Overview of getback™:
Principles, Systems and Science

Introduction

getback™ now has available in Australia, Medical Rehabilitation Devices which have recently been included for registration as Class 1 Medical devices with measuring function in the Australian Register of Therapeutic Goods administered by the Therapeutic Goods Administration [TGA], Department of Health. There are six devices in the getback™ Clinic which specifically target, isolate, progressively exercise and evaluate function of the musculature of the back and neck. The Devices are from Finland from the David Company. Acceptance for this registration ensures that these Medical Devices have been shown to adhere to strict standards of production, risk analysis, safety of performance, validity and reliability of functioning. These getback™ medical devices are the culmination of years of clinical experience supported by scientific data collection and analysis by Exercise Physiologists and Biomechanists in Universities in Finland and Germany.

getback™ is developing a national network of getback™ clinics in successful physiotherapy practices targeting low back and neck pain and to make a world leading impact on chronic low back and neck pain rehabilitation and prevention Our aim is continue to build a network of centres operating under the same quality control and data gathering procedures.

There have been over 35 peer reviewed papers published in which the getback™ Devices were utilised to address chronic low back and neck pain. The publications have appeared in prestigious journals such as Spine, Rheumatology, European Journal of Applied Physiology. Journal of Rehabilitative Medicine etc.

getback™ has the sole distribution rights for these TGA registered Devices in Australia and New Zealand.

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Executive Summary

- Musculoskeletal pain is the main reason for people to live in disability[1].

- Back and Neck pain is estimated to be experienced by in excess of 85% of the Australian population[2]

- There is a need for specificity when prescribing preventative and therapeutic management in patients with neck pain and back pain [3][4][5]

- The getback[TM] program addresses this specificity and offer the only complete system of improvement and measurement available, utilising:

  - Optimised biomechanics
  - Structured, evidenced and quantifiable approach
  - High Productivity
  - Comprehensive Data Collection and analytics

- Scientific evidence backed by numerous research studies

- Big data analytics for continuous optimisation of program effectiveness including device exercise and additional training programs.

- Patient and centre confidentiality is paramount and ensured.

- Proven and documented financial outcomes for corporate organisations

1 *WHO methods and data sources for global burden of disease estimates 2010-2011, WHO, Geneva November 2013*

2 Hoy D, March L,Brooks P, et al. *Ann Rheum Dis*   The global burden of low back pain: estimates from the Global Burden of Disease 2010.Published Online First: 24/03/2014 doi:10.1136/annrheumdis-2013-204428

3 *Salmon et al, (2011), Neck Pain in Military Helicopter Aircrew and the Role of Exercise Therapy. Aviation, Space and Environmental Medicine: 82 (10)*

4 Falla D. Unravelling the complexity of muscle impairment in chronic neck pain. (2004) *Manual Therapy* 9 (2004) 125–133

5 *Kankaanpaa M, Taimela S, Airaksinen O, et al.(1999) The efficacy of active rehabilitation in chronic low back pain. Effect on pain intensity, self-experienced disability, and lumbar fatigability. Spine;24:1034-42.*

get**back**[TM]

Inherent Problems with Current Physiotherapy and Exercise Therapist Treatment, Rehabilitation and Strengthening Models.

Being the preferred treatment does not mean that the current active physiotherapy and rehabilitative methods are optimal. In fact, there are several inherent flaws with these methods causing fluctuating results, high costs and lack of documentation.

Poor Biomechanics

Critical, but poorly understood factors in successful active rehabilitation are the biomechanical properties in various exercises. A well-designed exercise prevents any harmful movements, is gentle to the joints but highly fatiguing to the muscles and can be easily fine-tuned for each individual.

Figure 1: This widely used exercise for the outer rotation of the shoulder is a typical example of poor biomechanics: the load increases when the band is stretched whereas the strength of the muscles decreases.

In this regard, current tools are quite rudimentary and ineffective. For example, the widely-used rubber band exercises for outer and inner rotation of the shoulder and neck strengthening have exactly the opposite loading curve compared to the joints strength curve: the loading is at the highest at the end of the movement where the muscles are the weakest. This puts unnecessary stress on the joint while providing a poor training effect. The design of the getback™ devices addresses this issue and accounts for the changing strength curve through the range of motion producing optimal strength gains in a safe motion.

Random Approach

Generally accepted fact is that the randomness of these programs is a problem. There are no set standards in what exercises to use, how often, how intensely etc. Programs are planned by physiotherapists and exercise therapists based on their preferences and experience. This means that the system can never really learn and gradually improve. This also means inconsistent results from patient to patient, therapist to therapist. Physiotherapy and personalised training is fundamentally one-to-one and as the demand increases it forces, in most cases therapist to limit program length and attention which is detrimental in the long term.

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Lack of Documentation

A major issue that hinders therapists is the absence of uniform descriptive documentation and subsequently attaining quantifiable outcome measures (ie strength and mobility). Some metrics may be used to evaluate the pre and post status of the patient, but there is practically never adequate documentation of the actual content of the programs. And even if there is some kind of description, quantitative data of the various parameters is missing. No real learning and optimization can occur when critical data is missing.

The use of getback™ system incorporating therapeutic exercise devices has solved these problems by using advanced training technology and cloud-based software for guidance, control and complete and unique data gathering capacity.

Poor not optimized Biomechanics

The solution includes joint specific rehabilitative devices with optimized biomechanical properties for the spine with the correct joint and loading curves and target area isolation enabled by effective fixations, these devices are remarkably gentle to the joints yet providing highest possible neuromuscular training effect.

Figure 2: Specially designed training and testing devices include optimized joint angles, body fixation and variable isoinertial loading that initially feels very light and easy, but after number of repetitions proves to be very fatiguing and effective.

In each device, a computer terminal guides and motivates the patients to follow exactly the given parameters prescribed in their individualized programs. Parameters include e.g. selected movements, adjustments, loading, range of motion, repetitions, movement speed, progression, session numbers and frequencies. These parameters are automatically designed and fine-tuned with the use of the cloud-based software and patients get immediate feed-back on their compliance and performance level.

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Structured approach

Individualized programs can be applied in a structured and systematic way, because all parameters are quantified and controlled. Programs are based on quantifiable performance measurement and test-based templates reduce planning time to a minimum while providing high predictability in outcomes.

High productivity

Despite all the sophistication in the devices and software, they are remarkably easy to use. Registering to each device is done with an RFID card. Seats and other support elements are automatically adjusted and the program is retrieved from the cloud. After a few instructed sessions, patients quickly master the use of the system freeing human resources for more critical tasks. One Exercise Physiologist (EP) can control 3-6 patients simultaneously without any reduction in the quality of care. The Exercise Physiologist or Exercise Therapist constantly evaluates the patient progress through data collected from the devices and patient feedback at every intervention session.
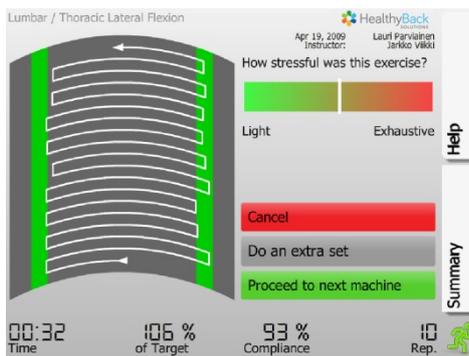
Figure 3: The touch a RFID card loads a patients training parameters and screens provide feedback on their compliance level.

Comprehensive data collection

All relevant data is collected automatically from several sources: e-mail links, tablets, mobile phones, Info-Kiosk and devices.
Data gathering is pre-programmed according to each treatment pathway, which ensures that all data is collected and with minimal human intervention. Data is collected from questionnaires, tests, pain drawings and exercises.

All data is instantly available for reporting and analysis. With one click, up-to-date status of any patient can be retrieved. With this intelligent solution the most critical shortcomings in physical therapy have been solved.


Figure 4: With a click of a button a report can be printed showing both progression in loading and mobility and pain reduction and selected questionnaire indices.

Movement as medicine

Movement can be very effective medicine in the treatment of musculoskeletal problems, but like with any medicine too much can be harmful while too little has no effect. With over 25 years of experience, multiple studies and extensive data collection, we have learned the art of administering correct dosages of movement and loading for each patient and disorder.

The main component in successful progress is the ability to control loading and range of motion very precisely. This is possible if the devices are correctly designed to provide smooth and easy-to-handle loading over the full range of movement. The movement and speed are accurately controlled by the responsive graphical feedback system which ensures that individually prescribed, safe range is followed.

The picture below provides a schematic view of the process. It is critical that enough time is given for the tissue to heal before loading is increased and the functional capacity is normalized. Every joint and every individual has its own rate of recovery. getback™ software solution can intelligently adjust the training program parameters based on feedback- and pain rules.
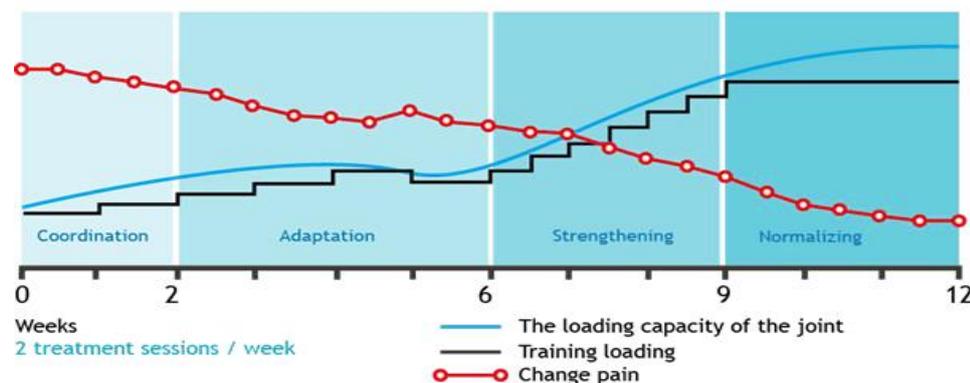
Joint-specific/targeted vs. functional training

One of the issues often discussed in connection to the device-based rehabilitation is if such closely controlled and guided exercises are the best option rather than using more functional exercises instead. This question is especially raised by Exercise therapists and physiotherapists who are used to using simple tools and high level personal supervision.
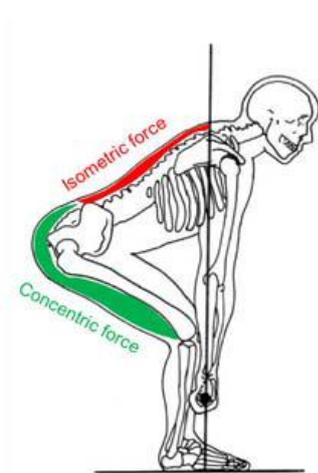
To understand our approach, it is important to first consider some basics in strength training. Every movement with a load requires some amount of coordination. The more "functional" the movement is, the more coordination is required. For example, the "dead-lift" (see picture above) is an effective exercise but requires a lot of coordinative skills. When loading increases, the exercise becomes more demanding and even dangerous, not something to ideally recommend without close supervision.

In a compound movement (using multiple muscle groups and joints) the weaker muscles and painful joints are automatically protected by the use of isometric (static) muscle force while strong surrounding muscles are doing the actual work.

With most back extension machines, the training has very little to do with the spinal musculature, but are rather hip extension exercises. In addition to being ineffective for the spinal musculature, there is a real danger because weaker spine muscles can easily be overloaded.

Each of the six devices in the getback™ system includes technology to eliminate the effect of the strong, dominating muscles and targets the training to the weak and often painful joints and muscles. Figure 6 below shows how proper fixation helps the weaker spine muscles to work dynamically facilitating a unique vertebrae by vertebrae movement and activation of the small, critical inter vertebral deep spinal muscles.

Instead of using the more demanding functional training, where strong muscles and compensating movements can easily destroy the intended training of the deep musculature, our approach uses targeted, isolated, safe and highly specific and effective guided exercises. This allows early activation of even painful joints with high level of precision. This also quickly empowers the patient as they learn that movements are not painful. Training

provides gratifying sensation in the muscles surrounding the troubled joints, which strengthens their motivation to continue.

Once the "weak link" is removed, return to normal functionality is almost automatic and more functional exercises are safe to perform.
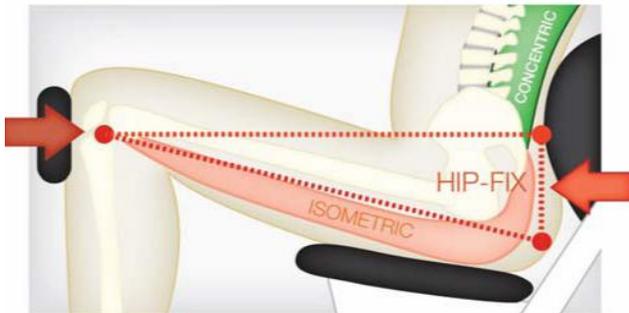

Figure 6: The Hip-Fix solution is a good example how proper fixation makes it possible to target the training effect exactly where needed. This exercise is safe and forces the spine to move vertebrae by vertebrae, which is very difficult to do in a controlled way with any other method. Critical small spinal muscles and Multifidus are trained effectively.

Cloud-based Exercise Evaluation Software and getback™ Proprietary Software platform [Sonic]

The Sonic Software platform manages the whole treatment process, guides through individual exercises and collects all of the data for reporting. It is a major tool which guides the therapists in making better treatment choices and motivates clients in their recovery journey. It also acts as the controlling tool for the management to see the quality and quantity of the operation down to individual therapists, all on-line and in real-time.

Software platform components:
Device Terminals - All treatment devices have a colour touch screen monitor where patients can log-in with an RFID card and see the correct training settings. It adjusts most of the settings of the device automatically with actuators, based on preferences stored by the exercise therapists. During the intervention it shows the safe movement range, which is derived from the patient's own pain free mobility measurement values. The monitor also guides the correct movement speed and constantly monitors the coordination of training. Patients are immediately given feedback on how well they were able to follow the designed exercise based on range of motion, work amount, coordination and speed.

Device Info-Kiosk is used by the patients to log-in to the training session. It shows possible messages from the therapists and asks for pain information and possible other questionnaires that have been pre-programmed. Customers can view their current /past/future training programs. Therapists can easily modify the program of the patient at the kiosk.

Software Exercise-Kiosk - The system is not limited to only device exercises. Any exercise or treatment can be added to patients' training programs with pictures, videos and written instructions. The Exercise-Kiosk has a large 42-inch touch-screen and can be operated with Kinect tracked hand-gestures from afar. Patients can easily mark what exercises they have performed and if they had issues with performing those exercises.

Cloud Service is the heart of the whole getback™ Software platform. All the training information is stored on the server software allowing for a complete analysis of the treatment data. True to a full cloud service, the system can be accessed with a web browser from any location. The cloud service offers treatment professionals and clients the following functionality:

- Functional profile analysis for creating an optimal treatment programme;
- Treatment templates and programmes for individualized approach;
- Quality tracking of each movement for detailed training analysis;
- Questionnaires from easy-to-analyse
- Intervention engine for additional exercises based on achievements and progress;

- Total treatment tracking for evaluating treatment success
- Quality and quantitative data for Clinic management and complete Network monitoring by getback™ .
- Full integration to any patient records system via Sonic interface.

getback™ collaborates with multiple centres around our Australian network with unified data collection in searching for better, faster and more cost-effective ways of reaching the desirable outcomes. The collected data is extracted from the database and analyzed with getback™ Sonic software. The examination of the extracted data is a critical factor to ensure quality service and is crucial in achieving continued treatment success.

Real-time Data Monitoring

The Sonic Cloud Services provide real-time view of everything that takes place in any clinic. For persons with access to the Clinic data it is easy to monitor daily volumes and quality with one look. Any anomalies can be examined by drilling in to individual visits.

All relevant data is collected automatically without any additional effort. This means that the data is always complete, without holes. The availability of this kind of instant, real-time data ensures our proactive approach to issues like the economic outlook, service level and medical quality.

On the patient level, comprehensive reports can be printed with one click collecting all available data with calculated indices and graphical improvements. With the flexibility of our systems, reporting can contain any set of parameters required by each health system. From the R & D point of view, this kind of data is invaluable in understanding the problems and finding the most effective solutions. To maximize the use of the data, getback™ is collaborating with The David company which has started to use data analytics tools and machine learning methods.

Wide range of applications

With its roots in sports science, the Medical Device's technology was built to meet the most demanding needs of elite athletes. This required uncompromising biomechanical solutions that allowed athletes to train at extreme intensities without any risk of injury. To our surprise the exact same technical principles worked perfectly in rehabilitation: high intensities with low joint stress and low risk of injury. But our rehabilitation devices those days (as with most devices in the market today) were complicated to use and had many adjustments. Therefore, it was necessary to have one type of devices for normal exercise conditioning and other type for rehabilitation.

The latest evolution version of getback™ devices developed by the David Company in Finland is based on new, innovative technology with automated adjustments and use of lockable gas springs. With just 1-2 adjustments (compared to industry standard of 5-6) it is now possible to do demanding rehabilitation, prevention programs and high intensity athlete training with the same devices.

With the cloud-based software guidance solution, the getback™ system can have variety of applications from rehabilitation to prevention to sports training without a single compromise in efficacy and safety. All three can be applied in the same location.

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Scientific evidence

Studies conducted with the getback^{TM} devices and concepts can be divided in two categories: 1) **validation studies**, 2) **medical and economic outcome studies**. Some of the studies have been initiated by David Health Solutions, but all studies have been carried out by third parties like universities, insurance companies and car manufacturers and most are published in peer review magazines.

Validation studies

At first the **variable resistance** method developed by The David Company was examined. There was a set of studies under the supervision of Professor Paavo Komi, comparing the getback^{TM} Devices to other methods and using EMG to validate the correctness of the loading curves and efficacy of training. Outcomes were very clear: the Device variable principle was indeed optimal and had great fatiguing effect on muscles (see box 1)[1].

> [1] In conclusion, the present findings suggest that the repeated concentric contractions of the knee extensor muscles against the variable resistance may create optimal loading conditions that result in great fatiguing effects on the neuromuscular performance.

These were followed by several studies analysing the **intra and inter reliability** of the isometric strength testing method (Germany 1992, Sweden 2001, Austria 2014) which all showed high level of reliability (see box 2).

> [2] The results showed that neck strength in an upright position measured with David neck equipment has almost perfect intra- and inter-tester reliability.

A series of **EMG validation** studies were conducted in collaboration with the University of Cologne, Germany to determine if the unique getback^{TM} Device based isolation principle really fatigued the targeted muscles and blocked the strong surrounding muscles[2]. These studies demonstrated in a beautiful way that not only were the strong hip extensors blocked but in fact inhibited creating high level of isolated and specific activation in the spinal target muscles.
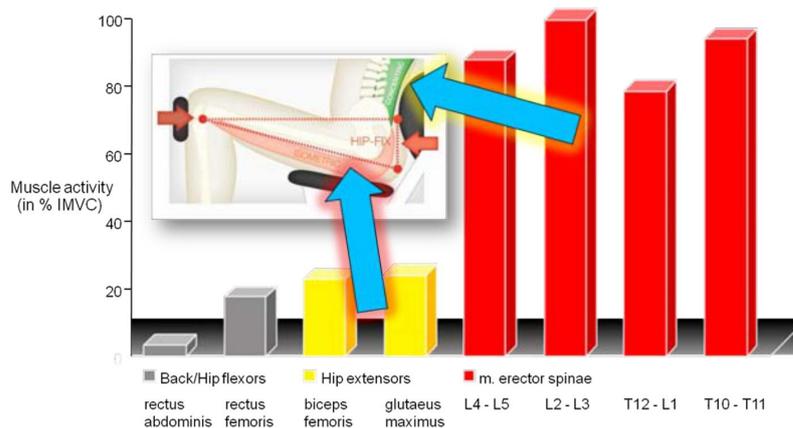
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Figure 7: EMG measurements show clearly that with David's the Hip-Fix system spine extensor muscles are highly activated while the strong hip extensors are effectively inhibited.

A set of **fatigability studies** with back patients and healthy persons were conducted using EMG spectral analysis to find out if these methods could be used as diagnostic and outcome tools. The first study clearly demonstrated that back patients are both weaker and fatigue easier than healthy individuals[3]. A Follow-up study showed the MFP (EMG mean power frequency) is a valid post-rehabilitation outcome measure[4].

Another study in Sweden (2002) analysed if EMG can be used as a classification tool to differentiate between healthy and back pain patient. Result showed that classification power was 80% accurate.

Two studies were conducted in the early 2000s to find out more about **optimal loading methods**. The first study looked at variable vs. constant resistance in a leg press exercise and found out that the best training effect can be obtained with slightly increasing loading with a variable resistance method (used in David G210 Multifunctional Leg Press)[5]. The second study compared the David variable resistance against artificial (pneumatic) loading (HUR). The findings showed that with correct variable loading it is possible to provide higher fatiguing, which is essential in restoring the function of any joint[6].

1. Effects of fatiguing loading with a variable resistance equipment on neural activation and force production of the knee extensor , K. Häkkinen, H. Kauhanen and P. V. Komi, Electromyogr. Clin. Neurophysiol. 1988, 28, 79-87.
2 The Spinal Muscular Profile, Achim Denner, Springer 1992
3 Back and Hip Extensor Fatigability in Chronic Low Back Pain Patients and Controls, Markku Kankaanpää, BM, Simo Taimela, DrMedSci, David Laaksonen, MD, Osmo Hänninen, DrMedSci, PhD, Olavi Airaksinen, DrMedSci, Arch Phys Med Rehabil Vol 79, April 1998
4 Reference change limits of the paraspinal spectral EMG in evaluation of low back pain rehabilitation, Markku Kankaanpää, Simo Taimela, Olavi Airaksinen, Pathophysiology 5 (1998) 217–224
5 Kinetic and electromyographic analysis of single repetition constant and variable resistance leg press actions, Simon Walker, Heikki Peltonen, Janne Avela, Keijo Häkkinen, Journal of Electro-myography and Kinesiology 21 (2011) 262–269
6 Neuromuscular responses to different resistance loading protocols using pneumatic and weight stack devices, Heikki Pelto-nen, Keijo Häkkinen, Janne Avela, Journal of Electromyography and Kinesiology (2012)

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Medical and economic outcomes

There are several studies analysing the medical and economic efficacy of the our system, mostly with back problems. Some of the best studies have been published in the leading medical journals like the Spine.
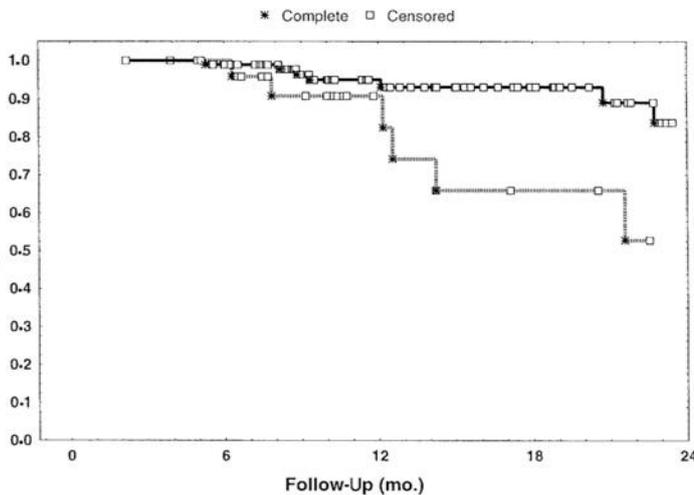

Figure 8: Survival patterns (Kaplan–Maier) without work absenteeism due to low back pain of physical exercise groups after the active outpatient rehabilitation. Solid line (above) denotes the group with any physical activity; dotted line (left) denotes the physically inactive group. The group difference was statistically significant (P , 0.01).

One randomized study compared the results of active rehabilitation and passive control treatment in patients with chronic low back pain with follow-up at 6 months and 1 year. The active progressive treatment program was more successful in reducing pain and self-experienced disability and also in improving lumbar endurance than the passive control treatment[7].

Another study analyzed the role of physical exercise and inactivity on the long-term outcome after active outpatient low back rehabilitation. Subjects received an active program for 12 weeks and the average drop in self-perceived VAS pain was 30 mm. After the program, part of the group maintained some activity while others were passive. Result shows clearly that some activity helps to maintain effectively the achieved results and therefore is highly recommended to patients. Figure 8 shows how the active group had significantly less sick leave days while the passive group started have more and more absent days from work[8].

There is a set of three published outcome reports by **FPZ**, a chain of over 200 licensed back centres in Germany. The treatment method is the same standardized method that getback™ uses with the exception that the Germans put more emphasis in increasing strength. These publications are looking at various outcome measures, like pain intensity, pain frequency, sick leave days, visits to doctors, etc. The N's in these data sets are very large, ranging from 4.559 to 37.943 subjects. Results are excellent. For example, 41% of the patients were pain free after the program and of the rest 88% had significant pain reduction (the start pain levels were not as high as in some other studies)[9].

Some of the studies have been initiated or conducted by insurance companies in Germany. **Gothaer insurance** discovered that by investing in back treatment, the insurance company was saved almost 5 times more in medical and sick leave costs (see box 3)[10].

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AOK insurance in Baden-Württemberg had a randomised study with 1936 insured back pain customers in an intervention group and 548 controls. All costs incurred by these subjects were analysed two-year prior and two-year post of the intervention. After deducting the cost of running the program, the study showed that each person in the intervention group saved EUR1.307 in a two year follow-up period.

A randomised study conducted at the **Frankfurt airport** compared sick-leave days of an intervention groups and control group. The outcome showed that one year following the program the intervention group had 7.3 days less sick-days than before while the control group had 1.1 days more[11].

Daimler Chrysler initiated a special program, "Kraftwerk" at their factories in which a David back extension device was transported around the car factory and employees trained during working hours once a week. This small amount of training / week resulted in 48% reduction in sick leave cases[12].

Figure 9 Due to the huge size of the factory it was easier to move the training platform to workers than have them walk the long distances at the Daimler Chrysler factory. Even one extension exercise once a week reduced sick leave incidences by 48%.

A recent study at **Mercedes** factory in Vittoria, Spain, used a slightly more extensive program. A container sized house was put in the middle of the factory and workers trained once a week in this location for one extension and flexion exercise for the spine. The overall program included also education and ergonomic advice. The program produced outstanding results reducing back related sick-leave days by 78%.
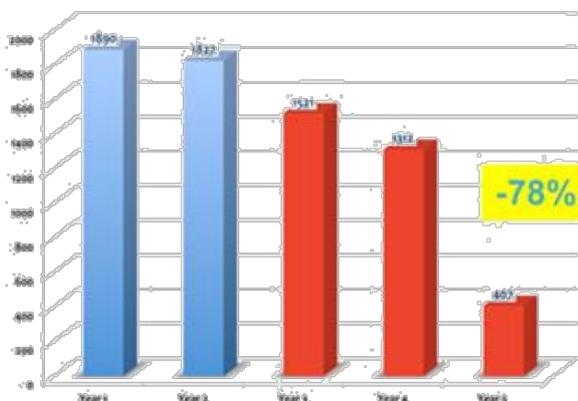
Figure 10: At Mercedes factory in Spain back related absenteeism was reduced by as much as 78% with only 16 training sessions during working hours once a week that lasted 10-15 minutes each. In a survey conducted afterwards 95% of the workers wanted to continue the program.

A medical centre in Vienna, Austria uses getback™ concept to treat patients paid by social insurance system. The program includes a 12-week phase two times a week and an on-going program of 12 weeks once a week. One of the periodic reports to the government with 360 back patients shows an average pain reduction from VAS 49 to 17, and Roland-Morris from 8,8 to 5,8[13].

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An Australian study[14] conducted by getback[TM] presented the data from 223 patients found a mean increase of strength of 48 and 50% respectively, for males and females. Further to the increases in strength clients reported 86% and 76% reduction in pain and lifestyle disability respectively, for males and females, using the Oswestry Functional Disability index for back pain. This clinically significant change in functional ability with decreasing pain further supports the research evidence of the efficacy of our unique exercise rehabilitation [15, 16].

7 The Efficacy of Active Rehabilitation in Chronic Low Back Pain, Effect on Pain Intensity, Self-Experienced Disability, and Lumbar Fatigability, Markku Kankaanpää, BM,Simo Taimela, MD, Olavi Airaksinen, MD and Osmo Hänninen, MD, PhD, SPINE Volume 24, Number 10, pp 1034–1042

8 The Role of Physical Exercise and Inactivity in Pain Recurrence and Absenteeism From Work After Active Outpatient Rehabilitation for Recurrent or Chronic Low Back Pain, Simo Taimela, MD, DMSc, Carlo Diederich, PT, Marc Hubsch, PT, and Michel Heinricy, PT

9 Integrated Back Care Intervention Scientific documentation 2006–2008, Dr. Frank Schifferdecker-Hoch, The PZ Company Koln Germany

10 Cost / benefit analysis of a scientifically supported training for health insurance participants with back problems. The example of the Gothaer Health Insurance Company) T. Daschner F. Tschubar, Manuelle Medizin 2006, 44:308–312

11 Reduction of back related sick leave of workers who load and unload aeroplanes, through specific medical training therapy of the back. B. Sappich, W. Gaber, S. Caspar und K. Baum 2001 Arbeitsmedizin 8, 371-377

12 Evaluation of the Spine Concept "Kraftwerk" of the DaimlerChrysler Company 2003-2005. Prof. Dr. Gerhard Huber, Scientific Report 2006 Institute for Sport and Sport Science University of Heidelberg

13 Medical Therapy in Austria, Dr. Thomas Kienbacher, Karl-Landsteiner-Institut für ambulante Reha-Forschung, David World Forum 2014

14 Cabble et al (2016), Quantification and Effectiveness of Rehabilitation Devices Utilising Isolated, Targeted and Progressive Strength Development Protocol for the Treatment of Patients with Chronic Low Back and Neck Pain. Proceedings: 2016 Biennial Exercise and Sport Science Association: Research to Practice Conference.

15 Richardson C.A. and Jull G.A.(1995) Muscle control- pain control. What exercises would you prescribe? Manual Therapy 1, 2-10.

16 Jull, G., Trott, P., Potter, H., Zito, G., Niere, K., Shirley, D., Emberson, J., Marschner,I., Richardson, C. (2002) A Randomized Controlled Trial of Exercise and Manipulative Therapy for Cervicogenic Headache. Spine 27, (17), pp 1835–1843

getback[TM]

Space allocation

A complete physical therapy centre set-up can be very space efficient. The getback™ Spine Concept is a complete system including training and testing devices, evaluation protocol, software, documentation and education and support post installation. The treatment area can be as small as 25 square meters. The diagram below shows a possible installation in a 25 square meter area.
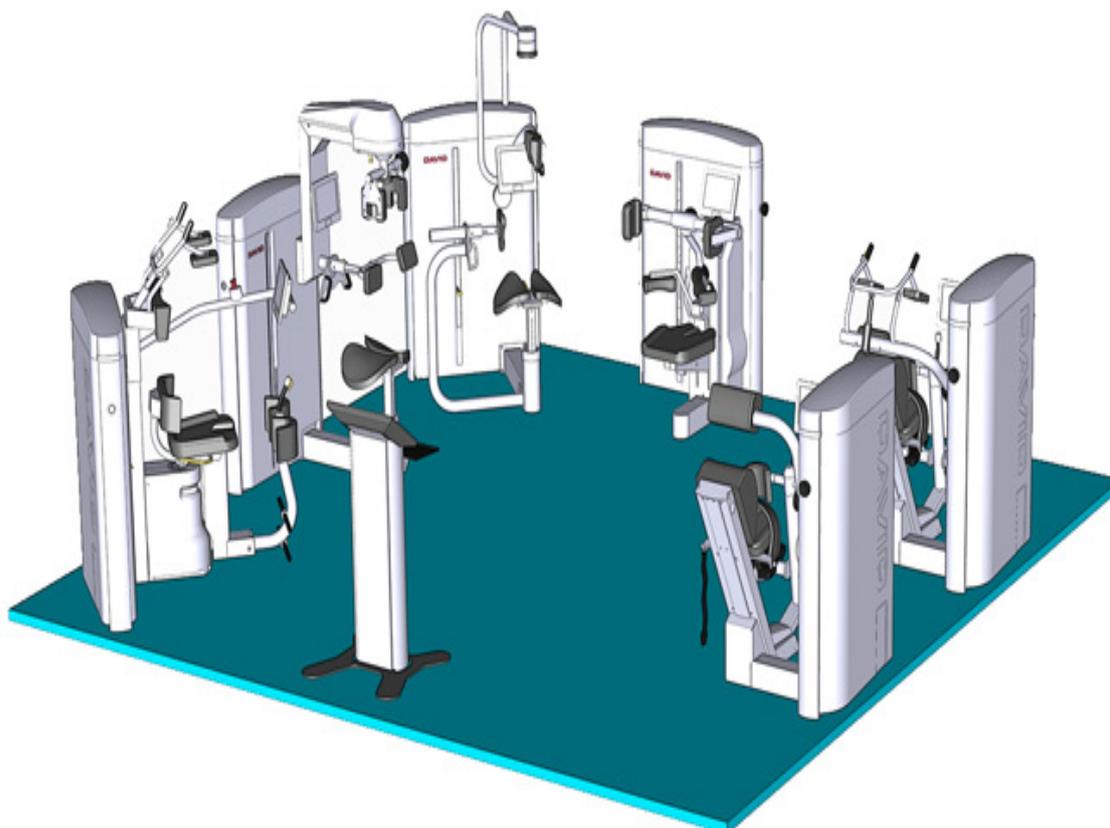
The unique Ability to Collect and Conduct Big Data analytics

getback™ treatment and strengthening programs rigorously address the international clinical guidelines for best practice of back and neck pain.

The modern cloud based data gathering platform has opened up new, unprecedented opportunities in musculoskeletal care. Director of research Emeritus Professor John Carlson oversees the development of this platform in Australia and New Zealand.

Using the platform, diverse data sets during an exercise treatment period can be now collected from patients from all over Australia at multiple clinic locations describing general health status, demographics and other relevant background information, treatment progress, detailed exercise parameters and treatment outcome. The platform thus generates an accumulating treasure trove of information with unlimited potential for new knowledge.

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Even with the long experience in treating back, recently collected data has produced never before understood new insights into optimal treatment of musculoskeletal pain. As an example, comparison of patient groups with successful and unsuccessful treatment outcomes revealed that if no improvement occurs in pain levels during first five treatment sessions, it is likely that the program will not be beneficial during future sessions either and therefore further consultation is needed.

With this kind of high quality, comprehensive data, getback™ is now moving to the next level in data analytics. Using the sophisticated Sonic software and our rapidly growing patient data, our analytical software permits optimization of the data collection procedure, find subgroups of patients with similar treatment responses, predicts treatment outcomes, and optimizes treatment during different stages of the treatment period. Continuing success in our treatments will be based on accumulating evidence and sophistication of the system.

Education and Maintenance

Education

Our education process aims to assist clients in providing highest possible level of service to their clientele base using the getback™ system. The education process typically includes start-up education for basic skills at installation, an intensive block with the Exercise Physiologist (often at our flagship clinic in Middle Park, Victoria) prior to the installation and ongoing training and support.

Intensive Education with Exercise Physiologist: a minimum 8 hours of getback™ training will be made available prior to the installation of the getback™ devices and software and will be composed of theory and practicum components surrounding the use of the medical Grade 1 TGA registered rehabilitation devices and protocols. getback™ if requested can assist with further seminars or additional training.

Ongoing Training and Education: ongoing support via phone, skype, email and sight visits are provided on a regular basis between getback™ and the getback™ clinic network.
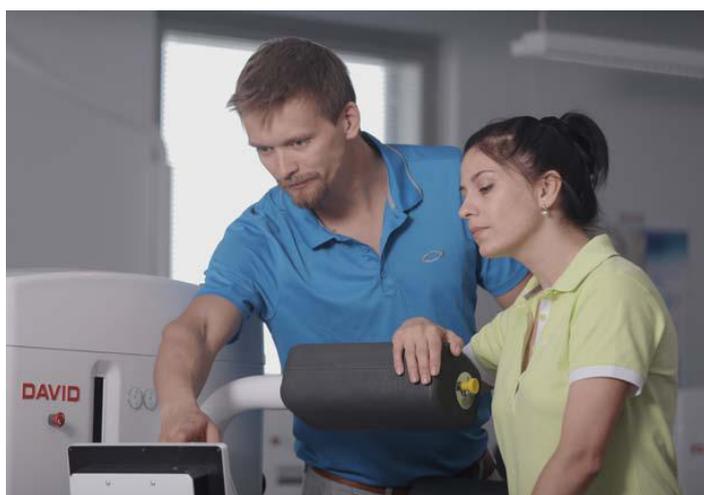
The expertise of our Directors of Clinical Practice and Clinical Research are available to present at important meetings within our Network and to present the latest developments and findings in the area of musculoskeletal care.

Validity and reliability studies

Name of the study	Year	Type	Objective	Country	n	Set-up	Outcome	Publication
Isometric reliability test	1992	Reliability study	Reliability of isometric testing	Germany	22 untrained individuals	Reliability in mobility and isom strength in David spine units	r=0.97-0.99	Muskuläre Profil Der Wirbelsäule, Springer 1995
Reliability of Isometric Trunk Moment Measurement in Healthy Persons Over 50 Years of Age	2014	Reliability study	Short- and long term test-retest reliability	Austria	42 over 50 yrs. (44 under 50 as controls)	Isometric retest after 2 days and 6 weeks	As reliable with over 50 as with under 50	Journal of Rehabilitation Medicine 2014
Intra- and inter-tester reliability and reference values for isometric neck strength	2001	Reliability study	Reliability of David F140 + reference data	Sweden	30 (reliability), 101 (reference values)	Repeat tests with three testers	David F140 has almost perfect intra- and inter-tester reliability.	Physiotherapy Research International, 6, 2001
Muscle activation study	1992	Validation study	To analyse the activity of target vs, other muscle.	Germany	22 untrained individuals	Using EMG to test the isolation of target muscles	Fixation is devices effectively activate target muscles and inhibit others	Muskuläre Profil Der Wirbelsäule, Springer 1995
Reference change limits of the paraspinal spectral EMG in evaluation of low back pain rehabilitation	1998	Validation study	To validate EMG fatigue test after rehabilitation	Finland	14 healthy females (15 patient controls)	Testing the MPF of EMG pre and post rehabilitation	MPF (mean power frequency analysis is a valid measure for fatigue)	Pathophysiology 5 (1998)
Lumbar paraspinal muscle fatigability in repetitive isoinertial loading: EMG spectral indices..	1997	Validation study	Develop a valid fatigue test with EMG	Finland	10 healthy individuals	30 repetition to fatigue with David F110 device	Highly repeatable MPF parameters with high correlation to self preceived Borg scale	Eur J Appl Physiol 76 (1997)
Lumbar muscle fatigue and recovery	2002	Validation study	Evaluate EMG to estimate lumb. fatigue	Sweden	57 patients (55 controls)	Repeated 80% MVC 45 sec.	80% classification power	Disseration from Karolinska Institut 2002
Kinetic and electromyographic analysis of single repetition constant and variable resistance	2011	Validation study	Best resistance pattern	Finland	9 healthy individuals, not training backgr.	To full fatigue with various loading patterns	Variable loading proved to be most effective	Journal of Electromyography and Kinesiology 21 (2011)
Impaired Lumbar Movement Perception	2002	Descriptive study	Ability to sense change in lumbar position	Finland	26 spinal stenosis patients	Slow spine rotation with by motor in David F120	Impaired proprioceptive abilities (increased risk)	SPINE Volume 27, Number 9, 2002
Scientific evaluation of specific of knee extension with variable resistance…	1986	Comparison study	Most effective muscle activation	Finland	5 athletes	Maximal 1RM with David, squat and isokinetic	David provided highest neural activation throughout the range of motion	Medicine and Sports Science, Kargel, Basel 1987
Effects of fatiguing loading with a variable resistance equipment on neural activation…	1988	Comparison study	Most effective muscle activation	Finland	7 athletes	60% submaximum training to full fatigue	High muscle fatigue with full range to end vs. shortening range with comp. device	Electromyog. clin. Neurophysiol. 1988,28
Back and Hip Extensor Fatigability in Chronic Low Back Pain Patients and Controls	1998	Comparison study	Compare EMG fatigue btw. LBP and controls	Finland	20 LBP females (15 healthy controls)	Isometric MVC and 50% of MVC	Especially in Gluteus Maximus LBP patients fatigued faster	American Congress of Rehabilitation Medicine 1998
Neuromuscular responses to different resistance loading protocols (weight vs. pneum.)	2012	Comparison study	Most effective fatiguing	Finland	15 healthy individuals, not training backgr.	To full fatigue at several loading levels	Variable resistance (David) induces greater levels of peripheral fatigue	Journal of Electromyography and Kinesiology. 2012

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Outcome studies

Name of the study	Year	Type	Objective	Country	n	Set-up	Outcome	Publication
Gother insurance comp.	2001-2003	RCT[1]	Economic savings	Germany	95 (205 controls)	24 sessions in 12 weeks, DSC	Savings ratio € 1/ € 4,7	Manuelle Medizin 2006 · 44:308–312, Springer Medizin
The Efficacy of Active Rehabilitation (comp. to massage, thermal)	1999	RCT	Pain reduction, funct. disab,one year follow-up	Finland	30 (24 control)	24 sessions in 12 weeks, DSC	At one year VAS 55-->22 (48.5-->45.5 cntrl)	SPINE Volume 24, Number 10, 1999
The Role of Physical Exercise and Inactivity in Pain Recurrence and Absenteeism From Work	2000	RCT	Long term benefits of active therapy	Luxembourg	125	24 sessions in 12 weeks, DSC	VAS - 30, significantly better "survival" for ongoing active group	SPINE Volume 25, Number 14, 2000
AOK insurance comp.	2013	RCT	Economic savings	Germany	1936 (548 controls)	34 session in 12 weeks, DSC[2]	Direct savings of 1.307 € / 24 m. /person	Kosten-Nutzen-Analyse, AOK / Universität Karlsruhe
Kraftwerk (DaimlerChrysler)	2003-2005	RCT	Reduction of sick days	Germany	398 (610 controls)	32 sessions in 32 weeks (one device / David)	35% reduction in sick days, 48% in sick leave cases	Der Universität Heidelberg 2005
Frankfurt airport / AOK	2001	RCT	Reduction in sick days	Germany	95 (85 controls)	24 sessions in 12 weeks, DSC	Reduction of sick days by an average of 7.3 days per worker in a year	Arbeitsmedizin 8/2001
Company prevention with coal mine workers	2014	CCS[4]	Reduction of sick days	Russia	725	Back training (DSC) 3 to 6 m.	34.98% reduction in sick leave cases	Siberian Coal and Energy Comp- 2014
EVE / non-EVE comparison	2009-2012	CCS	Pain reduction	USA	261 (454 controls)	24 sessions in 12 weeks, DSC	With EVE system pain reduction 20% higher (81% vs. 63%)	David internal data analysis
FPZ economic study 1	2006-2008	CCS	Economic savings in medical costs	Germany	9,455	24 sessions in 12 weeks	€ 1.562 savings / patient / year	FPZ 2009
FPZ economic study 2	2014	CCS	Reduction in sick days	Germany	4,559	24 sessions in 12 weeks, DSC et ál	50.81 % reduction is sick days (9.8--> 5.6)	FPZ Schifferdecker-Hoch, F., Hollmann, M., Hoppe, M. 2014
FPZ economic study 3	2015	CCS	Reduction in doctor visits	Germany	13,009	24 sessions in 12 weeks, DSC et ál	57.09 % reduction is doctor visits (1.9-->0.8)	FPZ Schifferdecker-Hoch, F., Hollmann, M., Hoppe, M. 2014
FPZ integrated health study	2011	CCS	Pain reduction	Germany	37,943	24 sessions in 12 weeks, DSC et ál	41% pain free / from the rest 78% signific. less pain	Aktuelle Zahlen und Erkenntnisse zue Medizinischen...(FPZ 2014)
Insurance back patients	2014	CCS	Pain reduction	Austria	360	12 w (2xw) + 12 w (1xw)	VAS 49->17, EQ-5D 58.3 --> 73.2, RMQ 8.8 -->5.8	Reporting to Austrian social insurance
Texas Workmans Comp comparison	2005	CCS	Cost reduction	USA	23 random selected (X control)	24 sessions in 12 weeks, DSC	DSC cost of care $4.100, similar average case $10.000	Texas Workers Compensation Commission Open Records Report #2004563/2005
Mercedes company prevention	2014	CCS	Reduction of sick days	Spain	950	16 sessions, once a week, two devices	78% reduction is sick days	Athlon (Spinn-0ff of Monrdagon University) 2014

[1] Randomised controlled trial

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Summary of How getback™ is Different!!

- getback™ does not have exercise weight machines which one can see in any business gym. We are a rehabilitation / reconditioning clinic for the spine.

- The getback™ Devices are designed by biomechanical specialists and exercise physiologist to a medical rehabilitation standard such that they are registered with the TGA (Therapeutic Goods Administration) of Australia as Medical Grade One Measuring Devices. Gym equipment whilst requiring the normal Australian standards of safety in production these machines do not meet the stringent requirements required to be registered with the Therapeutic Goods Administration (TGA) Department of Health as Medical Rehabilitation Devices.

- Our Devices can provide valid & reliable quantification of the strength and weaknesses and range of motion in every movement direction of the Lumbar and Cervical spine.

- For the specific treatment, testing and evaluation of the Spine getback™ has Six Devices which isolate the specific movements of the Spine in flexion/ extension (forward backward bending), lateral flexion /extension (side to side) and rotation in both Lumbar/Thoracic and Cervical Spine.

- getback™ protocols recognise that every patient has his/her own stages of recovery and supported by research evidence we ensure careful and safe progression of exercise rehabilitation stages which are appropriate and measurable for that patient at that stage of their recovery from chronic spinal pain.

- All the getback™ Devices are fitted with a visual screen which guides, provides visual feedback and motivates the patient's performance in range of motion, speed of contraction and gives the Exercise Therapist a report on the compliance to the correct exercise every time they present for Exercise rehabilitation. The getback™ Devices do all of this and provides us with the ongoing quantifiable data to ensure the patient is safely progressing in their treatment.

- getback™ has a defined end point to our programs. We can provide valid, reliable and evidence based measurements which can be compared with age and gender norms from which to compare your results and quantify your rehabilitation? getback™ research tells us that a range of between 18 - 24 visits should be suffice to treat and rehabilitate the musculature of the spine.

- The getback™ rehabilitation devices are designed to isolate the injured muscles, and safely increase strength and range of motion. The result is a decrease in pain and functional restoration of normal mobility. There are no other Devices currently available that can safely and effectively isolate and rehabilitate the lumbar and cervical muscles like those available in getback™ clinics.

getback™

The Founders

Geoffrey Mackay is co-founder of getback™ PTY LTD and owner of Middle Park Physiotherapy. He has over 30 years of experience working with elite athletes and researching and developing the most effective means for addressing low back and neck pain.

Geoffrey was awarded the Australian sports medal in 2000 for his services with international sport. His contribution included working with the Australian Cricket Team, the Australian Institute of Sport the Australian Olympic team and the Australian Commonwealth Games team. He also served with Australian tennis for 14 years and contributed at a national level across cycling, squash, modern pentathlon and Australian rules football.

Geoffrey Mackay

BApp Sci (Human Performance)

& B App Sci (Physiotherapy)

Founder and Owner of Middle Park Physiotherapy,
Consultant to Australian National Sporting Teams,
Accredited National Coach

Professor Emeritus John Carlson has published over 100 refereed journal papers and book chapters and been awarded in excess of $8.75 million in grant money for research in Exercise and Sport Science and Exercise rehabilitation. He has over 30 years' experience at Victoria University in Sport and Exercise Science. He has worked with Australian national sporting teams including: track cycling, hockey, tennis, badminton, water skiing, modern pentathlon, triathlon and AFL clubs Collingwood, St Kilda, Essendon and the Western Bulldogs, Melbourne Storm in the NRL and the Melbourne Tigers plus many others. John has also served for an extended time as an external advisory consultant to the Australian and Victorian Institutes of Sport.

Professor Emeritus John Carlson

Dip PE (Melb), BSc (Alberta)

MSc (Kansas), PhD (Illinois)

Emeritus Professor, Victoria University,
Institute for Sport, Exercise and Active Living (ISEAL),
Former Director of the Victoria University Research Centre for Exercise Rehabilitation,
Sport and Exercise Science.

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