

Efficacy of new age Recovery Technology in Injury Prevention and Care
June 2023

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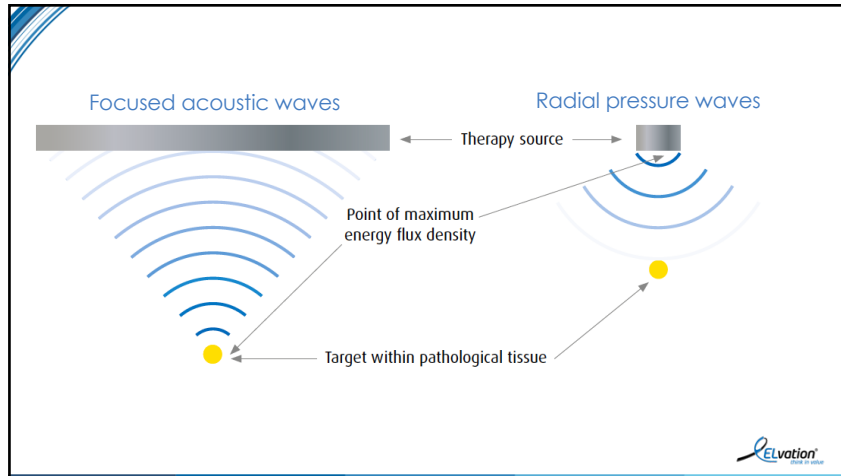
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AGENDA

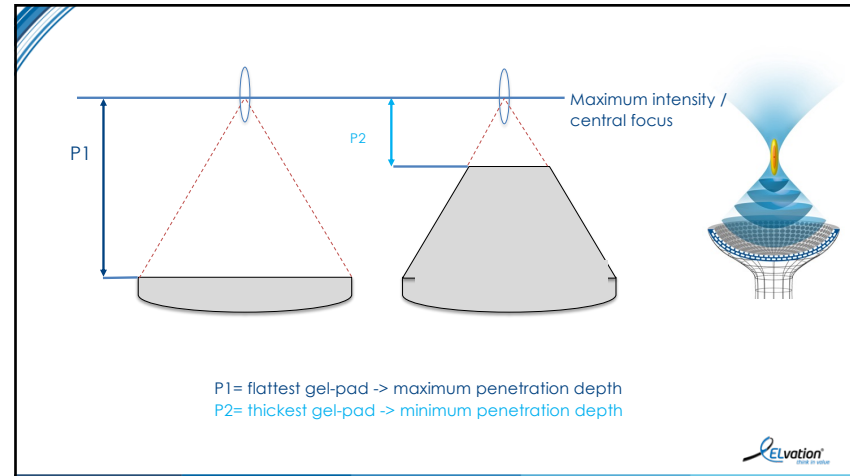
- Fundamentals – Understanding the Technology**
Terminology, Focus Zones, Mechano-transduction
- Application MSK – Evidence and best practice**
 - (I) Mechanism of Action
 - (II) Treatment basics
 - (III) Different approaches and best practice
- Hands-On**
- Q&A and Discussion**

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1. Take Home Message

Therapy Source

Penetration depth

Focal Zone

Skin coupling

Radial

Med. Pressure wave

ca. 2cm

Focused Piezo Technology

Radial pressure waves

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The Aim

Intracorporeal mechanical pressure and traction impulse

- Non - invasive
- Targeted and accurate:
 - Size
 - Depth
 - Strength
 - Painless at the skin insertion

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Unit: Energy flux density – mJ/mm²

5 MPa zone
(at least 5 MPa)
"therapeutic impact zone"

-6dB zone
(50% of the maximum)

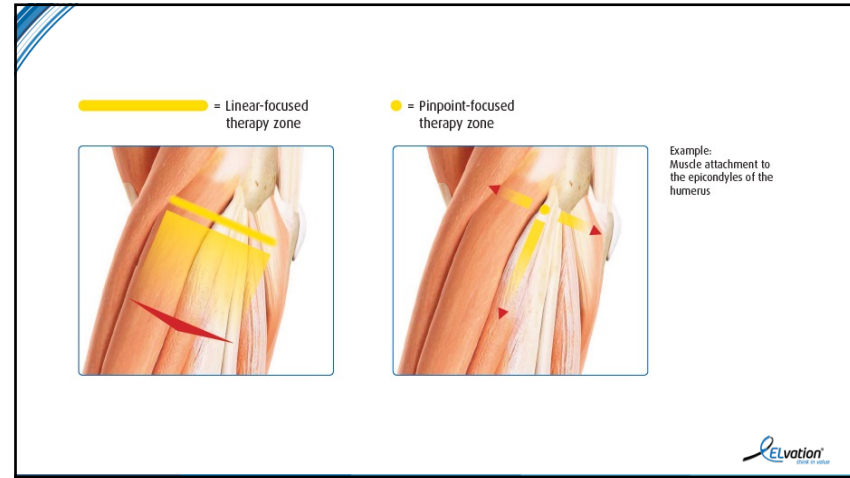
Central point
(100% of energy)

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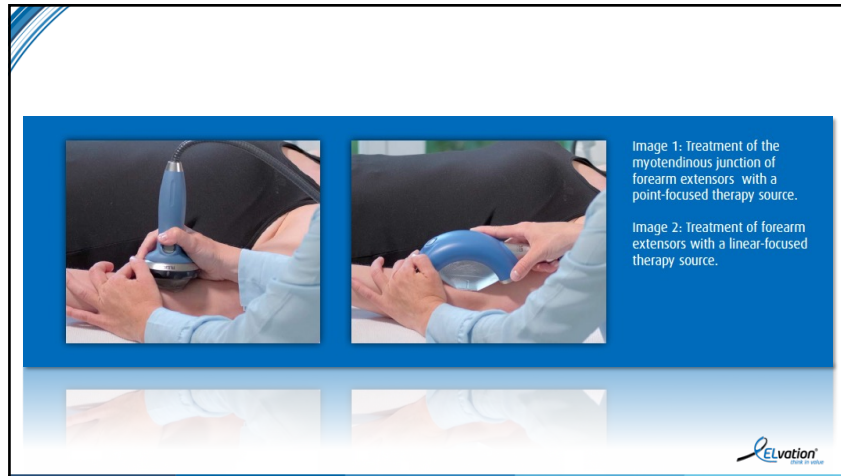
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Hands-On

Q&A and Discussion

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How does the Piezo-Technology work?

www.cartoonalarm.de

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Mechanotransduction

BEFORE AFTER

Mechanical stressors are inducing biochemical changes in tissue.

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Mechanotransduction

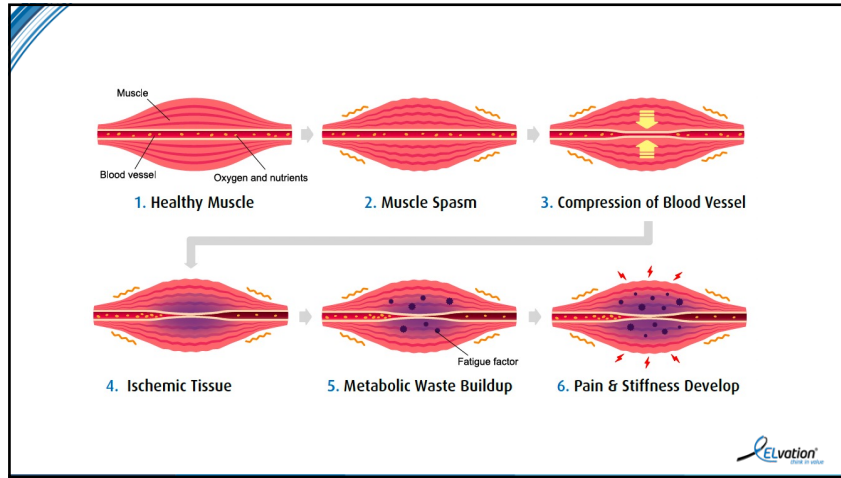
...shock waves exert stress on cells from membrane to the nucleus via cytoskeleton and integrated mechanosensory system and finally lead to a broad range of biological effects, such as cell structure rearrangement, gene expression regulations and metabolic alterations through various signal pathways, etc...

Model of Mechanotransduction, Wang, Tyrell, Ingber (Nature Rev 2009)

Wang JH, Li B. Mechanics rules cell biology. Sports Med Arthrosc Rehabil Ther Technol. 2010;2:14. Published 2010 Jul 8. doi:10.1186/1758-2555-2-14

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Piezo-Technology

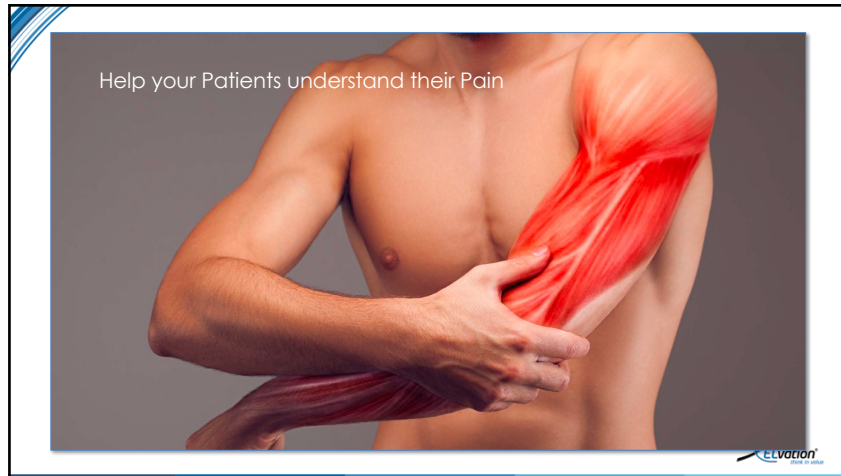
- improves blood circulation in capillary blood vessels,
- decreases the tension and stiffness of muscles,
- reduces pain.

An important trigger for improved local microcirculation after the application of focused sound waves is the release of nitric oxide (NO) which is an important signalling molecule to cause vasodilatation.

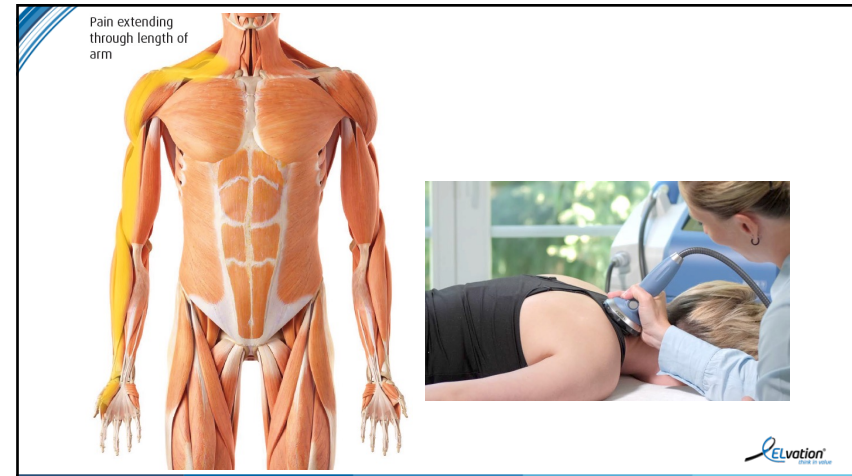
Labels: Blood vessel, Oxygen and nutrients

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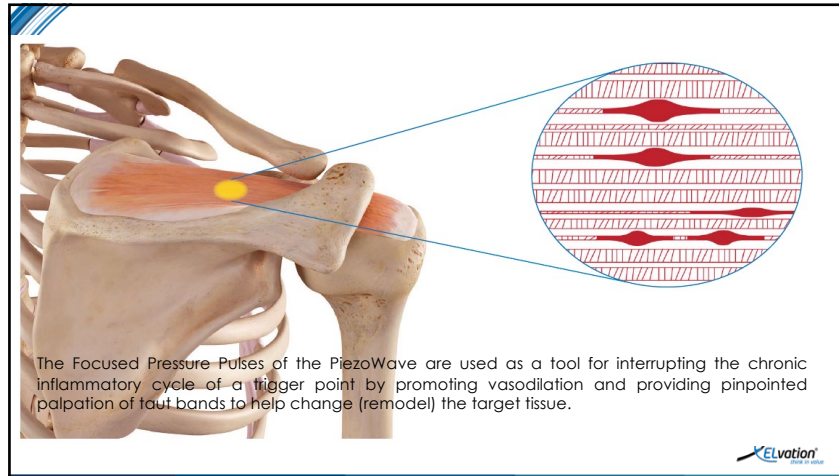
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Mechanisms of action scientifically proven

- Stimulation of microcirculation (blood, lymph)
- Release of substance P
- Hyper-stimulation analgesia („Gate-Control“)
- Reduction of non-myelinated nerve fibers
- Release of nitric oxide (NO), which causes vasodilation, increased metabolism and angiogenesis and has an anti-inflammatory effect
- Release of growth factors (blood vessels, epithelium, bones, collagen, etc.)
- Stimulation of stem cells
- Stimulates lubricin production

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Contraindications*

- tumor diseases
- brain tissue
- infections
- clotting disorder (before use, an analysis of the coagulation status is necessary)
- Environment of a pacemaker
- lung tissue
- pregnancy (only embryo and fetus area)
- epiphyseal plate
- young children

*generally accepted


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- Q&A and Discussion**

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Treatment - General information






B A S I C S



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Treatment basics

- ✓ Therapist sits down!
 - ✓ find a comfortable position yourself
- ✓ Small finger side has contact to patient
 - ✓ avoid slipping! Place the weight of the therapy source „on“ the patient
- ✓ Small tilting movement
- ✓ Relaxed position for patient
 - ✓ especially when treating the shoulder/ thoracic spine area
- ✓ Skin marks

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Treatment basics

- ✓ Patient information: educate your patient!
 - ✓ about the ESWT treatment itself
 - ✓ avoid the pain-inducing movement for up to 8 weeks
 - ✓ though the analgesic effect is very strong, the tissue should not be fully loaded
- ✓ Initial aggravation:
 - ✓ patients sometimes report of an initial aggravation of 1-3 days after treatment




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Penetration depths Gel-pads

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2. Take Home Message

Understand the PiezoWave also as a diagnostic tool that can clearly show you where (anatomically) the injury is.

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3 different Approaches

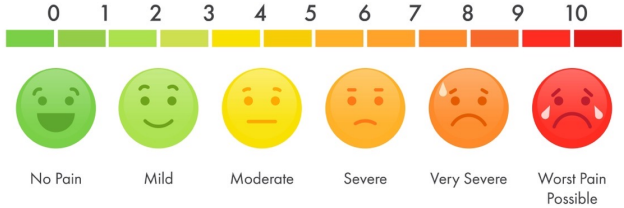
- 1. Standard**
treatment with biofeedback
- 2. Expanded**
treatment with diagnostic imaging and biofeedback
- 3. Myofascial application** – treating the kinetic chain

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1. What is biofeedback?

PAIN SCALE



0	1	2	3	4	5	6	7	8	9	10
No Pain	Mild	Moderate	Severe	Very Severe	Worst Pain Possible					




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3. Take Home Message

Always look for his/her familiar pain!



NOTE: Only pathologically altered and tense tissue responds to the focused sound waves of the PiezoWave.



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2. Expanded Treatment

- ✓ Analgetic effect: after 300 – 500 Impulses, patient could lead away from the target structure...
- ✓ Ultrasound: correct positioning!
- ✓ Marks

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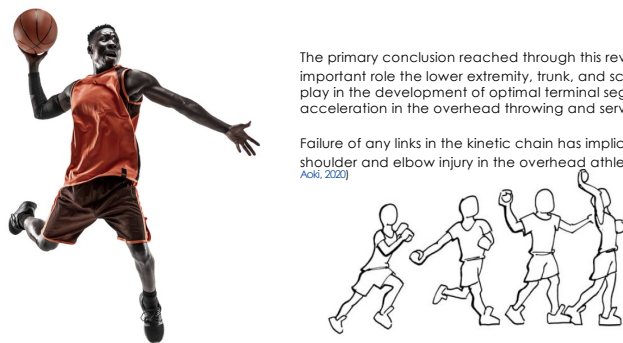
4. Take Home Message

For tendon pathologies/calcifications: Ultrasound can help you work more accurately!



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3. What is kinetic chain



The primary conclusion reached through this review is the important role the lower extremity, trunk, and scapular region play in the development of optimal terminal segment acceleration in the overhead throwing and serving motion.

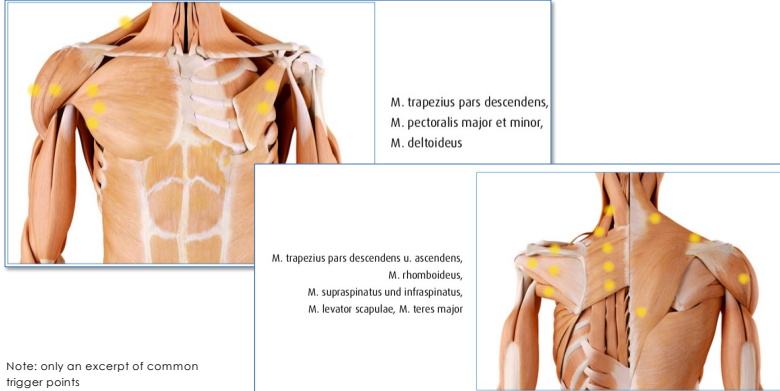
Failure of any links in the kinetic chain has implications for shoulder and elbow injury in the overhead athlete. (Ellenbecker & Aoki, 2020)

Ellenbecker TS, Aoki B. Step by Step Guide to Understanding the Kinetic Chain Concept in the Overhead Athlete. *Curr Rev Musculoskelet Med.* 2020;13(2):155-163. doi:10.1007/s12178-020-09615-1



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Myofascial application – treating the kinetic chain (shoulder region, trunc)



M. trapezius pars descendens,
M. pectoralis major et minor,
M. deltoideus

M. trapezius pars descendens u. ascendens,
M. rhomboideus,
M. supraspinatus und infraspinatus,
M. levator scapulae, M. teres major

Note: only an excerpt of common trigger points



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5. Take Home Message





Human movement is always an interplay of numerous muscles and joints.

Always follow a holistic approach!



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Kinetic chain – example of a Tennis Player

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Kinetic chain – example of a Tennis Player


The deceleration force between the trunk and the arm at ball impact and follow-through is up to 300 Nm. This is required to stabilise and support the shoulder against the distraction forces that equal 0.5 to 0.75 times body weight.

These loads are placed on the shoulder with every stroke.

- Providing a stable proximal base for distal arm mobility.
- Maximise force development in the large muscles of the trunk and transfer them to the hand.
- Generating interactive moments at distal joints that develop more force and energy than the joint itself could develop, and reducing the magnitude of the loads applied to the distal joint.
- Generation of torques that reduce deceleration forces.

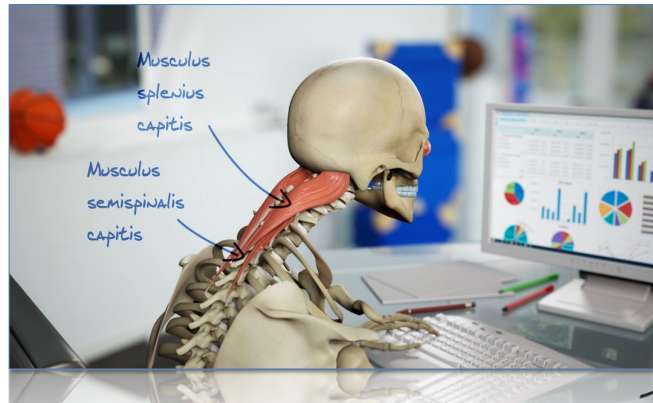

The legs and trunk segments are the engine for force development and the stable proximal base for distal mobility. This link develops 51 to 55% of the kinetic energy and force delivered to the hand.

Ellenbecker TS, Aoki R. Step by Step Guide to Understanding the Kinetic Chain Concept in the Overhead Athlete. *Curr Rev Musculoskelet Med.* 2020;13(2):155-163. doi:10.1007/s12178-020-09615-1





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Kinetic chain – example of an Office worker

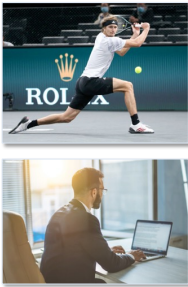
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Kinetic chain – example of an Office worker

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3. Myofascial Application/ Approach




Tennis elbow was not found to be associated with physical activity in leisure time or the performance of sports activities. This study adds evidence to the claim that forceful work, extreme posture, and probably repetitive movements are independent risk factors for tennis elbow. (Hochr & Andersen, 2003)

Researchers have identified shoulder girdle weakness in patients with LET. Therefore, it is reasonable to assume that scapular muscle exercises should be considered as part of a comprehensive rehabilitation program for LET. (Day, 2015)

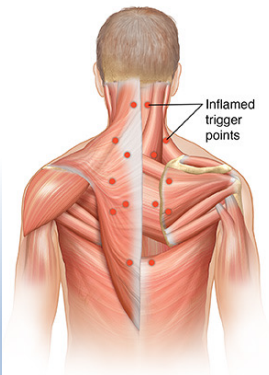
Note: Check proximal structures in LET!

Day JM, Lucado AM, Uhl TL. A COMPREHENSIVE REHABILITATION PROGRAM FOR TREATING LATERAL ELBOW TENDINOPATHY. *Int J Sports Phys Ther.* 2019;14(5):818-829. doi:10.1136/oem.60.5.322. PMID: 12709516; PMCID: PMC1740535




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6. Take Home Message




Inflamed trigger points

Check the entire kinetic chain for long-lasting results




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Myofascial chain
Morphological continuity between the skeletal muscles
Tension transfer along myofascial intermuscular connections



Superficial Back Line, and Superficial Front Line Lateral Line Spiral Line Back Functional Line, Front Functional Line Deep Front Line

Wike J, Krause F, Vogt L, Banzer W. What Is Evidence-Based About Myofascial Chains: A Systematic Review. Arch Phys Med Rehabil. 2016;97(3):454-461. doi:10.1016/j.apmr.2015.11.011



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Fascia is a mechanically active tissue with proprioceptive and nociceptive functions and builds an extensive tensegrity network linking the skeletal muscles of the human body.

The possibility of load transfer between muscles encourages targeting entire myofascial chains in the evaluation process, therapy and exercise.

Instead of focusing on single structures, muscles or joints, more holistic diagnostic and treatment approaches seem appropriate for overuse conditions or radiation pain symptoms that involve several structures of myofascial chain.

Examples:

- Recent studies indicate that tightness of the gastrocnemius and the hamstrings are associated with plantar fasciitis.

REVIEW ARTICLE
Intermuscular force transmission along myofascial chains: a systematic review
Frieder Krause, Jan Wilke, Lutz Vogt and Michael Banzer
Department of Sports Medicine, Goethe University Frankfurt/Main, Frankfurt am Main, Germany


Abstract
The present review aims to provide a systematic overview on tensile transmission along myofascial chains based on anatomical dissection studies and in vivo experiments. Evidence for the existence of myofascial chains is growing, and the capability of force transmission via myofascial chains has been hypothesized. However, there still is lack of evidence concerning the functional significance and capability of force transfer. A systematic literature research was conducted using MEDLINE (PubMed), Scopus and Google Scholar. Selected myofascial chains encompassing the superficial backline (SBL), the back functional line (BFL) and the front functional line (FFL). Peer-reviewed human dissection studies as well as in vivo experiments reporting intermuscular tension transfer between the components of a myofascial chain were included. To assess methodological quality, two independent investigators rated studies by means of validated assessment tools (QUADAS and PRISMA-ScR). The literature research identified 1031 articles, from which 12 studies in respect methodological quality were included. Concerning the SBL and the BFL, there is moderate evidence for force transfer of all three fasciae based on in vivo studies, and one of two fasciae (SBL and BFL) could provide moderate evidence for a slight, but not significant, force transfer at one location in the FF. The findings of the present study indicate that tension can be transferred between some of the central adjacent fasciae. Force transfer might take on three or several directions at all in vivo dissections. However, different methods of force application and measurement hinder the comparability of results. Considering anatomical variation in the degree of continuity and histological differences of the fasciae, variations in result for interpretation. Future studies should focus on the in vivo function of myofascial continuity being tested either in passive force transfer.

Key words: anatomy; fascia; myofascial continuity; tension transfer.

Introduction
Fascia is a mechanically active tissue with proprioceptive and nociceptive functions that act as 1982. Sobral et al. (2006) found that the amount of force created by these cells is sufficient to influence tissue tone (Lee et al. 2006, 2008, 2009, 2010). Furthermore, it is possible to generate proprioceptive feedback via an extensive sensory network linking the various fasciae of the human body (Harris, 1992a, 1992b, 1994; Wainwright et al. 2010). This extensive myofascial continuity and integration found that the lumbar fascia modifies its thickness and stiffness based on force exerted on it.

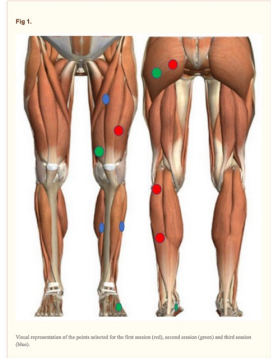
Krause F, Wilke J, Vogt L, Banzer W. Intermuscular force transmission along myofascial chains: a systematic review. J Anat. 2016;228(6):910-918. doi:10.1111/joa.12444

Wike J, Krause F, Vogt L, Banzer W. What Is Evidence-Based About Myofascial Chains: A Systematic Review. Arch Phys Med Rehabil. 2016;97(3):454-461. doi:10.1016/j.apmr.2015.11.011



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Fig 1.



Visual representation of the points selected for the first metatarsal (red), second metatarsal (green) and third metatarsal (blue).


A global approach for plantar fasciitis (Giordani et al., 2019)

The therapy was focused on the active trigger or myofascial points of the leg, thigh and pelvis in order to return the correct equilibrium of the myofascial system of the whole limb.

Since the fasciae of the lower limb are a continuum, proximal tensions could generate stiffness and pain to distal regions as plantar fascia. Based on this evidence, our aim is to analyze and treat plantar fasciitis with a global approach in order to return a correct tension in the entire fascial system of the lower limb.

Results suggest that plantar fasciitis may be due to proximal rigidity or tension of the fascia and a global approach using ESWT may have a similar or better outcome respect to the standard application.

Giordani F, Bernini A, Möller-Ehrenberg H, Stecco C, Masiero S. A global approach for plantar fasciitis with extracorporeal shockwaves treatment. Eur J Transl Myol. 2019;9(3):8372. Published 2019 Sep 9. doi:10.4081/ejtm.2019.8372



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7. Take Home Message

Check the entire myofascial chain for long-lasting results

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...take a look at our ELvation HUB!

- ELvation HUB - web-based information platform where all current experience and knowledge about the Piezo-Technology application is merged and can be accessed at any time
- Parameter setting based on the latest setting and application experience
- "digital" library of all media (videos, webinars, brochures, studies)

<https://hub.elvationusa.com/>

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<https://hub.elvationusa.com/>

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Welcome to the ELvation USA Hub
Supporting your clinical success

We are excited to share with you insights into the expanding understanding and use of Myofascial Acoustic Compression Therapy (MyACT) for musculoskeletal conditions.

Feel free to contact us with any access issues.

VIDEOS
Treatment approaches and settings for different indications

PODCASTS
Listen to the latest episodes of our podcast "Recovery Lab"

DOCUMENTATION
Current brochures, booklets, flyer and leaflets

STUDIES
Providing insights related to the treatment of musculoskeletal conditions and myofascial pain

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Elvation HUB
Studies

© 2006 ORTHOPAEDIC RESEARCH SOCIETY Expression and Mapping of Lubricin in Canine Flexor Tendon	© 2003 JOHN WILEY & SONS AS From mechanical loading to collagen synthesis, structural changes and function in human tendon
© 2010 JOHN WILEY & SONS, INC. Mechanotransduction: a major regulator of homeostatic and development	© BY THE NATIONAL ATHLETIC TRAINERS' ASSOCIATION IN Myofascial Release as a Treatment for Orthopaedic Conditions: A Systematic Review
© THE AUTHOR(S) 2007 Remedial Massage Therapy Interventions Including and Excluding Sternocleidomastoid, Scalene, Temporalis, and Masseter Muscles for Chronic Tension Type Headaches: a Case Series	© 2017 WESTLIFE FITNESS HEALTH, INC. Responsiveness of myofascial trigger points to single and multiple trigger point release massages – a randomized, placebo controlled trial
© MILLER DEGENERES, ET Effects of Focused Piezo-Electric Sound (Myofascial Acoustic Compression Therapy) on a Myofascial Trigger Point (MTrP)	

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Elvation HUB
Video center

VIDEOS
Myofascial Acoustic Compression Therapy (MYACT) is widely used in the treatment of acute and chronic pain in myofascial tissue. MYACT uses acoustic waves to compress and manipulate targeted soft tissues resulting in pain reduction, increased circulation, and potential tissue remodeling.

- VIDEO Pain resulting from calcification of the rotator cuff
- VIDEO Pain resulting from Tennis and/or Golfer's elbow
- VIDEO Wrist and Finger Pain – Flexor Tendinopathy
- VIDEO Low Back Pain – Different approaches
- VIDEO Hip Muscles and Greater Trochanter Pain
- VIDEO Pain resulting from the Muscles along the Tibial Edge
- VIDEO Patella Tendon Pain
- VIDEO Achilles Tendon Pain
- VIDEO Plantar Fascia Pain

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Application booklet

Pain Resulting from Calcification in the Rotator Cuff
The rotator cuff is the most complex part in the body, and is susceptible to injury. Calcification in the rotator cuff muscles is a common cause of chronic shoulder pain. The mechanism of muscle calcification and related muscle dysfunction, and are unknown in most of cases.

How can MYACT help?
The acoustic compression waves of MYACT can be used to gradually target the pathologic calcification of the rotator cuff. The effect is visible after three sessions. The calcification is fragmented by increased circulation and relaxation of these muscles, which can lead the body to resorb the existing calcium.

Positioning the Patient
The patient should be placed in a supine position. Depending on the location of the calcification, the patient should sit on the floor to keep the hip perpendicular to the table. The patient should be positioned so that the hip is perpendicular to the table. A knee roll can be used if the patient reports to feel any pain.

Treatment Approach with Bufoferrax
Preparation: clean hands by the following way: 1. Wet your hands with water. 2. Rub your hands together for 20 seconds. 3. Rinse your hands with water. 4. Dry your hands with a clean towel.

Number of treatment sessions: 1-4 sessions in total

With a simple, repeat check on page 14 and 15.

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Your Questions please

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The data on settings, application sites, duration of applications and the general use of the technology is based on clinical experience and settings can vary from patient to patient. This handout is provided for training purposes. All data provided are only guideline figures, the applicability of which must be verified by medical end-users who have been trained in the use of MyACT systems. The information in this training is not intended as a replacement for the information provided by the most current User Manuals of the different MyACT/therapy source units.



PiezoWave^{2T}
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