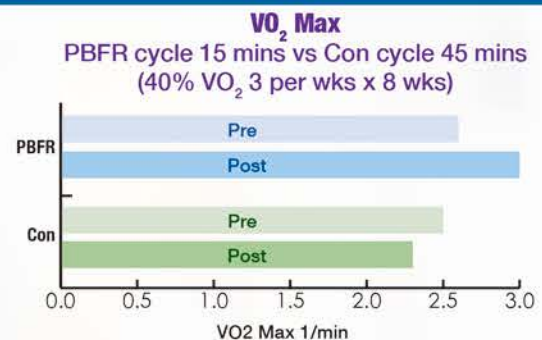
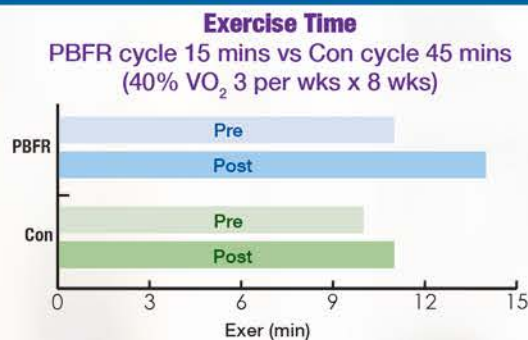
Backed up by Research

Over 300 scientific papers showed PBFR can increase muscle strength and muscle mass, improving function movement and performance, and help patient to pick up daily life task easier.

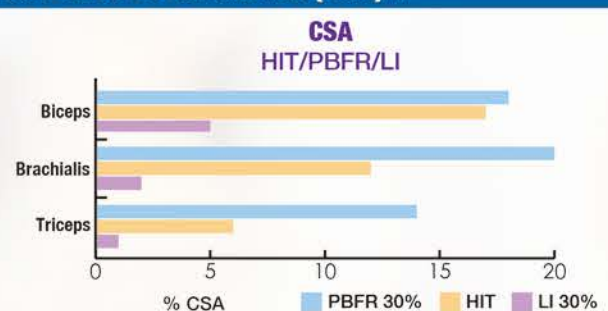
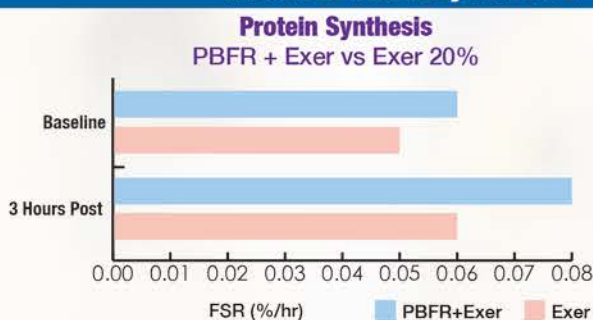
Muscle Strength $\uparrow^{1,2}$



Aerobic Capacity $\uparrow^3$



Muscle Protein Synthesis $\uparrow^{4,5}$ & Muscle Cross Section Area(CSA) $\uparrow^1$



Hong Kong Local Study, Feeling of PBFR Training⁹



Studies Specified in different body parts



Hand



Shoulder/
Deltoides



Hip/quadriceps/
Hamstrings



Knee/ACL/
Total knee replacement



Ankle/
Achilles Tendon