Journal of Bodywork & Movement Therapies (2016) xx, 1–10

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PREVENTION & REHABILITATION: EDITORIAL

Dynamic tape. Is it all about controlling load?

An athlete making an explosive movement puts extremely high loads through the contractile and non-contractile musculo-tendinous elements attached to their skeletal structure. The ensuing movement of their skeleton accelerate their trunk or limbs, which, during a change in direction, need to tolerate a rapid deceleration while maintaining appropriate balance, dynamic joint position and control, placing stress on capsules, ligaments and fascia…and this continues through out the duration of their event or training session.

Once control becomes compromised due to fatigue, repetition, or a loss of focus, amongst a plethora of other factors, the control of movement or load may result in injuries that can range from minor to major, painless to painful, micro to macro. As long as motivation is still present, and the stakes are high enough, an athlete can choose to put their pain aside, and continue. 'It is not pain that finally stops them, elite athletes are often able to move beyond pain,' says Musculoskeletal Physiotherapist Ryan Kendrick, when interviewed in Leiden, Netherlands in November 2015,' what stops them is tissue failure and tissues don't fail because of pain, they fail because of overload. In the literature there is a poor correlation between tissue damage and pain.' (Beecher, 1946; Moseley, 2007). Kendrick says, 'The inability to adequately dissipate or accommodate load is strongly implicated in conditions such as tendinopathy and may also result in compensation strategies and maladaptive behaviour' (Soslowsky et al., 2002, Cook and Purdham, 2009).

The role of a physical therapist in sport not only encompasses preparation of the athlete in training, managing current injuries to reduce the risk of exacerbation pre-event and the rehabilitation post injury, but it is also significantly focused at the field of play, providing strategies to solve the problems that present during the event.

Kendrick, while working in the United Kingdom identified a problem. How to manage load. Kendrick says, 'Certain measures such as building in adequate adaptation and recovery periods into the training schedule, manipulating equipment and the environment could yield some benefit but I felt there was limited capacity to directly remove load from the athlete during the performance of their activities.' The lack of tools available to him in this area he felt was restricting his ability to reduce risk to his professional sports clients, who included Tennis Players and English County Cricket Players. 'It is often possible to assess where an athlete is experiencing over-load, and, for certain conditions there is a strong correlation with various kinematic parameters.' In other words, Kendrick is suggesting that the evidence of tissue overload may be visible in movement patterns, or it could present as a common overuse injury consistent within their sport. The cumulative load may be influenced by the athletes' size, shape and bio-metrics, but all will relate to the movement tasks within the sport. He says, 'What is difficult is to be able to do something as a therapist that adequately manages load. To do something that does 'just enough' to offload compromised tissues, yet not interfere with the movement patterns through range, that have contributed to their sporting success. A therapist still needs to use load as it is also essential for recovery but the specificity of loading is critical.'

In a musculoskeletal physical therapists' kit bag there is sports tape, Kendrick describes two choices of types of taping approaches open to him; a 'biomechanical approach' such as rigid strapping tape and 'neurophysiological approach' such as the Kinesio-tape range of manufacturers and products. Would either of these taping solutions help with his quest to reduce load within the bodies of his injured or at risk athletes?

Biomechanical tape, common use and suitability for off loading through range

The ubiquitous tape combination 'Leukotape P,' and its under-tape, 'Fixomull' (designed to reduce the risk of skin reactions due to its hypoallergenic adhesive) and manufactured by BSN medical, was marketed to therapists treating patello-femoral pain syndrome using the McConnell patella taping techniques she first described in the Australian Journal of Physiotherapy (McConnell, 1986).

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http://dx.doi.org/10.1016/j.jbmt.2015.12.009

Please cite this article in press as: McNeill, W., Pedersen, C., Dynamic tape. Is it all about controlling load?, Journal of Bodywork & Movement Therapies (2016), http://dx.doi.org/10.1016/j.jbmt.2015.12.009

Leukotape P is a rigid, cotton, high tensile strength, zinc oxide tape and when applied to the patella may alter the patella's position and alignment while still allowing the knee to move (with some restriction towards the end of knee flexion). The rationale suggested that the tape medially glides the patella so it is better able to resist lateral glide during loaded knee flexion/extension, such as when descending or ascending stairs. With appropriate angling to counter patella tilt and correct anchors to minimise the risk of skin traction injuries this taping technique can reduce pain instantly. Smith et al. (2013), however, refers to a controversy where some research suggests patella taping is a valuable adjunct in therapy while a Cochrane review (Callaghan and Selfe, 2012) concluded that pain outcomes comparing patella taping and a co-intervention — often exercise, and exercise without patella taping did not significantly favour patella taping. In the Clinic the taping method is known to reduce pain — this is not under debate, but research (Gigante et al., 2001) does not clearly indicate the biomechanical mechanisms at work. Smith quoting Lan et al. (2010) suggests that subgroups of patients with a higher body mass index or a smaller Q-angle, might not do well with patella taping, creating a washout effect in the research, therefore use of rigid tape in treating patella issues still has many questions to answer. Callaghan and Selfe as late as 2010 still call for consensus on the diagnosis of PFPS (patellofemoral pain syndrome), out come measurement standardisation and acceptable patella taping technique as this may improve the research design in this area.

Leukotape P when applied in non-sesamoid situations is designed to provide rigid joint immobilisation and is often used to stabilise at risk or injured ligaments, it is used very regularly at the shoulder.

For the 'off-loading' applications that Kendrick was looking for, rigid tape was a poor match. When athletes were taped their ligaments may have been protected but their skin was compromised because of the very nature of the rigidity of the tape. The zinc oxide fixative itself can cause allergic reactions, movement can create traction injuries on the tape ends — 'anchors' and the manufacturers recommend removal of the tape in 18 h. The tape fatigues after a while and permanently stretches potentially losing its desired effect. A key issue is that athletes performance is likely to decrease wearing a rigid tape due to restrictions in joint range, altered balance and unnatural movement patterns. Kendrick had to look elsewhere.

Neurophysiological tape, intended use and suitability for off loading through range

American trained Japanese Chiropractor Dr. Kenso Kase developed Kinesio-taping (KT) in the 1970's. During its development phase Kase looked for a material that mimicked the stretch of skin (Kase et al., 2003). So when handling the tape (without it's backing) it is easy to stretch the tape longitudinally (2-way stretch), increasing its length by about 40% at which point the tape does have a sudden end point. Kuni et al. (2015), compared three products for use in ankle instability; KT, non-elastic (rigid) tape and bracing. The study showed that KT did not show any significant relevant stabilising effects on foot kinematics. It is clear that Kase was not looking to mechanically fixate a joint, KT was a definite and conscious move away from rigid taping. His idea was to use the application of tape to create a change in the pain, proprioceptive, motor control or lymphatic systems as a result of the sensory input created via the tape on skin contact. KT is applied with the muscle on stretch and when the joint moves back into mid range the altered shape of the ribbed material, referred to as 'convolutions' in the tape, then 'lifts' the skin. It is hypothesised that this action creates space in the tissue to enhance circulation or reduce pressure on pain sensitive structures.

Kinesio Tape 'is made of tightly woven elasticized cotton fibers and the glue on the back is acrylic, highly durable and waterproof so the tape can be worn for up to a week, during which time it will withstand vigorous movement, sweat and total immersion in water' (Taylor et al., 2014). Taylor et al.'s article is a 'scoping review' which is a type of review that creates a 'map' of a topics evidence base, without quality assessment or extensive data synthesis and helps formulate the questions for later systematic reviews (Armstrong et al., 2011). This choice of review type, in this case looking at Kinesio type tapes (which they refer to as 'elastic therapeutic tape') for neck or upper extremity conditions appropriately indicates that the research in this area is still relatively nascent. Walker comments that only 3 papers on 'elastic therapeutic taping' in the neck and upper limb area have been suitable for inclusion in the 3 high quality systematic reviews since 2010 in this area. They found that this type of taping may help reduce short-term neck and upper extremity pain and be convenient to apply, but they comment that there are not yet enough adequately powered studies to provide satisfactory evidence for the clinical claims being made about elastic therapeutic taping. This is reflected through out the current literature on KT research, that guarded positive findings are being made, but not necessarily validating the original hypothesis of the developers. A look through recent research found that: there is evidence KT could have a positive effect on muscle fatigue resistance (Zhang et al., 2015), KT doesn't reduce postoperative pain following anterior cruciate ligament (ACL) reconstruction (Laborie et al., 2015), and, published later in this Prevention and Rehabilitation section of the JBMT, 'assumptions suggesting that peripheral to distal application of KT stimulates muscle and distal to peripheral relaxes the muscle, seem to be false but application of KT in various directions can affect muscle strength (Vered et al., 2015).

Again, for the 'off-loading' applications Kendrick was looking for Kinesio-tape was also a poor match. When athletes are K-taped as the developers intended there may well be neurophysiological effects in play perhaps affecting pain or proprioception, but certainly little of the easily measurable, firmly elastic biomechanical assistance Kendrick was looking for, KT's elastic response is weak, measuring in grams. Kendrick was looking to control excessive deceleration loads, perhaps measuring in kilos, and provide assistance in the movements return. He realised this type of product wasn't yet in the market. He relates on courses that he tried to approximate what he was looking for by attaching theraband to his clients, but he

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realised that this was never going to work outside of the clinic. So accidentally, Kendrick admits, he ended up needing to develop the product he envisaged.

Posture pals to dynamic tape

After initially experimenting with foam tapes which Kendrick utilised in his initial development of 'posture pals' which are pre-cut tape shapes that help the wearer maintain awareness of a more neutral posture, particularly in the lumbar, thoracic and scapular areas. Market testing of an early foam tape product indicated that users of a postural taping device still wanted to have a full range of motion available to them while wearing the product, such as the range required to partake in a yoga class. This resulted in some skin reactions in a small percentage of the wearers, some from over stretch mechanically shearing the skin or a contact dermatitis magnified by the lack of breathability of the foam tape.

Kendrick realised that the tape he required needed to have:

1. the ability to stretch in 4 directions — to allow the tape to conform to the body of the wearer and to be able to move in complex three dimensional movements, creating an even force on the skin thereby reducing the tension points at which excessive tractioning of the skin could produce blisters.
2. strong elastic resistance and recoil — the tape has to act like the bungee cord used by bridge jumpers, strongly decelerate the falling body and bounce it back up.
3. a high degree of stretch with no rigid end point — at least 200% stretch (Kinesio Tape stretches to about 140% but then stops stretching suddenly).
4. visco-elastic properties — one of these properties is that the material being stretched can provide a greater resistance if the load comes on quickly. This means that a tape product can respond to various speeds of load and provide greater resistance when it is needed at higher loads. For example the arch of the foot might require greater support doing running loads verses walking loads.

By 2009 Kendrick, working with materials experts, had produced Dynamic Tape (DT), a visco-elastic nylon and lycra blend material with 4-way, greater than 200% stretch he has manufactured in Asia. The material and adhesive are fast drying and breathable meaning that the tape, if appropriately applied may stay on for up to 5 days, bearing in mind that if any discomfort, itching, burning, stinging or irritation is felt immediate removal is strongly advised. In 2010 DT was brought to the market. Kendrick continues to develop the product and based on feedback and experience he has changed the product 7 times since launch, altering materials, adhesive or process. The changes have improved the adhesive by 20—25% and the amount of glue on the tape has doubled.

A new DT — 'Dynamic Tape Eco' — made out of recycled plastic bottles is about to be launched at the time of writing. This tape has a much greater resistance that builds much sooner in range. Kendrick says, 'The Eco Tape will ideally be used when more resistive force is required in situations where only small movements like glides, rotations, and lateral movements of joints occur, as well as providing ligament support.'

Three tape types, three taping roles

Kendrick is clear, there are three types of tape: Rigid Athletic tapes, Kinesiology Tapes and Dynamic Tape. The divisions between them Kendrick suggests are based on the materials properties and how they are designed to be used (See Table 1). This table supplied by Kendrick reflects his opinion as to the key differences between the tape types.

Understanding the properties of the three tape types allows a Therapist to use clinical reasoning to decide on a clinical aim and choose what tape, if any, should be used to promote their therapeutic goal.

Table 1 Tape comparison.

	Dynamic tape	Kinesiology tapes	Rigid athletic tapes
Material	Nylon/Lycra or Recycled PET/ Lycra	Cotton ± Lycra	Rayon/Cotton & may contain natural rubber latex
% Elongation	>200%	140—180%	Nil
Rigid end point	No	Yes	Yes
Resistance and recoil	Strong (double layer measured at 10—15 kg)	Weak	Nil
Direction of stretch	Longitudinal and transverse	Longitudinal only	Nil
Application position	Shortened	Lengthened (generally)	Neutral/corrected/shortened
Primary mode of action	Mechanical — deceleration, load absorption and assistance of movement	Neurophysiological	Mechanical — restrictive
Secondary mode of action	Neurophysiological	Mechanical — resistive/ restrictive with weak recoil and rigid end point	Neurophysiological

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Pink, blue or tattoo?

In what appears to be a marketing stroke of genius Kendrick has had the rolls of DT printed with a unique tattoo design, one style being black on a tan coloured tape — the other faded to be much less visible on the tan coloured tape. The tattoo was designed by Tihoti Tatau a Norfolk Island and Tahitian artist. Kendrick was living on Norfolk Island during the development phase of DT and wanted to promote awareness of the Island by incorporating this design.

The tattoo differentiates the tape from other manufacturers products and when seen on an elite athlete with global recognition and resources to pay for the best Strength and Conditioning, Medical and Physiotherapeutic advice may intimate a 'celebrity' endorsement to the brand.

There is no therapeutic effect claimed from the design but if a product 'looks good' it may encourage patient compliance.

Kinesio-Tape is manufactured in different colours but there are no physical product differences between the coloured tapes. According to kinesiotape.co.uk, 'In Japan they use them as a form of colour therapy. Beige is the most popular colour for oedema taping. Pink, black and blue are the most popular colours for sports and physiotherapy taping' (websource 1). Paul Coker a physiotherapist and the UK Medical Director at Rocktape, a company that produces a variant of kinesio tape that has 180% stretch, identifies in a discussion about myths in KT theory that the colour of the tape alters the temperature of the tissue under the tape, with lighter colours reflecting heat and darker colours absorbing it. He rightly suggests that if a temperature change does occur it must be an infinitesimal change and would immediately be countered by homeostasis (websource 2). In preparation for this editorial no scientific paper read discussed the colour of KT other than identifying the colour of the tape used in the research.

What does dynamic tape do?

For DT to produce a mechanical effect Kendrick suggests the tape must be applied to cross one or more joints, be applied in a shortened position and have a good purchase on the levers.

Load absorption: DT is applied to the body in a very different way to KT. To maximise KT's tissue lifting effect KT is usually applied with the tape stretched with the body part lengthened to use the proposed tape convolution effect. After the KT has been applied and the body returns to normal postures the return of the stretch of the tape is theorised to lift the skin a little. In DT application the technique to maximise load absorption is to put the tape on with the body part shortened and with a degree of stretch in the tape (other than the anchors at either end of the tape which must not be placed on in tension). In functional use this means the tape is pre-stretched and is ready to provide support as soon as the musculo-tendinous unit lengthens. Kendrick says, 'The tape should begin to tension as the target muscle begins to work eccentrically.'

DT comes in two widths 5 cm and 7.5 cm, with the extra width of tape increasing the amount of load absorption possible. A greater potential of load absorption can be created by laminating two layers of DT prior to application, the so-called PowerBand. Kendrick says, 'recent testing of a 7.5 cm width PowerBand has shown that Dynamic Tape can absorb 13 kg or more of force through range.' To increase load absorption parallel tapes can be applied.

Force contribution: As an eccentric movement comes to its end and a returning concentric movement starts, the elastic potential stored in the tape contributes to a lightening of muscular load required to make the movement. The elastic potential energy being converted into kinetic energy.

Proving that there is work generated in stretching a light application of DT on the flexor surface of the finger hand and forearm with the wrist held in flexion Kendrick reports an as yet unpublished EMG pilot study by Thomas Nikolaus that showed that wrist extensor EMG activity increased about 40% when the subjects wrist was extended against the force of the tape. The degree to which EMG activity may vary will be influenced by the position in which the tape is applied, the degree of stretch, the part of the body the tape is applied to and the width of the tape. Another preliminary study by Nikolaus on EMG activity of the upper trapezius pre and 48 h after the application of a cervical offload PowerBand technique in a group of office workers with neck pain showed a desirable significant decrease in EMG activity with the tape (websource 3).

A larger study conducted in Brazil and currently being written up for publication has yielded further support. Natalia Bittencourt, Marcela Gomide and Alysson Zuin assessed elite female volleyball athletes from the Minas Tenis Clube, Brazil and identified that the application of DT to resist hip adduction, flexion and internal rotation decreased the frontal plane knee angle (FPKA) during a single leg squat. Of the 17 athletes assessed, 10 had a high FPKA ($>8^\circ$). The as yet non-peer reviewed T-Test revealed statistical difference pre and post DT ($p < 0.0001$). Mean of FPKA pre DT $= 10.5^\circ$ and mean post DT $= 5.4^\circ$ (Bittencourt et al., unpublished).

These early findings suggest there are real mechanical effects provided by the application of DT. Any person having the tape correctly applied immediately perceives the physical effects, and clients with tendon or patello-femoral area symptoms can anecdotally report a decrease in load related discomfort as soon as they stand up. Asking Kendrick about future investigations into clinical efficacy of the tape, he believes the lowest order of evidence gathering which is beginning now is promising, but he is concerned, 'In the clinic each application of the tape can be modified and re-applied until the desired effect is attained, which makes it an effective clinical tool. We start with the end in mind and modify the technique until we achieve our aim but in the research lab exactly the same taping procedure will be applied to 100 subjects, and a potential washout effect, where the taping has been incorrectly applied, the wrong taping has been chosen or the subjects have a poor homogeneity, will hinder the validation of this tool.' Kendrick adds, 'I believe the greatest threat to dynamic taping evidence will be future poor research design.'

Modifying movement: The effect of an application of DT is that it does not hinder range or the movement pattern but that it reduces the load a muscle (group) has to affect.

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In scapular stabilisation the trapezius muscle and serratus anterior work together to upwardly rotate the glenoid appropriately. Physical therapists teach clients motor control exercises which help recruit under performing musculature (Worsley et al., 2013). Dynamic scapula placement under low load — arm by the side exercises, can be graduated to increased load exercises by abducting or flexing the shoulder. A therapist can add or subtract load to adapt an exercise to the capabilities of the client in front of them by bending or straightening the elbow to shorten or lengthen the lever. Elbow flexion reduces the weight of the arm making appropriate recruitment easier to achieve. DT can be used similarly in motor control work with the tape applied in such a way so that the taping takes some of the load of the upper limb, while also positioning the shoulder to improve the ability of under recruited musculature (lower trapezius, serratus anterior) to fire, while typically over recruited muscles (levator scapulae, rhomboids) are positionally inhibited.

Dynamic taping technique: examples of aims

Using clinical reasoning to identify the aims for a taping technique requires thought, but a starter list of examples is provided by Kendrick in his Advanced Dynamic Taping course notes (Kendrick, 2013). Dynamic Tape can aim to:

- resist knee extension to decelerate the leg and reduce eccentric hamstring workload in terminal knee extension
- resist lateral translation of the patella, facilitate the vastus medialis obliquus (VMO) and assist knee extension in patellofemoral pain syndrome
- support the weight of the upper limb in the subluxed hemiplegic shoulder to reduce load on painful structures and improve function
- resist excursion of the ulna nerve by resisting elbow flexion, pronation and wrist and finger extension and assisting the function of muscles which may become overactive and serve as an ongoing source of irritation
- reduce load on the lateral ligament complex of the ankle by decelerating plantar flexion/inversion, approximating the joint to augment force closure and enhance stability and proprioception and providing a facilitation of the peronei
- apply a rotation or Mulligan type intervention to improve pain and range of motion
- decelerate the navicular drop and resist flattening of the medial longitudinal arch to reduce loading on tibialis anterior and posterior to assist 'shin splints'
- assist function of the gastocnemius/soleus/achilles tendon complex by resisting dorsiflexion and assisting the transition into plantar flexion to reduce loading on the achilles tendon in tendinopathy or following repair of a rupture
- decelerate or resist hip adduction and internal rotation that presents as collapse at the knee
- take the weight of the upper limb, approximating the gleno-humeral joint, resisting anterior translation, upwardly rotating the scapula to bring the scapula muscles into mid range (better length—tension relationship) to reduce load and improve rotator cuff function and scapula control in someone with bursitis or subacromial pain.

Learning to use DT

It is perhaps best to be taught how to use DT on courses, though instructional videos are available online. Understanding that there are direct techniques that clearly follow the function of the muscle in movement, for example, the quadriceps crossing the knee joint, or a hamstring technique crossing the hip and the knee, and the calf taping crossing the Achilles tendon on to the sole of the foot to the toes. Using the muscles eccentric role to identify the area needing to be taped, mimicking the eccentric movement and adding support by taping concentrically where it is required. 'Taping the movement allows the user to support the muscle and/or resist through a full range of movement in all functional tasks,' says Kendrick.

When assistance is required directly over the joint and/or in a rotational direction the techniques of choice are grouped under indirect techniques. Kendrick describes these as not copying a particular muscles function but correcting a movement pattern as a whole by offloading or supporting a joint. He gives an example of an arch support technique which creates a force vector to shorten the foot and raise the medial longitudinal arch. 'This technique can be started at the great toe with it positioned in plantar flexion to create an artificial windlass mechanism to further resist lengthening and flattening of the foot. Circumferential application of the tape around the foot can increase force closure. By decelerating the navicular drop and lengthening of the foot, a reduction in overactivity of tibialis anterior and tibialis posterior may be achieved.' Other applications of DT can use a rotation or glide placed on, over, or around the joint as part of the technique, such as patellofemoral glides with the dynamic tape sling, or upper limb glenohumeral control of medial or lateral rotation, subluxation and scapula tilt. These techniques follow a rotational direction crossing over one joint and continuing in the same 3D movement direction although in the opposite direction, often using anterior and posterior parts of the same joint. 'These indirect techniques

Photo 1 Kinesio tape (left) and dynamic tape 7.5 cm and 5 cm rolls (right).

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are more complicated and can require significant practice,' say course tutors Martin Berg and Patrik Pedersen who teach Dynamic Taping courses in Sweden (Pedersen, 2015).

controlled deceleration followed by an assisted shortening action.

Direct Technique — Quadriceps

Figure 1 Figure demonstrates the Direct Technique — Quadriceps, applied in long sitting or in supine lying with full knee extension.

Dynamic tape, the future?

It is likely that DT will become a well known product in the sphere of prevention and rehabilitation in the coming years, it's simplicity in general concept is easily grasped but perhaps more importantly 'felt' by the therapists and their clients who have tried it on themselves and applied it to others. It's scant research base is entirely appropriate at this stage of it's development though it will be in the evidence gathering phase that the longevity of such a product will be determined. In the experience of both research into McConnell's patella taping and Kinesio-tape there are likely to be controversial findings which may or may not support clinical efficacy. Research design will need to be carefully thought through so that the right questions are asked.

Dynamic Tape (DT) Practical examples

Application

The tape can be applied with different applications primarily described as Direct Techniques (Figs. 1, 3 and 4) and Indirect Techniques (Figs. 5 and 6).

Direct Techniques are applied to mimic the action of the musculo-tendinous unit and are applied in the shortened position with long lever arms over the joint and moment arms. The aim of the tape is to absorb energy in the lengthening action of the muscle similar to that of a bungee cord. The elastic characteristic of dynamic tape allows for a

Application recommendations

Prepare the skin correctly (remove hair, clean off moisturisers).

Remove the backing paper by tearing the paper and avoid contact of fingers and adhesive glue.

Apply the anchor (three or four fingers widths) without tension; hold the anchor and press in the opposite direction to the technique so that no tension is transmitted to the skin.

In this technique (Fig. 1) after the anchor is applied and held (as above) the tape is gently tensioned to the onset of resistance and the applied over the anterior thigh, then the knee joint and finishing approximately 2/3rds down the length of the tibia.

The second anchor should be placed on the skin without any tension. Both anchors held in place 30 s. Good taping technique ensures that these anchors have no tension and should be held in place for 30 s to ensure warming of the glue for better skin adhesion. Common taping errors can result in Traction Blisters; these occur at the end points of the taping and are the result of too much tension in the ends during the application. Instructions for application are available on the dynamic tape website and the developer, Ryan Kendrick, Musculoskeletal Physiotherapist advises that users should take time to read and understand carefully before applying on real clients (websource 4).

The quadriceps direct technique is useful in muscle tears, patella tendonopathy, PFPS, Osgood Schlatters, and fat pad/bursa symptoms and is often applied as a power band, see Fig. 2A/B.

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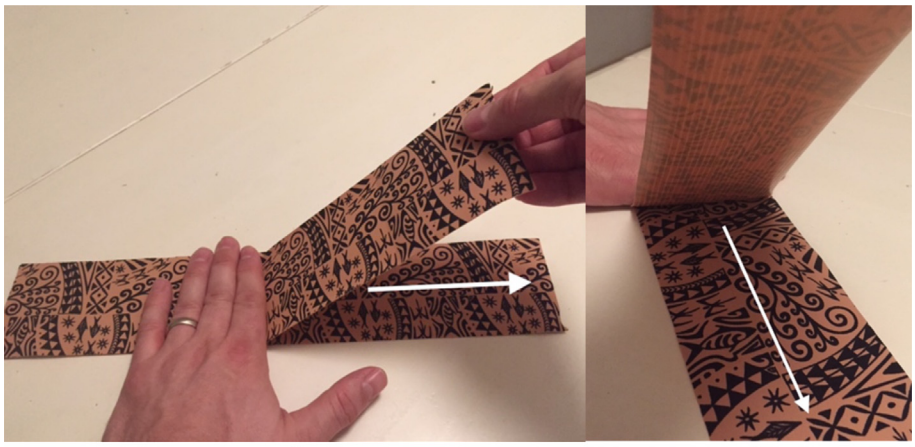


A B

Figure 2 A and 2B PowerBand (Lamination 2—3 layers of tape).

A dynamic tape PowerBand is used in clinical situations where greater resistance is required to decelerate more force within the kinetic chain. This is created by applying additional tape lengths in parallel. Particularly useful with lower limb direct and indirect techniques, even shoulder techniques.

Application — Using 2—3 identical lengths of dynamic tape. Place one piece on a firm surface, carefully remove the backing sheet of the second and place section by section down till both sides are laminated together.

Important to note that there should be no stretch between the layers.

Hold and rub the power band to activate the glue.

Applied in the shortened position.

Direct Technique — Hamstrings

Fig. 3A For ease of application the client should be prone lying with the lower leg flexed at the knee at approx. 135° knee flexion (Tape application as described for Fig. 1).

The aim of this technique is to assist eccentric knee extension by absorbing some of the hamstrings load and then assisting back during the concentric phase into flexion.

Fig. 3B This technique is beneficial in clients with neural provocation symptoms (sciatica) and very helpful in runners, sprinters and jumpers where the load in hamstrings can be very high. In this case the application of tape can even extend over the hip, buttock and diagonally onto the spine which increases the elastic support over the joints involved in the kinetic chain during the activity.

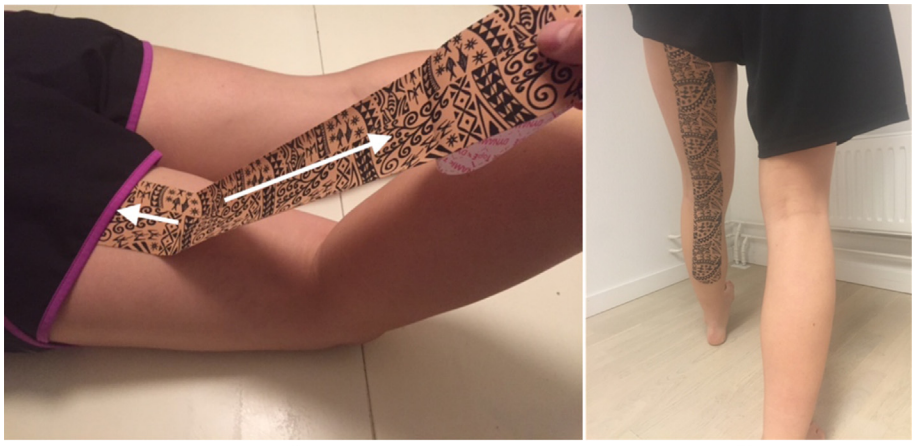
Direct Technique — Calf/Achilles

Fig. 4A: Apply a 5 cm dynamic tape length in plantar flexion from the Metatarsal heads over the Achilles tendon onto the calf — approximately 2/3rds up the muscle belly.

No stretch is necessary because of the shortened start position.

Fig. 4B: Spray the 5 cm tapes with dynamic adhesive spray then apply a 7.5 cm strip over the top of the 5 cm. This will enhance the resistance and hence offload the musculotendinous unit during functional load.

The Achilles/calf direct technique is useful for calf strains, muscle tears, muscle fatigue, Achilles tendonopathy, plantar fasciitis, lower limb pain syndromes.



A B

Figure 3 A & B hamstrings direct technique.

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Figure 4 A. Achilles/calf direct technique 5 cm tape. B. Achilles/calf direct technique 7.5 cm tape.

Indirect technique — Deceleration of pronation

Fig. 5A. This indirect technique as described by Kendrick is for the deceleration of pronation. It is applied often as a power band in the shortened supinated position (dorsiflexion, inversion and forefoot adduction).

Fig. 5B. The start position is under the first and second metatarsal moving towards the navicular tubercle to invert the foot. Kendrick explains that there is a longitudinal force vector acting to shorten the medial longitudinal arch and adduct the foot. The supra-lateral direction across the anterior talo-crural joint provides a deceleration force preventing navicular drop because of the rotation and dorsiflexion direction of the tapes application.

Clinically this technique is useful in exertional lower leg pain and shin splints.

Indirect technique — Control of External Rotation

Essentially designed to decelerate end of range external rotation and assist the gleno-humeral joint back to neutral.

Figure 5 Deceleration of pronation.

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Figure 6 A B Control of external rotation — indirect technique.

This technique is often applied as a power band for greater force.

The starting position is variable depending upon how much external rotation braking force is required. A thrower may require more horizontal extension and external rotation than perhaps a tennis player who may require more external rotation control in overhead flexion. These considerations affect the anterior placement of the tape.

The gleno-humeral joint is positioned in internal rotation and the tape is applied to the lateral part of the arm proximal to the elbow. The direction of the application is superiorly at a 45° angle to create a spiral effect (and avoid circulatory compromise). This creates a force vector up the limb taking the weight off the arm. The tape comes from a posterior direction over the gleo-humeral joint and continues across the chest at the correct required angle to resist anterior translation.

Fig. 6 A and B demonstrate the start and finish positions of the taping technique.

Useful in clients with previous gleno-humeral dislocations or problems in throwing athletes, fatigue or inhibition of internal rotators, pectoral muscle strain.

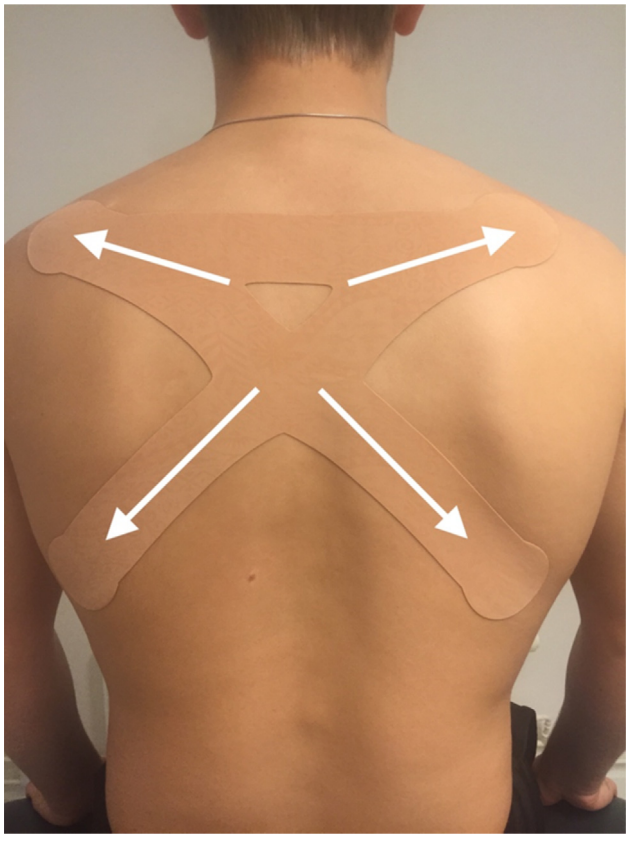

Figure 7 Posture pals.

Thoracic X technique

Fig. 7 shows a posture pals technique for postural control. It is applied in thoracic extension and scapula posterior tilt to provide some resistance to thoracic flexion and scapula hitch to unload a sustained thoracic flexion sitting posture.

The tape is slightly stretched until some resistance is felt and applied in the position of choice. It can remain there for approx. 4—5 days.

Used primarily to aid postural control, headaches, neck pain and back pain, muscle imbalances, shoulder injuries and rib injuries.

P&R section comment

Saner et al. (2015) have their randomised control trial (RCT) comparing a tailored exercise program versus general exercise for a subgroup of patients with low back pain and movement control impairment, published later in this section, though the results showed no significant difference between the two groups, of which both improved, the findings suggest that specific exercise for motor control impairments in low back pain research needs to continue.

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Please cite this article in press as: McNeill, W., Pedersen, C., Dynamic tape. Is it all about controlling load?, Journal of Bodywork & Movement Therapies (2016), http://dx.doi.org/10.1016/j.jbmt.2015.12.009

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Please cite this article in press as: McNeill, W., Pedersen, C., Dynamic tape. Is it all about controlling load?, Journal of Bodywork & Movement Therapies (2016), http://dx.doi.org/10.1016/j.jbmt.2015.12.009