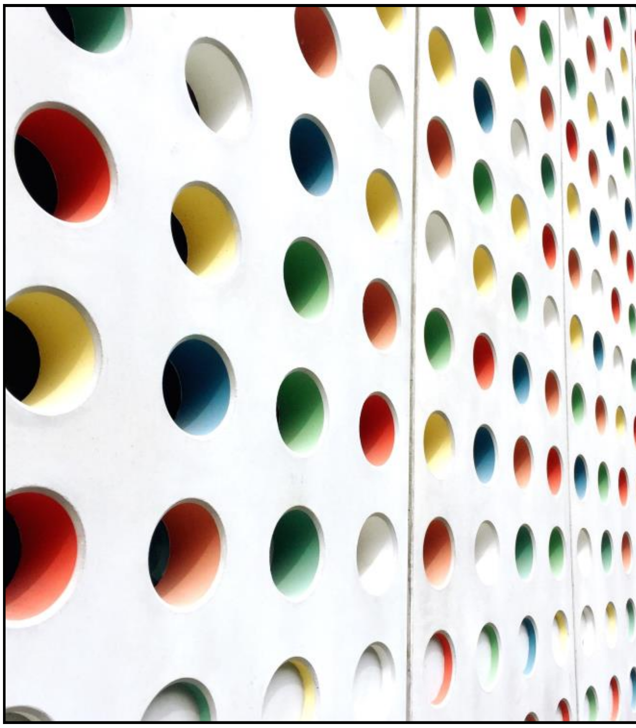

Evidence-Based Use of Rehab for the Busy Clinical Practice

WENDY VARISH, DC, FIANM(US), DACO, CCSP, CCOHC, MCS-P

1

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2

Active Patient Rehab

In office patient exercises and rehab?

No problem… I will add that into my schedule somewhere between pulling my hair out and being way too busy to eat lunch!

3

Today's Goals… We will learn Rehab Protocols that are….

- Evidence -based
- Time- efficient
- Easily adopted into routine practice
- Applicable for all stages of care: ***Acute, Chronic, and Wellness***
- Able to be delegated to appropriate staff
- Appropriate as a billable service
- and…. ***SAFER and EASIER*** for YOU

4

- Appropriate as a billable service
- AND…. ***SAFER and EASIER*** for YOU

5

Proper Coding and Documentation for Rehab

6

Common Rehab Codes

- 97110 – Therapeutic Exercise
- 97112 – Neuromuscular Re-Education
- 97350 -Therapeutic Activities

7

97110

Therapeutic Exercise

- CPT code 97110 is defined as "therapeutic exercises to develop strength, endurance, range of motion and flexibility."
- Includes 1 or more areas
- Requires direct contact time with a qualified healthcare professional and patient
- Billed in 15 minute units -- follow the 8 minute rule as needed

8

97110 – Therapeutic Exercise Activities include:

- Active, active assistive, or passive range of motion to improve joint motion
- Active, resistive exercises to increase muscle strength and endurance (include whether it's isometric, isokinetic, or isotonic)
- Stretches to improve flexibility (indicate type of stretch such as active, ballistic, PNF, etc.)
- Exercise to improve cardio-pulmonary endurance, such as walking on treadmill, using upper extremity ergometer. (not gait training)

9

97112 Neuromuscular Re-education

- One or more areas
- Includes neuromuscular reeducation of movement, balance, coordination, kinesthetic sense, posture, and/or proprioception for sitting and/or standing activities
- Must be one-on-one direct contact time with the patient
- Billed in 15 minute intervals (follow the 8 minute rule)

10

97112 Neuromuscular ReEducation

- Includes activities that facilitate RE-EDUCATION of movement, balance, posture, coordination, and proprioception / kinesthetic sense. Includes use of Proprioceptive Neuromuscular Facilitation (PNF), Feldenkreis, Bobath, BAP'S Boards, and desensitization techniques
- Includes time spent kinesiotaping as well as performing stabilization exercises, facilitation or inhibition, desensitization, ergonomic, training, improving motor control, and plyometrics
- MUST document the body parts treated (specific muscles, joints) along with the specific exercises and activities performed AND ***for what purpose***. KEEP IN MIND A **FUNCTIONAL GOAL**!

11

97112 Neuromuscular Re-education (cont.)

CPT 97112 is often used stroke patients, but it does apply to others as *neuromuscular* is a broad category of diseases. (including motor neuron diseases, disorders of motor nerve roots and peripheral nerves, neuromuscular transmission disorders, and muscle disease).

CPT 97112 can be used in chiropractic / orthopedic rehab settings.

For example, you can use manual cues and have a patient perform open-chain shoulder exercises with closed eyes.

- This procedure will facilitate proper scapulohumeral rhythm and position sense.

12

97112 used in Chiropractic / Rehab Setting

Another example is maintaining balance while performing specific movements.
- Pelvic tilt exercises are performed to teach proper pelvis positioning.
- A progression of that exercise would include maintaining the tilt while standing on a wobble board, then progressing to moving one leg, and finally to standing on one leg while maintaining balance and pelvic tilt

13

97112 Neuromuscular ReEducation Summary (cont.)

When documenting CPT 97112, include the body parts treated (specific muscles, joints) along with the specific exercises and activities performed.

This could include:
- specific exercises or activities performed and for what purpose,
- neuromuscular reeducation of movement, balance, coordination, kinesthetic sense, and/or posture
- proprioception for sitting and/or standing activities

14

97530

Therapeutic Activities

- Requires use of "dynamic activities" to improve functional performance.
- Specific to improving functional activities: Use with patients with difficulty with a certain ADL or sport, or deficits in mobility, strength, balance or coordination
- Therapeutic activities include functional tasks such as bending, lifting, catching, pushing, pulling, throwing, squatting etc.
- Must be one-on-one direct contact time with the patient
- Billed in 15 min. intervals (follow the 8 minute rule)

15

CPT 97530
Therapeutic Activities

An example of a therapeutic activity would be lifting a weighted object from the floor and placing it on a shelf in order to simulate stocking shelves.

- This activity strengthens core motion while reproducing the activity that the patient is lacking.

Can also use activities such as twisting, lifting, pushing, pulling, reaching, throwing, etc. – as long as it simulates the functional deficit.

16

97530 Therapeutic Activities… Additional "functional" or "dynamic" activities include:

- Sit-to-stand training
- Bed mobility
- Step-ups/stair negotiation
- Hip-hinge training
- Squatting maneuvers
- Throwing a ball
- Swinging a bat or golf club
- Car transfer training
- Training proper lifting mechanics

97530 is usually reimbursed at a higher rate than therapeutic exercise (97110)

Due to the fact that these activities require a higher level of skill and repetition in order to achieve mastery, and therefore, require more skilled intervention on the part of the provider.

17

97012 Mechanical Traction

Mechanical traction

-described as the force used to create a degree of tension of soft tissues and/or to allow for separation between joint surfaces.

The degree of traction is controlled through the amount of force (pounds) allowed, duration (time), and angle of pull (degrees) using mechanical means.

Terms often used in describing pelvic/cervical traction:

-intermittent or static (describing the length of time traction is applied)

-autotraction (use of the body's own weight to create the force).

19

Related Procedures for CPT codes 97110 & 97112

- 97113 Aquatic therapy with therapeutic exercises (15 min)
- 97116 Gait Training (includes stair climbing) (15 min)
- 97124 Massage Techniques (15 min)
- 97140 Manual Therapy Techniques (mobilization/manipulation, manual lymphatic drainage, manual traction) (15 min)
- 97150 Therapeutic procedure(s), group (2 or more)

20

Examples of Documentation / Billing Codes

97110 vs. 97112 vs. 97530

97110: Therapeutic Exercise

97112: Neuromuscular Re-education

97350: Therapeutic Activities

21

Case #1

Activity: Right shoulder abduction, adduction, flexion, extension, and internal/external rotation exercises using resistance bands to increase strength and shoulder stability in order to improve tolerance for playing tennis.

Proper code: 97110 (therapeutic exercise) –exercise to develop strength, endurance, ROM & flexibility

NOT this code: 97350 (therapeutic activities) – dynamic activities to improve functional performance

Explanation: The activity of ROM exercises using bands is helping build strength and flexibility, but ***the activity itself is not simulation*** of any aspect of playing tennis.

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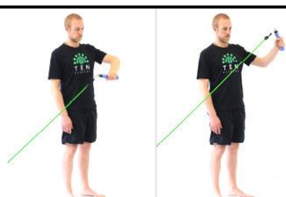
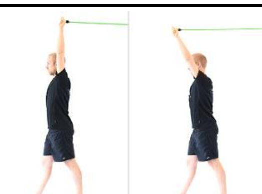


Case #2



Activity: Right shoulder resisted abduction and external rotation, resisted flexion and internal rotation, and resisted internal rotation and resisted external rotation exercises using resistance bands to simulate tennis serves and returns.

Proper code: 97350 (therapeutic activities) – dynamic activities to improve functional performance

NOT this code: 97110 (therapeutic exercise) –exercise to develop strength, endurance, ROM & flexibility

Explanation: The activity of ROM exercises using bands is a therapeutic exercise to help build strength and flexibility, but by ***documenting that the motion simulates tennis serves and returns documents activity to improve functional performance***.

23

Case #3

Activity: Right shoulder PNF and open-chain exercises with eyes closed and manual cues to facilitate proper position sense and scapulohumeral rhythm.

Proper code: 97112 (neuromuscular re-education) – neuromuscular re-ed of movement, balance, coordination, kinesthetic sense, posture and/or proprioception

NOT this code: 97110 (therapeutic exercise) –exercise to develop strength, endurance, ROM & flexibility

Explanation: The activity of PNF and open-chain exercises are therapeutic exercises to help build strength and flexibility, but the addition of eyes closed and manual cues add neuromuscular re-education as described in the code

24

Today's Goals… We will learn Rehab Protocols that are….

- Evidence -based
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- Applicable for all stages of care: ***Acute, Chronic, and Wellness***
- Able to be delegated to appropriate staff
- Appropriate as a billable service
- and…. ***SAFER and EASIER*** for YOU

25

26

STOP LIMITING "REHAB" TO ACUTE

27

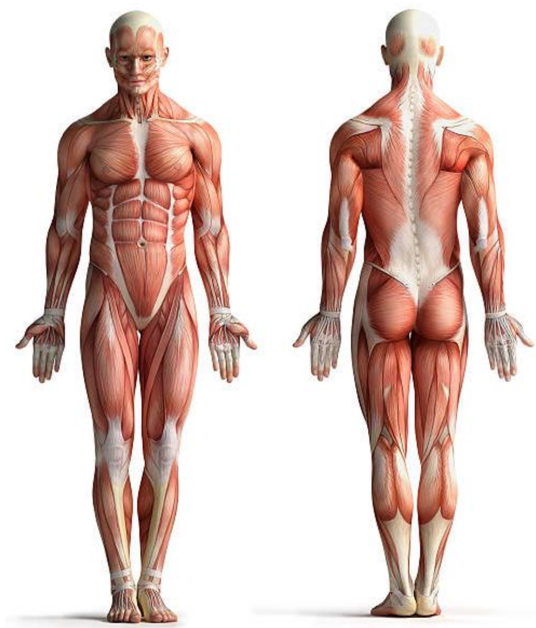
1. Test “before”
2. Perform Therapeutic Exercise
3. Test “after”

28

Balancing Strength and Stretch

Proprioceptive Neuromuscular Facilitation
– A perfect adjunct to the chiropractic adjustment

29



Influencing Muscles of Core Stabilization and Ability for Strength & Flexibility

- Hamstrings
- Glutes
- ITBs
- Abductors
- Adductors
- Gastrocs

30

Quick Review of the Literature

Evidence of Atrophy of lumbar multifidus and paraspinal muscles in chronic low back pain

Evidence that those with greater paraspinal cross-sectional area had lower levels of disability

Core stability better than general exercise for chronic LBP

Core stabilization exercise program significantly increased multifidus muscle mass (measured via CSA) in both healthy women and women with chronic LBP

Flexible hamstrings important for preventing lower back pain

31

Systematic Review to determine if and how altered muscle structure relates to Chronic, Recurrent, or Acute Low Back Pain

Review > Pain Physician. Sep-Oct 2016;19(7):E985-E1000.

Structural Changes of Lumbar Muscles in Non-specific Low Back Pain: A Systematic Review

Dorien Goubert [1], Jessica Van Oosterwijck, Mira Meeus [2], Lieven Danneels

Affiliations + expand

PMID: 27676689

Free article

Abstract

Background: Lumbar muscle dysfunction due to pain might be related to altered lumbar muscle structure. Macroscopically, muscle degeneration in low back pain (LBP) is characterized by a decrease in cross-sectional area and an increase in fat infiltration in the lumbar paraspinal muscles. In addition microscopic changes, such as changes in fiber distribution, might occur. Inconsistencies in results from different studies make it difficult to draw firm conclusions on which structural changes are present in the different types of non-specific LBP. Insights regarding structural muscle alterations in LBP are, however, important for prevention and treatment of non-specific LBP.

Objective: The goal of this article is to review which macro- and/or microscopic structural alterations of the lumbar muscles occur in case of non-specific chronic low back pain (CLBP), recurrent low back pain (RLBP), and acute low back pain (ALBP).

Study design: Systematic review.

Setting: All selected studies were case-control studies.

Methods: A systematic literature search was conducted in the databases PubMed and Web of Science. Only full texts of original studies regarding structural alterations (atrophy, fat infiltration, and fiber type distribution) in lumbar muscles of patients with non-specific LBP compared to healthy

Goubert D, Oosterwijck JV, Meeus M, Danneels L. Structural Changes of Lumbar Muscles in Non-specific Low Back Pain: A Systematic Review. Pain Physician. 2016 Sep-Oct;19(7):E985-E1000. PMID: 27676689.

32

Results indicate atrophy of the Multifidus and Paraspinal Muscles in Chronic Low Back Pain

Study design: Systematic review.

Setting: All selected studies were case-control studies.

Methods: A systematic literature search was conducted in the databases PubMed and Web of Science. Only full texts of original studies regarding structural alterations (atrophy, fat infiltration, and fiber type distribution) in lumbar muscles of patients with non-specific LBP compared to healthy controls were included. All included articles were scored on methodological quality.

Results: Fifteen studies were found eligible after screening title, abstract, and full text for inclusion and exclusion criteria. In CLBP, moderate evidence of atrophy was found in the multifidus; whereas, results in the paraspinal and the erector spinae muscle remain inconclusive. Also moderate evidence occurred in RLBP and ALBP, where no atrophy was shown in any lumbar muscle. Conflicting results were seen in undefined LBP groups. Results concerning fat infiltration were inconsistent in CLBP. On the other hand, there is moderate evidence in RLBP that fat infiltration does not occur, although a larger muscle fat index was found in the erector spinae, multifidus, and paraspinal muscles, reflecting an increased relative amount of intramuscular lipids in RLBP. However, no studies were found investigating fat infiltration in ALBP. Restricted evidence indicates no abnormalities in fiber type in the paraspinal muscles in CLBP. No studies have examined fiber type in ALBP and RLBP.

Limitations: Lack of clarity concerning patient definitions, exact LBP symptoms, and applied methods.

Conclusions: The results indicate atrophy in CLBP in the multifidus and paraspinal muscles but not in the erector spinae. No atrophy was shown in RLBP and ALBP. Fat infiltration did not occur in RLBP, but results in CLBP were inconsistent. No abnormalities in fiber type in the paraspinal muscles were found in CLBP.

33

Are the size and composition of the paraspinal muscles associated with low back pain? A systematic review

Abstract

Background context: Although previous studies have investigated the association between paraspinal muscle morphology and low back pain (LBP), the results are conflicting.

Purpose: This systematic review examined the relationship between size and composition of the paraspinal muscles and LBP.

Study design/setting: A systematic review was carried out.

Patient sample: No patient sample was required.

Outcome measures: This review had no outcome measures.

Methods: A systematic search of electronic databases was conducted to identify studies investigating the association between the cross-sectional area or fatty infiltration of the paraspinal muscles (erector spinae, multifidus, psoas, and quadratus lumborum) and LBP. Descriptive data regarding study design and methodology were tabulated and a risk of bias assessment was performed.

Results: Of the 119 studies identified, 25 met the inclusion criteria. Eight studies were reported as having low to moderate risk of bias. **There was evidence for a negative association between cross-sectional area (CSA) of multifidus and LBP**, but conflicting evidence for a relationship between erector spinae, psoas, and quadratus lumborum CSA and LBP. Moreover, there was **evidence to indicate multifidus CSA was predictive of LBP for up to 12 months in men**, but insufficient evidence to indicate a relationship for longer time periods. Although there was conflicting evidence for a relationship between multifidus fat infiltration and LBP, there was no or limited evidence for an association for the other paraspinal musculature.

Conclusions: This review found **evidence that multifidus CSA was negatively associated with and predictive of LBP up to 12 months** but conflicting evidence for an association between erector spinae, psoas, and quadratus lumborum CSA and LBP. To further understand the role of the paraspinal musculature in LBP, there is a need for high-quality cohort studies which extend over both the short and longer term.

Ranger TA, Cicuttini FM, Jensen TS, Peiris WL, Hussain SM, Fairley J, Urquhart DM. Are the size and composition of the paraspinal muscles associated with low back pain? A systematic review. Spine J. 2017 Nov;17(11):1729-1748. doi: 10.1016/j.spinee.2017.07.002. Epub 2017 Jul 26. PMID: 28756299.

34

Paraspinal muscle cross-sectional area predicts low back disability but not pain intensity

Tom A Ranger[1], Flavia M Cicuttini[2], Tue Secher Jensen[3], Stephane Heritier[2], Donna M Urquhart[2]

Affiliations + expand

PMID: 30529786 DOI: 10.1016/j.spinee.2018.12.004

Abstract

Background and context: The lumbar paraspinal muscles, including the erector spinae and multifidus, play an important role in movement and control of the spine. However, our understanding of their contribution to low back pain and disability is unclear. Systematic reviews have reported conflicting evidence for an association between paraspinal muscle size and low back pain, and a paucity of data examining muscle cross-sectional area (CSA) and low back disability.

Purpose: To investigate the relationship between paraspinal muscle CSA and both low back pain intensity and disability.

Study design/setting: One-year longitudinal cohort study.

Patient sample: Participants were selected from the SpineData Registry (Denmark), which enrolls people with low back pain of 2 to 12 months duration without radiculopathy and a satisfactory response to primary intervention.

Outcome measures: Current, typical, and worst pain in the prior 2 weeks were assessed by 11-point numeric rating scales and an average pain score was calculated, and disability was measured using the 23-item Roland-Morris Disability Questionnaire. CSA (cm^2) of the lumbar paraspinal muscles was measured at levels L3-L5 from magnetic resonance images.

Methods: Participants completed the study questionnaires and underwent the lumbar spine magnetic resonance images at baseline and were followed up 12 months later to repeat the questionnaires. Statistical analyses involved multivariable linear regression (cross-sectional analysis) and linear mixed-

Investigation of paraspinal muscle cross-sectional area (CSA) and Low Back Disability…

Ranger TA, Cicuttini FM, Jensen TS, Heritier S, Urquhart DM. Paraspinal muscle cross-sectional area predicts low back disability but not pain intensity. Spine J. 2019 May;19(5):862-868. doi: 10.1016/j.spinee.2018.12.004. Epub 2018 Dec 7. PMID: 30529786.

35

Results found that ***those with greater paraspinal cross-sectional area had lower levels of disability***

Results: A total of 962 participants were included and 588 (65.8%) were followed up at 12-months. Multivariable analysis showed that greater paraspinal muscle CSA was associated with lower levels of disability, after adjusting for confounders (right mean CSA: baseline beta -0.16, 95% CI -0.26 to -0.06, p<.01; longitudinal beta -0.11, 95% CI -0.21 to -0.01, p=.03). This was evident at all levels, except L5 which was marginal at baseline (beta -0.08, 95% CI -0.15 to -0.001, p=.045) and not significant longitudinally (beta -0.05, 95% CI -0.12 to 0.02, p=.18). However, there were no associations between muscle CSA and pain intensity (baseline beta -0.02, 95% CI -0.06 to 0.02, p=.29; longitudinal beta -0.02, 95% CI -0.06 to 0.02, p=.34). Results were similar for both complete case and multiple imputation analyses.

Conclusions: This study found an inverse relationship between lumbar paraspinal muscle CSA and low back disability, but not pain intensity. While further investigation is needed, these findings suggest that treatment strategies directed at increasing paraspinal muscle size may be effective in reducing low back disability.

36

Core Stability and Chronic Non-Specific LBP

PMC Alt PDF

Effectiveness of core stabilization exercises and routine exercise therapy in management of pain in chronic non-specific low back pain: A randomized controlled clinical trial

Pak J Med Sci. 2017 Jul-Aug; 33(4): 1002–1006.

Pakistan Journal of Medical Sciences
Professional Medical Publications

Effectiveness of core stabilization exercises and routine exercise therapy in management of pain in chronic non-specific low back pain: A randomized controlled clinical trial

Muhammad Waseem Akhtar, Hossein Karimi, and Syed Amir Gilani

Additional article information

Abstract

Background & Objective:

Low back pain is a frequent problem faced by the majority of people at some point in their lifetime. Exercise therapy has been advocated an effective treatment for chronic low back pain. However, there is lack of consensus on the best exercise treatment and numerous studies are underway. Conclusive studies are lacking especially in this part of the world. Thisstudy was designed to compare the effectiveness of specific stabilization exercises with routine physical therapy exerciseprovided in patients with nonspecific chronic mechanical low back pain.

Methods:

This is single blinded randomized control trial that was conducted at the department of physical therapy Orthopedic and Spine Institute, Johar Town, Lahore in which 120 subjects with nonspecific chronic low back pain participated. Subjects with the age between 20 to 60 years and primary complaint of chronic low back pain were recruited after giving an informed consent. Participants were randomly assigned to two treatment groups A & B which were treated with core stabilization exercise and routine physical therapy exercise respectively. TENS and ultrasound were given as therapeutic modalities to both treatment groups. Outcomes of the treatment were recorded using Visual Analogue Scale (VAS) pretreatment, at 2nd, 4th and 6th week post treatment.

Results:

The results of this study illustrate that clinical and therapeutic effects of core stabilization exercise program over the period of six weeks are more effective in terms of reduction in pain, compared to routine physical therapy exercise for similar duration. This study found significant reduction in pain across the two groups at 2nd, 4th and 6th week of treatment with p value less than 0.05. There was a mean reduction of 3.08 and 1.71 on VAS across the core stabilization group and routine physical therapy exercise group respectively.

Akhtar MW, Karimi H, Gilani SA. Effectiveness of core stabilization exercises and routine exercise therapy in management of pain in chronic non-specific low back pain: A randomized controlled clinical trial. *Pak J Med Sci.* 2017;33(4):1002-1006. doi:10.12669/pjms.334.12664

37

Meta-Analysis shows Core Stability Exercise Better than General Exercise for Chronic LBP and Disability

PMC Alt PDF

A Meta-Analysis of Core Stability Exercise versus General Exercise for Chronic Low Back Pain
PLoS One. 2012; 7(12): e52082.

PLOS ONE

A Meta-Analysis of Core Stability Exercise versus General Exercise for Chronic Low Back Pain

Xue-Qiang Wang, Jie-Jiao Zheng, [...], and Pei-Jie Chen

Additional article information

Associated Data

- Supplementary Materials

Abstract

Objective

To review the effects of core stability exercise or general exercise for patients with chronic low back pain (LBP).

Summary of Background Data

Exercise therapy appears to be effective at decreasing pain and improving function for patients with chronic LBP in practice guidelines. Core stability exercise is becoming increasingly popular for LBP. However, it is currently unknown whether core stability exercise produces more beneficial effects than general exercise in patients with chronic LBP.

Methods

Published articles from 1970 to October 2011 were identified using electronic searches. For this meta-analysis, two reviewers independently selected relevant randomized controlled trials (RCTs) investigating core stability exercise versus general exercise for the treatment of patients with chronic LBP. Data were extracted independently by the same two individuals who selected the studies.

Results

From the 28 potentially relevant trials, a total of 5 trials involving 414 participants were included in the current analysis. The pooling revealed that core stability exercise was better than general exercise for reducing pain [mean difference (−1.29); 95% confidence interval (−2.47, −0.11); P=0.003] and disability [mean difference (−7.14); 95% confidence interval (−11.64, −2.65); P=0.002] at the time of the short-term follow-up. However, no significant differences were observed between core stability exercise and general exercise in reducing pain at 6 months [mean difference (−0.50); 95% confidence interval (−1.36, 0.36); P=0.26] and 12 months [mean difference (−0.32); 95% confidence interval (−0.87, 0.23); P=0.25].

Wang XQ, Zheng JJ, Yu ZW, et al. A meta-analysis of core stability exercise versus general exercise for chronic low back pain. *PLoS One*. 2012;7(12):e52082. doi:10.1371/journal.pone.0052082

38

Effects of core stability exercises on multifidus muscles in healthy women and women with chronic low-back pain

Abstract

Background: Chronic low-back pain (LBP) may be related to decreased lumbar multifidus muscle cross-sectional area (CSA).

Objective: In this study, core stabilization exercises were designed to enhance neuromuscular control and correct multifidus dysfunction.

Methods: The subjects were healthy women (n = 11) and women with chronic LBP (n = 17). Lumbar multifidus muscle CSAs were measured by ultrasonography. Tests were carried out before training exercises for lumbar stability, and again 4 months and 8 months after training.

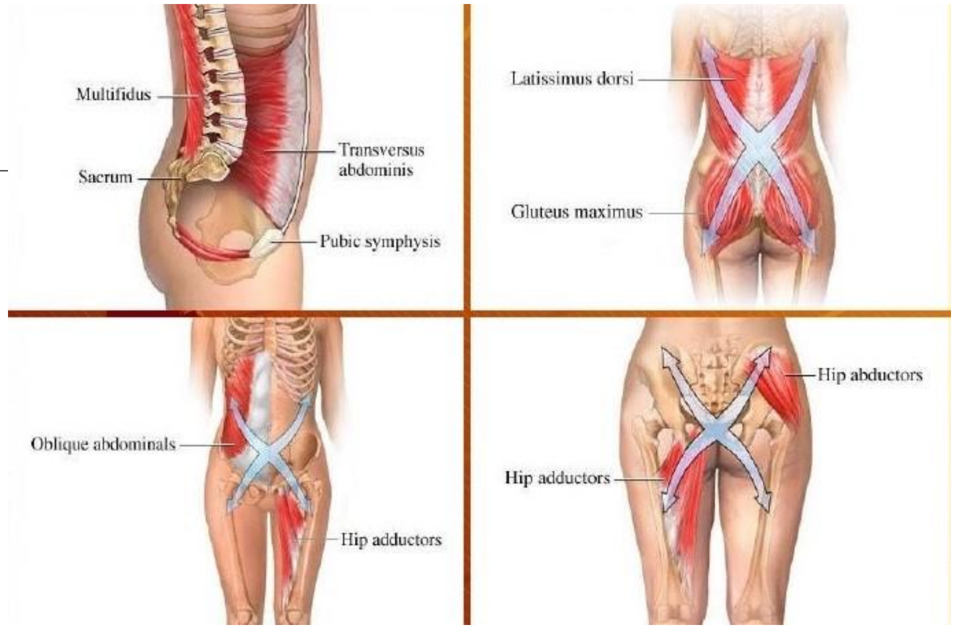
Results: In women with LBP, the mean multifidus muscle CSA increased by 22% on the right side and 23% on the left side after 8 months of lumbar stabilization training, compared with baseline measurements. In healthy women, mean multifidus muscle CSA increased by 24% on the right side and 23% on the left side, compared with baseline values.

Conclusions: A core stabilization exercise program significantly increased multifidus muscle CSAs in both healthy women and women with chronic LBP.

Kliziene I, Sipaviciene S, Klizas S, Imbrasiene D. Effects of core stability exercises on multifidus muscles in healthy women and women with chronic low-back pain. J Back Musculoskelet Rehabil. 2015;28(4):841-7. doi: 10.3233/BMR-150596. PMID: 25881694.

39

Core Muscles



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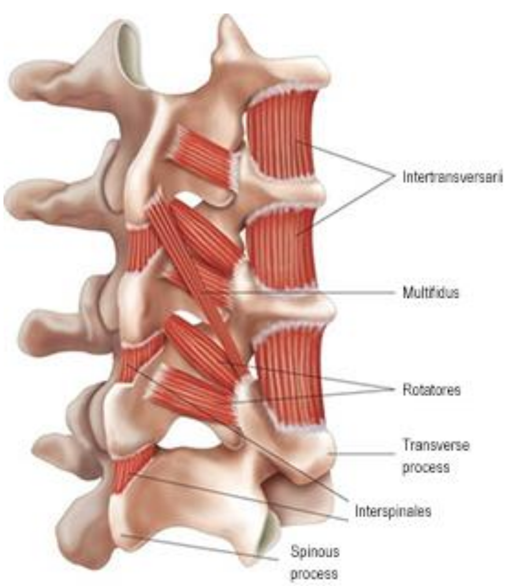
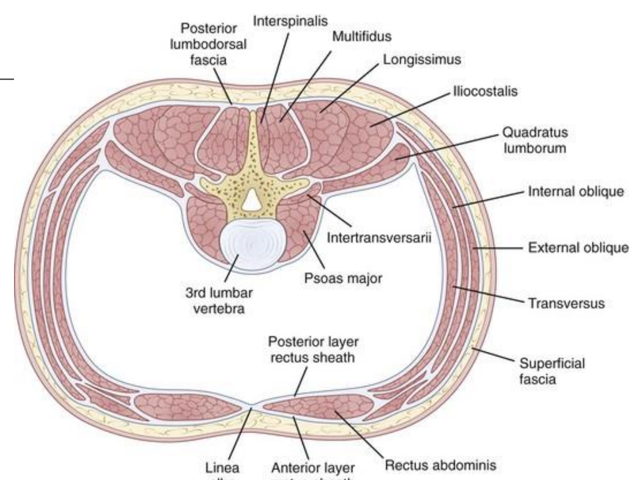




41

Multifidus

Origin: Posterior sacrum, posterior superior iliac spine, mammillary process of lumbar vertebrae, transverse process of thoracic vertebrae and articular process of lower cervical vertebra C4-C7.

Insertion: Base of spinous process of all vertebrae from L5 to C2, inserting 2-4 levels above origin.

Nerve Supply: Medial ramus of the dorsal root of the spinal nerve.

42

Multifidus

Action: Bilateral contraction extends the vertebral column. Unilateral contraction contralaterally rotates the vertebral column to the opposite side.

Clinical Relevance: Important stabilizer of the lumbar spine.

Weakness and atrophy are associated with chronic lower back pain and disability.

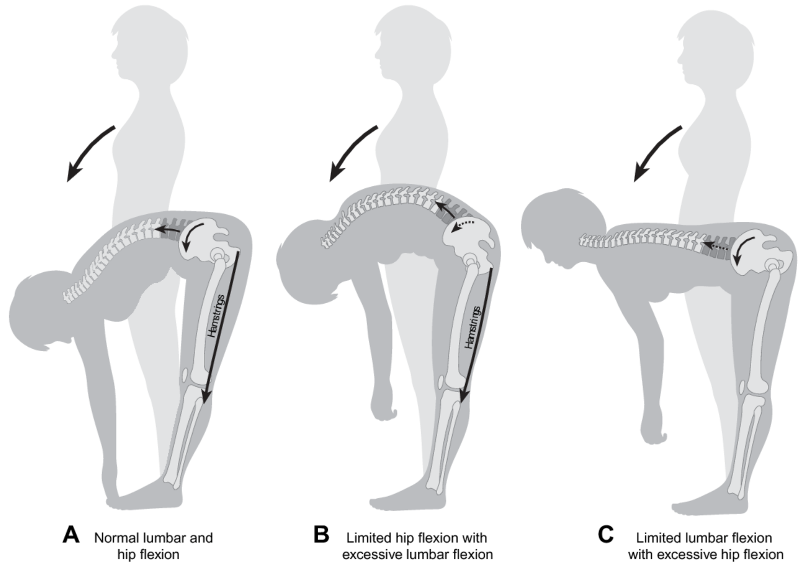
43

Lumbo-Pelvic Rhythm

A. Normal

B. Lumbar Dominant

C. Pelvic Dominant



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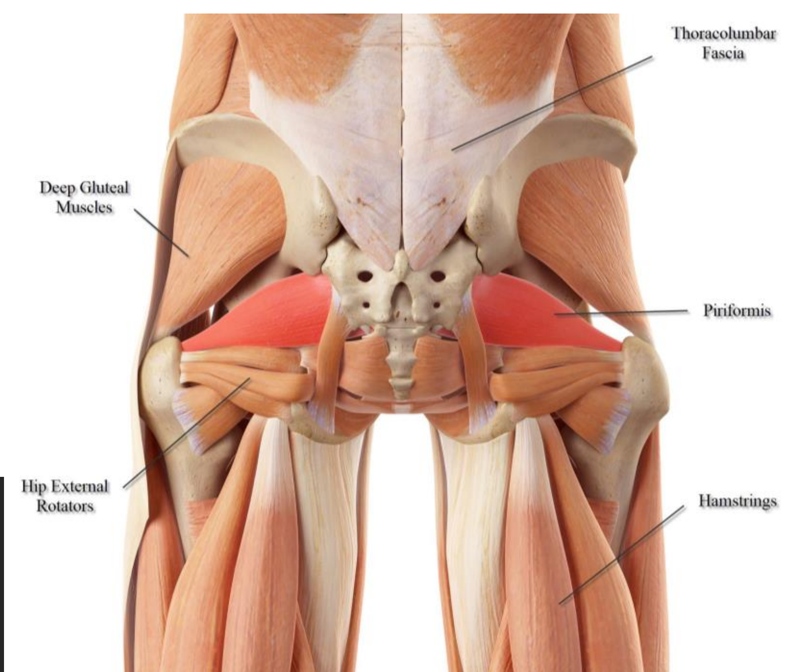


"The lumbo-pelvic-rhythm comprises 2 patterns:

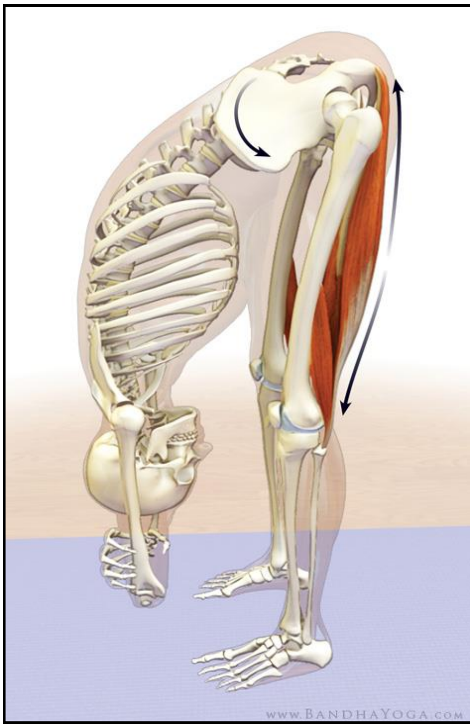
Lumbar Dominant and Pelvis Dominant.

In flexible subjects, Pelvis movement was dominant.

In conclusion, improving tight hamstrings may reduce lumbar loading thereby reducing low back pain."

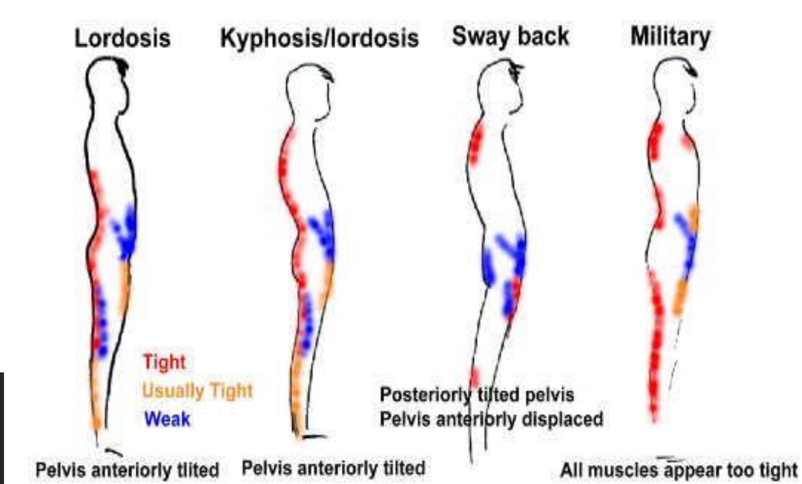
Hasebe K, Sairyo K, Hada Y, Dezawa A, Okubo Y, Kaneoka K, Nakamura Y. **"Spino-pelvic-rhythm with forward trunk bending in normal subjects without low back pain."** Eur J Orthop Surg Traumatol. 2014 Jul;24 Suppl 1:S193-9.

45



Hamstring Tightness and Pelvic Motion

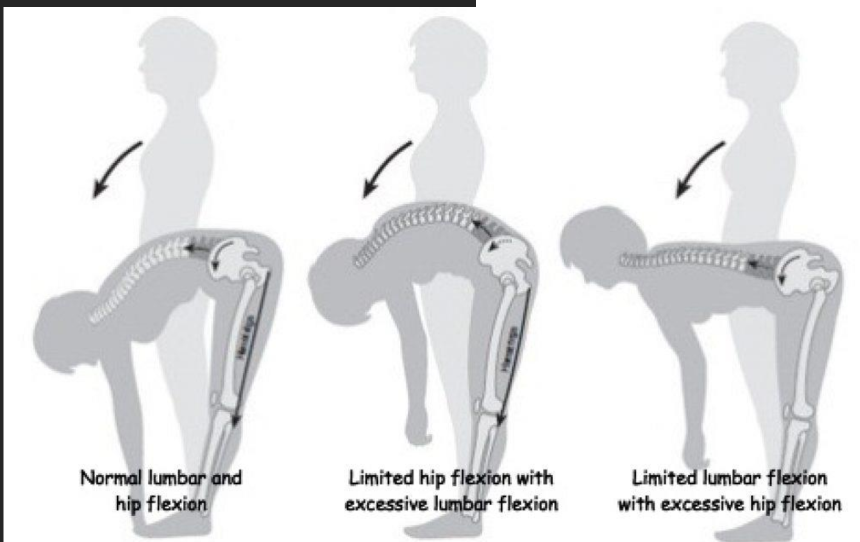
46



"Dynamic stretching could change the spino-pelvic to a pelvis-dominant motion, indicating that flexible hamstrings are important for preventing low back pain."

Hasebe K[1],Okubo Y, Kaneoka K, Takada K, Suzuki D, Sairyo K. **"The effect of dynamic stretching on hamstrings flexibility with respectto the spino-pelvic rhythm."** J Med Invest. 2016;63(1-2):85-90.

47



Must balance Flexibility and Strength

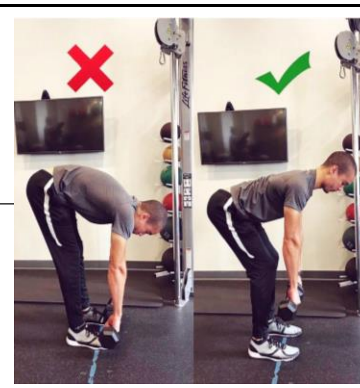
Tight does NOT mean Toned

48

Hip Hinge

-Indicator for Multifidus Stability

-Assists in "activating" the multifidus and core muscles



49

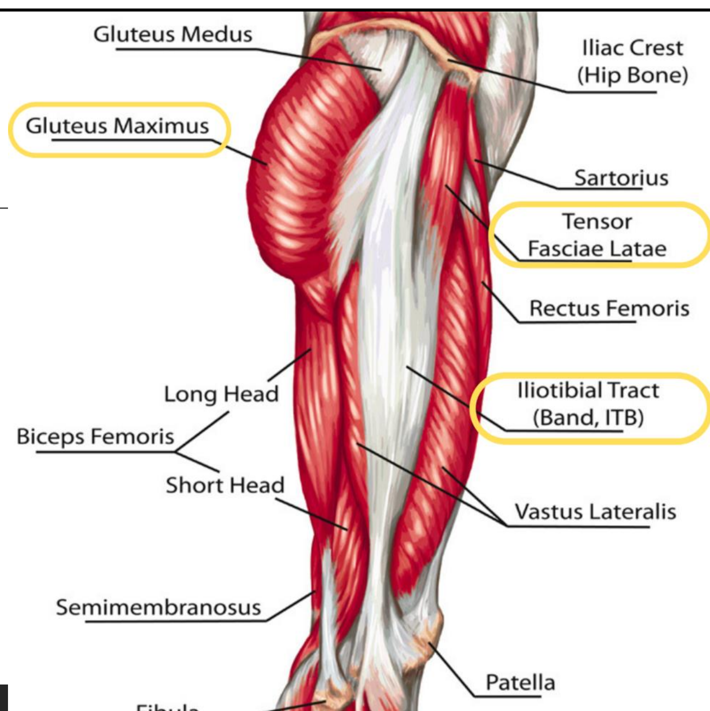
HANDS ON:

MODIFIED HIP HINGE

50

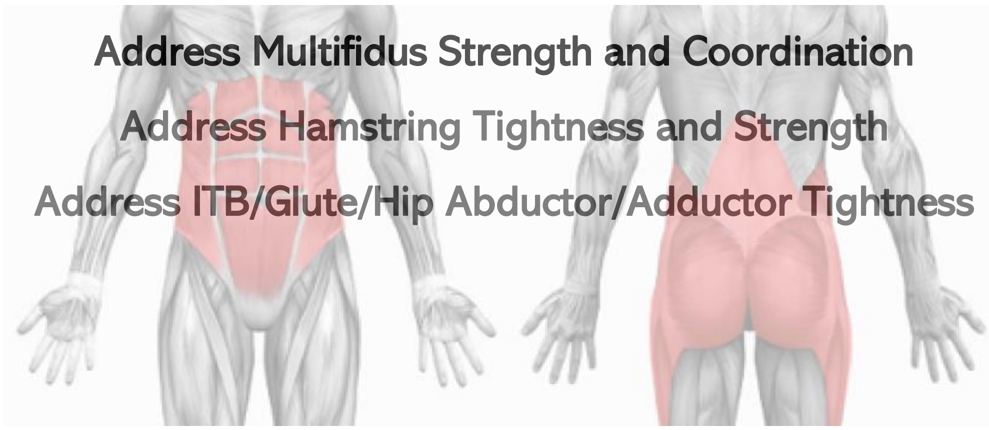
Hamstrings, Iliotibial Band, Hip Abductors Adductors, and Gastrocs

Tightness of the ITB, hamstrings, glutes, piriformis, gastrocs, abductors and adductors affect **EFFICIENCY** of the Core Musculature



51

Comprehensive Approach:



52

PNF for Stretch and Strength

Research has examined the effects of static stretching (SS), ballistic stretching (BS), and PNF stretching.

PNF has greater ability to cause a larger magnitude of gains within subjects' active and passive ROM

- (Funk et al., 2003; Lucas and Koslow, 1984; Wallin et al., 1985; Etnyre and Lee, 1988; Feland et al., 2001).

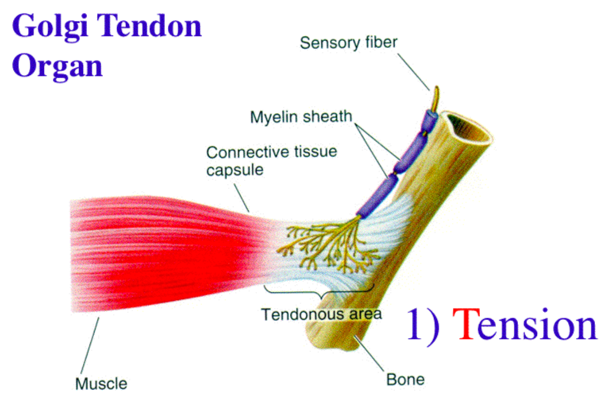
Proprioceptive Neuromuscular Facilitation (PNF): Its Mechanisms and Effects on Range of Motion and Muscular Function; Kayla B. Hindle, Tyler J. Whitcomb, Wyatt O. Briggs, Junggi Hong, J Hum Kinet. 2012 Mar; 31: 105-113. Published online 2012 Apr 3. doi: 10.2478/v10078-012-0011-y: PMCID: PMC3588663

53

PNF for Stretch and Strength

-4 Proposed Mechanisms Leading to Increased ROM:
- Autogenic Inhibition
- Reciprocal Inhibition
- Stress Relaxation
- Gate Control Theory (Sharman et al., 2006; Rowlands et al., 2003)

-All involve GTO of target muscle or antagonist muscle

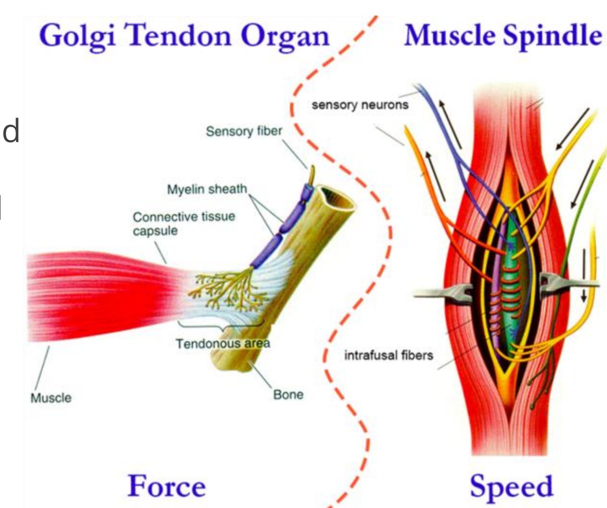


54

Sensory Organs of the Muscle-Tendon Unit

Muscle Spindle
- Senses the changes in muscle length and the rate (speed) of lengthening
- Involved in stretch reflex and Reciprocal Inhibition

Golgi Tendon Organ
- Senses the changes in muscle tension.
- Inhibits muscle activation in order to decreases the tension of muscle and tendons.
- Involved in Autogenic Inhibition

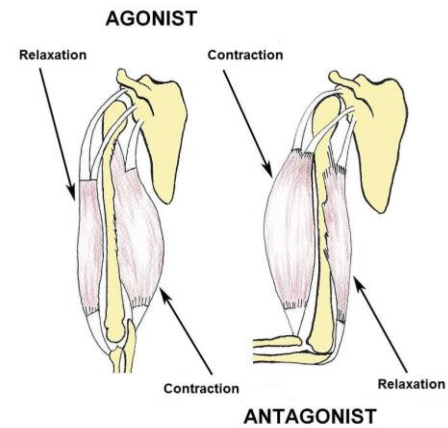


55

Autogenic and Reciprocal Inhibition

Autogenic Inhibition
- The ability of a muscle to relax when it experiences a stretch or increased tension

Reciprocal Inhibition
- The relaxation of muscles of the opposite muscle (on the other side of the joint) when the agonist muscle is stretched.



56

GTO's vs. Muscle Spindles

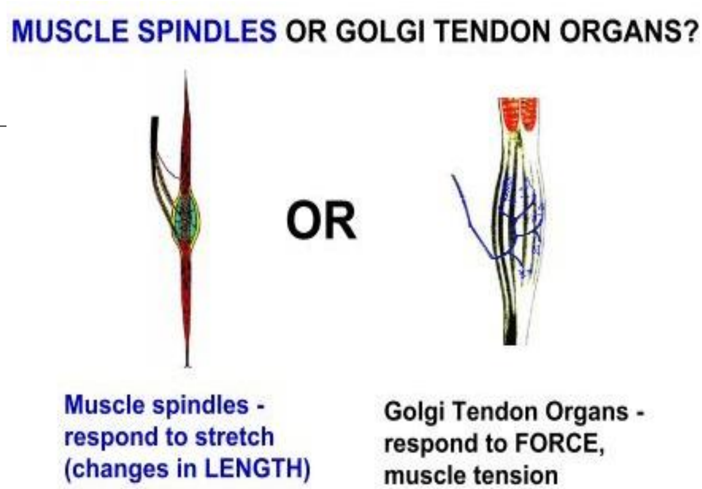
Golgi Tendon Organs
- Activated when the tendon attached to an active muscle is stretched.
- Results in inhibition (a reduction in tension within the muscle and tendon).

Muscle Spindles
- Activated when the muscle fibers are stretched - signals the muscle to contract to prevent it from too great of a stretch
- Can inhibit the opposing muscle (the antagonist) from contraction thereby reducing stretch

57

58

- **Muscle Spindles** *facilitate* activation/contraction of a muscle
  - Also cause Reciprocal Inhibition
- **GTOs** *inhibit* muscle activation
  - Using Autogenic Inhibition



59

PNF causes GTO's to activate

– thereby causing an ***inhibition*** of the muscle contraction **(relaxation)**.

60

When to Perform PNF? It matters….

When done prior to exercise, PNF has been shown to decrease muscle strength, power, EMG activity, vertical jump height, and ground reaction time (Bradley et al., 2007; Marek et al., 2005; Mikolajec et al., 2012).

- These effects appear to last at least 90 minutes.
- This may be due to the muscles being stretched too far outside of their capacity, causing inhibition following the stretching.

PNF has been shown to be beneficial for submaximal exercises such as jogging.

- Increased stride length, frequency, and ROM were recorded by Caplan et al. (2009) in 18 professional rugby players jogging at 80% of maximal effort over a five week period.

Studies have found PNF to be even ***more*** beneficial than strength training in increasing strength and athletic performance in untrained individuals over an 8 week period as muscle power, strength, and ROM increased during the protocol.

61

When to Perform PNF?
It matters…

- For Athletes, PNF stretching should be completed ***after*** exercise at least 2x/week to increase ROM and induce increases in muscle strength, power, and athletic performance.

- PNF exercises done before exercise will diminish performance for the short term (90 minutes)

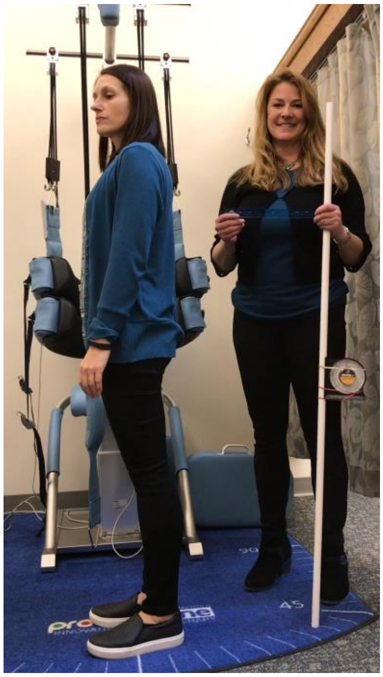
62

For the "Everyday Joe"

PNF techniques can be performed at anytime – usually following chiropractic adjustment

Measure BEFORE and AFTER…

63



PRE-PNF Testing Hip Hinge & Hamstring Flexibility

64

TECHNIQUES OF PNF

Strengthening techniques
- Rhythmic initiation
- Repeated contraction
- Slow reversal
- Slow reversal-hold
- Rhythmic stabilization

Stretching techniques
- Contract relax
- Hold relax

Hold – Relax

Contract – Relax

Hold – Relax - Contract

65

Hold- Relax

Stretch and hold:
Passively stretch muscle and hold in stretched position for ~10 secs.
Contraction:
While in passive stretch, have patient perform contraction (against isometric resistance) for ~5-6 seconds.
Relax:
Relax the stretch. As patient exhales, attempt deeper stretch.

REPEAT

66

PNF: Hold -Relax

1. **Passive Stretch and Hold**
2. **Patient contracts against resistance** -for ~5-6 seconds.
3. **Patient Relaxes as doctor/therapist passively stretches into deeper stretch**

REPEAT

67

Contract- Relax

Stretch and hold:
Passively stretch muscle and hold in stretched position ~10 secs.
Contraction:
While in stretch, patient performs contraction as Doctor/Therapist gently resists but moves with patient's contraction.(against active moving resistance) for ~5-6 seconds.
Relax:
Relax the stretch. As patient exhales, attempt deeper stretch.

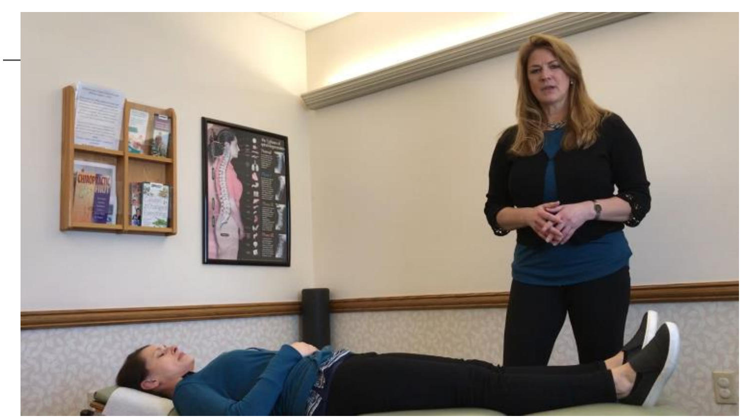
REPEAT

Similar to the hold-relax technique, but instead of contracting the muscle with hold, contraction takes place while moving.

68

Contract- Relax

1. **Passive Stretch and Hold**
2. **Patient contracts against decreasing resistance** -for ~5-6 seconds.
3. **Patient Relaxes as doctor/therapist passively stretches into deeper stretch**



REPEAT

Similar to the hold-relax technique, but instead of contracting the muscle with hold, contraction takes place while moving.

69

Hold - Relax – Antagonist Contract

Stretch and hold:

Passively stretch muscle and hold in stretched position for ~10 secs.

Contraction:

While in passive stretch, have patient perform contraction (against isometric resistance) for ~5-6 seconds.

Relax:

Relax the stretch. As patient exhales, patient will contract antagonistic muscles and assist in moving into deeper stretch.

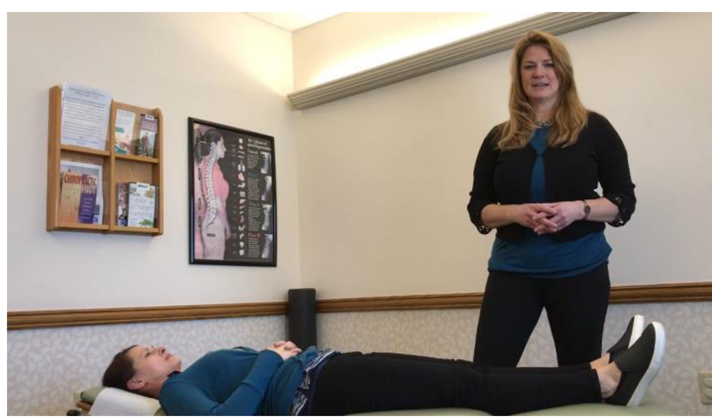
REPEAT

Similar to the hold-relax technique, but in the third phase, instead of relaxing into a passive stretch, the patient actively pulls into the stretch

70

Hold - Relax – Antagonist Contract

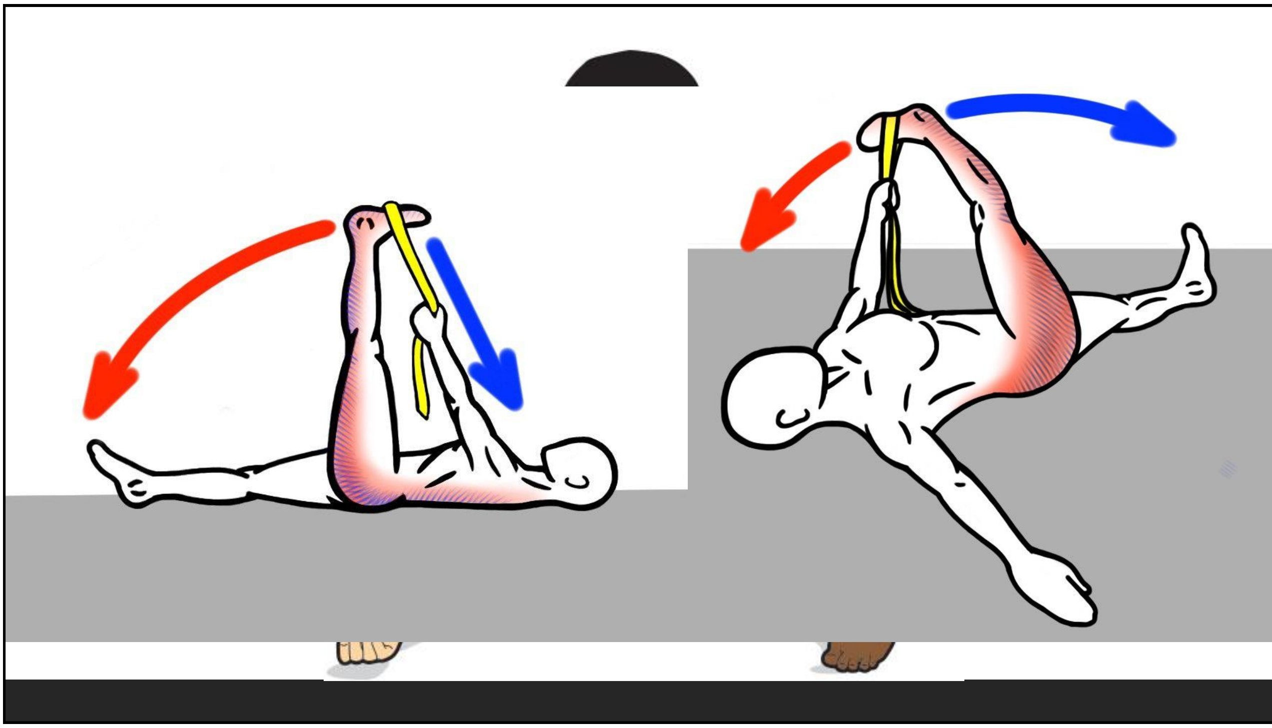
1. **Passive Stretch and Hold**
2. **Patient contracts against resistance** -for ~5-6 seconds.
3. **Patient relaxes THEN assists doctor/therapist deeper active stretch by contracting antagonistic muscle group.**



REPEAT

Similar to the hold-relax technique, but in the third phase, instead of relaxing into a passive stretch, the patient actively pulls into the stretch

71



72

In order to reduce stress on yourself, utilize what is necessary to help achieve optimal results for the patient.

73

PNF: Hold –Relax
Using Device to Protect Provider

1. **Passive Stretch and Hold**

2. Patient contracts against resistance -for ~5-6 seconds.

3. Patient Relaxes as doctor/therapist passively stretches into deeper stretch

REPEAT

74

75

Contract- Relax

1. Passive Stretch and Hold

2. Patient contracts against decreasing resistance -for ~5-6 seconds.
3. Patient Relaxes as doctor/therapist passivel stretches into deeper stretch

REPEAT

Similar to the hold-relax technique, but instead of contracting the muscle with hold, contraction takes place while moving.

76

Contract- Relax

1. Passive Stretch and Hold

2. Patient contracts against decreasing resistance -for ~5-6 seconds.
3. Patient Relaxes as doctor/therapist passively stretches into deeper stretch

REPEAT

Similar to the hold-relax technique, but instead of contracting the muscle with hold, contraction takes place while moving.

77

Hold - Relax – Antagonist Contract

1. **Passive Stretch and Hold**

2. **Patient contracts against resistance** -for ~5-6 seconds.
3. **Patient relaxes THEN assists doctor/therapist deeper active stretch by contracting antagonistic muscle group.**

Similar to the hold-relax technique, but in the third phase, instead of relaxing into a passive stretch, the patient actively pulls into the stretch

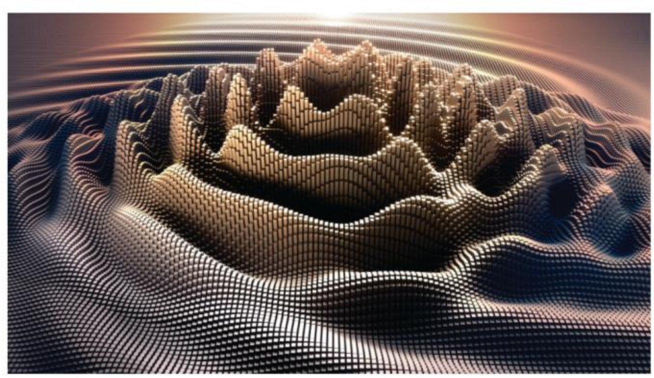
REPEAT

78

Adding Percussion Massage

The science behind percussion massage

Jeffrey Tucker April 20, 2021
6 minute read



Evidence-based physical therapy devices like percussion massage are becoming a must for DC practices

79

Adding in Percussion and Vibration

- Increases Metabolism
- Increases ROM
- Improves circulation
- Reduces fascia scar tissue
- Reduces Pain

80

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Vibration Therapy in Management of Delayed Onset Muscle Soreness (DOMS)

Zubia Veqar[1] and Shagufta Imtiyaz[2]

‣ Author information ‣ Article notes ‣ Copyright and License information Disclaimer

This article has been cited by other articles in PMC.

Abstract

Both athletic and nonathletic population when subjected to any unaccustomed or unfamiliar exercise will experience pain 24-72 hours postexercise. This exercise especially eccentric in nature caused primarily by muscle damage is known as delayed-onset muscle soreness (DOMS). This damage is characterized by muscular pain, decreased muscle force production, reduce range of motion and discomfort experienced. DOMS is due to microscopic muscle fiber tears. The presence of DOMS increases risk of injury.

A reduced range of motion may lead to the incapability to efficiently absorb the shock that affect physical activity. Alterations to mechanical motion may increase strain placed on soft tissue structures. Reduced force output may signal compensatory recruitment of muscles, thus leading to unaccustomed stress on musculature. Differences in strength ratios may also cause excessive strain on unaccustomed musculature. A range of interventions aimed at decreasing symptoms of DOMS have been proposed. Although voluminous research has been done in this regard, there is little consensus among the practitioners regarding the most effective way of treating DOMS.

Mechanical oscillatory motion provided by vibration therapy. Vibration could represent an effective

Percussion and Vibration assist in reducing DOMS

81

Increases Metabolism

Percussion Massage:

Helps to rehydrate areas of metabolically active tissues

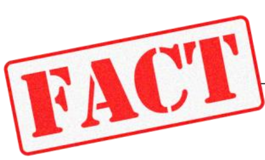
- Influences the superficial fascia, which has rich autonomic innervation that sends information to the prevertebral ganglia.
- This innervation controls thermo-regulation, lymph drainage, and metabolism of the subcutaneous adipose tissue (Stecco).

Assists in regaining softness in the fascia and muscles

- Allows muscles to contract and release better to ***increase local cellular metabolism*** and range of motion.

82

Increases ROM



- Immobilization causes increased muscle connective tissue thickening (Slimani 2012)
- The aging process creates stiffer epimysial fascia (Gao 2008).

Percussion massage :

- Will help loosen contracted and shortened muscles.
- Will stimulate weak, flaccid muscles through reciprocal inhibition
- Will provide stimulation to both the muscles and connective tissues that surround and support the muscles, vascular and lymph vessels, tendons, joints which helps keep these tissues elastic.

- **especially effective if performed while putting patients in gentle stretch position or asking for a repeated motion

83

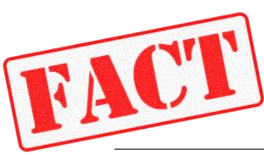
Improves Circulation

- As excess fluids (intra and extracellular fluids, exudates, proteins) accumulate in tissues, they create increased pressure in the superficial layers. Lack of motion in the skin inhibits lymphatic flow, therefore increasing ***edema***.
- When lymphatic circulation slows down, the regeneration of cells becomes less effective. Edema results in more toxins and proteins to accumulate around the cells, causing hypoxia, and ultimately ***tissue regeneration is diminished.***

Percussion massage:

- Increases the circulation of blood and flow of lymph
- Dilates blood vessels
- Increases rate of blood flow (due to direct mechanical effect of rhythmical pressure and movement)

84



Reduces Fascia Scar Tissue

- Layers of fascia provide
  - proprioceptive information
  - create motor unit activation
  - aid in peripheral motor coordination
- Muscle spindles, our primary proprioceptive cells affecting our muscles, are found in the fascia surrounding the muscle and its muscle bundles.
- Scar tissue from old injuries or repetitive motion (e.g. poor posture) creates increased density and lack of gliding of fascia.
- Leads to adhesions in the fascia - ultimately alters the spindle feedback loop, therefore resulting in altered function of a joint.

Example: old ankle sprain/strain eventually affects gait and lower back pain

Percussion Massage:

- Helps break up, prevent and restore "adhesive" gliding of the fascia over the muscle.

85

Reduces Pain

Percussion massage:

- Improves ROM, which essentially reduces pain via neurotransmitters
- Creates analgesic effects:
  - Releases Substance P --- plays a central role as a pain mediator and growth factor
- Overstimulates the small nerve fibers to block an increase in pain stimuli - Gate Theory

86

Multifidus Strength and Coordination -Additional "Key" to Core Stability

Hip Hinge

Lumbar Multifidus Activation

Other Recommended Exercises:

- 2-Legged Bridge
- Bridge and March
- Plank Exercises
- Bird Dog

87

Hamstring Balance: Reduce Tightness to Increase Strength

PNF of Hamstrings
- Incorporates contraction and stretch

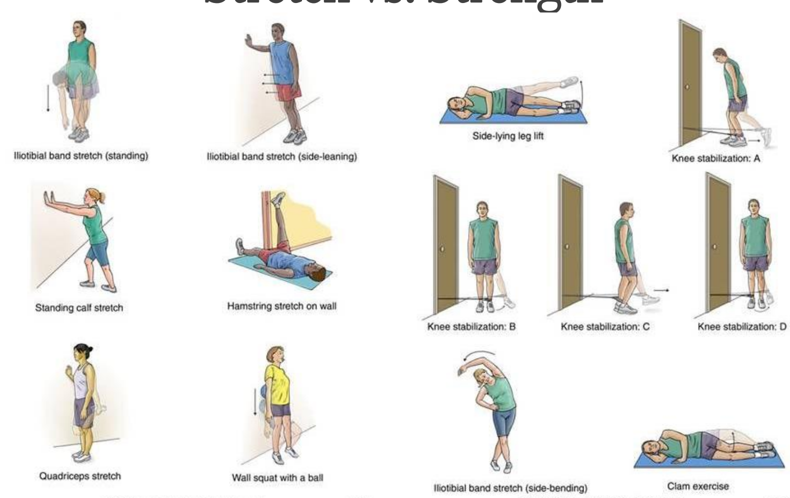
Hamstring Extension

Hamstring Heel Dig

Hamstring Stretch

88

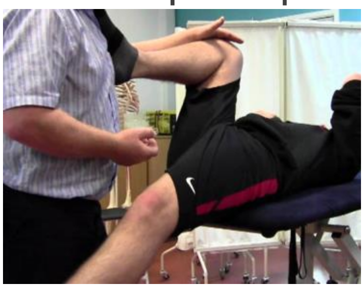
Iliotibial Band and Hip Abductor Balance: Stretch vs. Strength

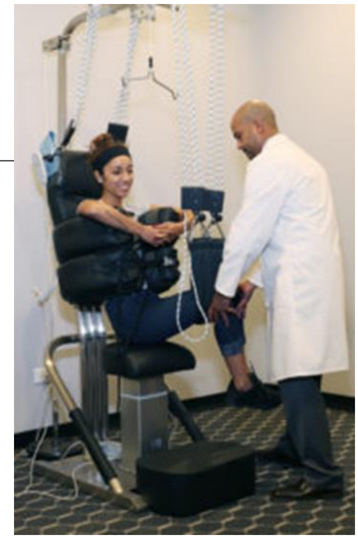


89

ITB Balance: Stretch vs. Strength

PNF – Proprioceptive Neuromuscular Facilitation





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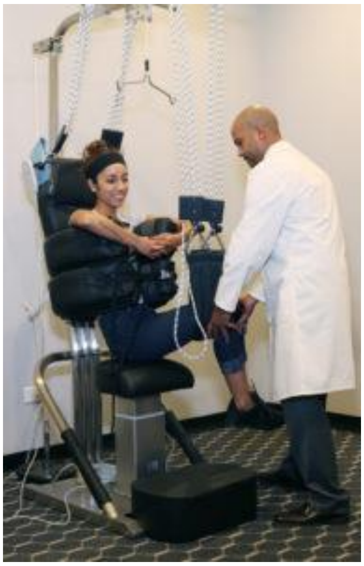
Bottom line…

Increased Multifidus cross-sectional area and Improvement of Core Stability has been proven to reduce chronic low back pain and disability.

91



Using PNF techniques for the influencing muscles (hamstrings and ITB, etc) will help balance stretch vs. strength with the core stabilizers and surrounding supportive musculature,

ULTIMATELY… improving efficiency and assisting patient in Core Stability

92

BE CREATIVE

93

Consider ALL Other Regions as well

- Modify treatment and PNF techniques based upon the ANATOMY you are treating

94

AGE DOES NOT MATTER

Everyone deserves the option to improve their health.

95

AGE DOES NOT MATTER

Everyone deserves the option to improve their health.

96

Results of Data Analysis

97

Wrapping it Up…

- ❑Encourage current acute and recurrent LBP patients to start Core Stabilization to prevent chronic LBP AND Disability
- ❑Don't forget to include current Chronic LBP patients in easy core stabilizing rehab techniques – chronic LBP and disability CAN be reduced!
- ❑Use PNF type techniques to affect the "influencing" muscles such as hamstrings and ITB in order to improve lumbo-pelvic motion (thereby improving core stability)
- ❑BALANCE Stretch vs. Strength

98

For more information, including references and protocols, please feel free to contact me:

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99