

PRUEBAS CIENTIFICAS DE LA INTERDEPENDANCIA REGIONAL

Wong CK, Strang BL, Schram GA, Mercer EA, Kesting RS, Deo KS. A pragmatic regional interdependence approach to primary frozen shoulder: a retrospective case series. J Man Manip Ther. 2018 May;26(2):109-118. doi: 10.1080/10669817.2018.1432524. Epub 2018 Mar 26.

OBJECTIVES:

Although the shoulder is known to move together with the scapula and other upper quarter joints, the current frozen shoulder clinical practice guidelines describe only physical therapy study treatments directed to the shoulder. None received a strong recommendation, highlighting the need for alternate interventions. This retrospective case series describes a pragmatic regional interdependence approach to frozen shoulder with impairment and functional outcomes, noting whether final ROM approached normal.

METHODS:

Five consecutive patients referred with frozen shoulder diagnoses attended 11-21 sessions over 5-10 weeks with one physical therapist. Treatment addressed inter-related regions (shoulder, shoulder girdle, scapulothoracic/humerothoracic, and spine) following a pragmatic approach using impairment-based interventions (joint/soft tissue mobilization, muscle stretching/strengthening) as well as patient education, modalities and warm up that addressed individual presentations.

RESULTS:

All patients improved on all outcomes. Mean shoulder ROM at discharge, the impairment outcome, demonstrated large effect size increases: flexion (117 ± 10 - 179 ± 12 , $d = 5.9$), abduction (74 ± 8 - 175 ± 9 , $d = 9.3$), external rotation (23 ± 7 - 89 ± 2 , $d = 12.0$). The Disability of Arm Shoulder Hand functional outcome score upon follow up demonstrated a large effect size improvement ($d = 1.5$) from 40.0 ± 19.4 - 6.2 ± 3.7 . Final ROM approached normal.

DISCUSSION:

This case series utilized a regional interdependence approach to frozen shoulder that included manual therapy interventions directed to consistent upper quarter body segments. Shoulder ROM was returned to near normal with functional improvements evident months after discharge. A pragmatic regional interdependence approach

addressing multiple joints related to shoulder function may benefit other people with frozen shoulder.

LEVEL OF EVIDENCE:4.

Sueki DG, Cleland JA, Wainner RS. A regional interdependence model of musculoskeletal dysfunction: research, mechanisms, and clinical implications. J Man Manip Ther. 2013 May;21(2):90-102. doi: 10.1179/2042618612Y.0000000027.

The term 'regional interdependence' or RI has recently been introduced into the vernacular of physical therapy and rehabilitation literature as a clinical model of musculoskeletal assessment and intervention. The underlying premise of this model is that seemingly unrelated impairments in remote anatomical regions of the body may contribute to and be associated with a patient's primary report of symptoms. The clinical implication of this premise is that interventions directed at one region of the body will often have effects at remote and seeming unrelated areas. The formalized concept of RI is relatively new and was originally derived in an inductive manner from a variety of earlier publications and clinical observations. However, recent literature has provided additional support to the concept. The primary purpose of this article will be to further refine the operational definition for the concept of RI, examine supporting literature, discuss possible clinically relevant mechanisms, and conclude with a discussion of the implications of these findings on clinical practice and research.

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Ghamkhar L, Arab AM, Nourbakhsh MR, Kahlaee AH, Zolfaghari R. Examination of Regional Interdependence Theory in Chronic Neck Pain: Interpretations from Correlation of Strength Measures in Cervical and Pain-Free Regions. Pain Med. 2019 Sep 4. pii: pnz206. doi: 10.1093/pm/pnz206. [Epub ahead of print]

OBJECTIVE:

Impairments present in chronic pain conditions have been reported not to be limited to the painful region. Pain-free regions have also been proposed to be adversely affected as a cause or consequence of the painful condition. The aim of this study was to investigate the association between muscle strength in painful and pain-free regions and chronic neck pain.

DESIGN:

A cross-sectional study.

SETTING:

Rehabilitation hospital laboratory.

SUBJECTS:

One hundred twenty-two patients with chronic neck pain (87 female) and 98 asymptomatic volunteers (52 female) were included in the study.

METHODS:

Maximal isometric strength measures of the neck, scapulothoracic, shoulder, trunk, and hip muscles were assessed using a hand-held dynamometer in all participants. Pain intensity and pain-related disability were also assessed in patients through visual analog scale and Neck Disability Index scores, respectively.

RESULTS:

Principal component analysis revealed one component for each of the studied regions. Multivariate analysis of variance found neck ($d = 0.46$), scapulothoracic ($d = 0.46$), shoulder ($d = 0.60$), trunk flexor ($d = 0.38$), extensor ($d = 0.36$), and hip ($d = 0.51$) strength components to be lower in the neck pain patients compared with asymptomatic participants ($P < 0.01$). Logistic and linear regression analyses found the shoulder strength component both to be a significant predictor for neck pain occurrence ($\beta = 0.53$, $P < 0.01$) and to have a considerable effect on pain intensity score ($\beta = -0.20$, $P = 0.02$), respectively.

CONCLUSIONS:

The results found that some pain-free regions in addition to the cervical spine to exhibit lower levels of muscular strength in neck pain patients. These findings support the regional interdependence theory, which proposes that impairments are not limited to the painful area and are possibly mediated by central mechanisms.

KEYWORDS:

Chronic Neck Pain; Muscle Weakness; Regional Interdependence Theory

PMID: 31504861 DOI: 10.1093/pm/pnz206

Kahlaee AH, Ghamkhar L, Nourbakhsh MR, Arab AM. Strength and range of motion in the contralateral side to pain and pain-free regions in unilateral chronic non-specific neck pain patients. Am J Phys Med Rehabil. 2019 Aug 26. doi: 10.1097/PHM.0000000000001298. [Epub ahead of print]

OBJECTIVE:

To determine if strength and range of motion (ROM) deficits are present in patients with unilateral chronic neck pain (CNP) at contralateral side to pain (CSP) and at other regions.

DESIGN:

Forty-nine patients with unilateral CNP and 98 asymptomatic subjects participated in this case-control study. ROM and muscle strength of the cervical, shoulder, trunk and hip regions were assessed bilaterally using inclinometer and dynamometer, respectively.

RESULTS:

CNP patients demonstrated reduced cervical, shoulder and trunk ROM in their ipsilateral side to pain (ISP) comparing the asymptomatic participants ($P<0.05$). The ISP cervical and shoulder ROM were also significantly lower than the CSP ($P<0.05$). Significant differences were also observable in the CSP comparing the asymptomatic group ($P<0.05$). Cervical, shoulder and scapulothoracic muscles were found weaker both in the ISP and CSP comparing the asymptomatic group ($P<0.05$). ISP and CSP hip flexors were also found to be significantly weaker than the asymptomatic group ($P<0.01$).

CONCLUSION:

The results revealed ROM and strength deficits in the pain-free regions of the body in unilateral CNP patients. Findings support the regional interdependence theory and emphasize the need for managing seemingly intact neighboring and more remote regions in unilateral CNP patients.

PMID: 31464752 DOI: 10.1097/PHM.0000000000001298

Engell S, Triano JJ, Howarth SJ. Force transmission between thoracic and cervical segments of the spine during prone-lying high-velocity low-amplitude spinal manipulation: A proof of principle for the concept of regional interdependence. Clin Biomech (Bristol, Avon). 2019 Oct;69:58-63. doi: 10.1016/j.clinbiomech.2019.07.006. Epub 2019 Jul 5.

BACKGROUND:

Regional interdependence is conceptually based on observations that applying manual therapy to a remote anatomical region has an effect in the area of the patient's primary complaint. The current model for regional interdependence depends on force

transmissibility within the body. This investigation sought to determine transmissibility between forces applied to the thoracic spine during prone-lying high-velocity low-amplitude spinal manipulative therapy and the cervical spine.

METHODS:

A chiropractic treatment table was modified to allow (or disallow) translation of the headrest in the caudal-cephalad direction when unlocked (or locked). Prone-lying high-velocity low-amplitude spinal manipulative therapy was applied to the thoracic region of 9 healthy participants with the headrest in both configurations. Head and thorax kinematics and kinetics were measured at interfaces between participant and the external environment, which included the clinician's hands. Compressive forces at the cervicothoracic junction and angular kinematics of the cervical spine were derived. Ratios between the clinician-applied forces (input) and the cervical compressive force (output) were also determined.

FINDINGS:

The cervical spine extended during all high-velocity low-amplitude spinal manipulative therapy trials. Force input-to-output ratios exceeded 1 for high-velocity low-amplitude spinal manipulative therapy trials performed with the headrest in the locked configuration, which was greater than ratios for the unlocked configuration.

INTERPRETATION:

Forces imparted to thoracic spine during high-velocity low-amplitude spinal manipulative therapy were transmitted to the cervical spine, which provided a precursor for the regional interdependence model for manual therapy. Friction between the participant's face and the treatment table's head rest likely amplified cervical compressive forces.

Haik MN, Alburquerque-Sendín F, Silva CZ, Siqueira-Junior AL, Ribeiro IL, Camargo PR. Scapular kinematics pre- and post-thoracic thrust manipulation in individuals with and without shoulder impingement symptoms: a randomized controlled study. J Orthop Sports Phys Ther. 2014 Jul;44(7):475-87. doi: 10.2519/jospt.2014.4760. Epub 2014 May 22.

EOM

STUDY DESIGN:

Randomized controlled trial with immediate follow-up.

OBJECTIVES:

To evaluate the immediate effects of a low-amplitude, high-velocity thrust thoracic spine manipulation (TSM) on pain and scapular kinematics during elevation and lowering of the arm in individuals with shoulder impingement syndrome (SIS). The secondary objective was to evaluate the immediate effects of TSM on scapular kinematics during elevation and lowering of the arm in individuals without symptoms.

BACKGROUND:

Considering the regional interdependence among the shoulder and the thoracic and cervical spines, TSM may improve pain and function in individuals with SIS. Comparing individuals with SIS to those without shoulder pathology may provide information on the effects of TSM specifically in those with SIS.

METHODS:

Fifty subjects (mean $\pm$ SD age, 31.8 ± 10.9 years) with SIS and 47 subjects (age, 25.8 ± 5.0 years) asymptomatic for shoulder dysfunction were randomly assigned to 1 of 2 interventions: TSM or a sham intervention. Scapular kinematics were analyzed during elevation and lowering of the arm in the sagittal plane, and a numeric pain rating scale was used to assess shoulder pain during arm movement at preintervention and postintervention.

RESULTS:

For those in the SIS group, shoulder pain was reduced immediately after TSM and the sham intervention (mean $\pm$ SD preintervention, 2.9 ± 2.5 ; postintervention, 2.3 ± 2.5 ; $P < .01$; moderate effect size [Cohen $d = 0.2$]). Scapular internal rotation increased $0.5^\circ \pm 0.02^\circ$ ($P = .04$; small effect size [Cohen $d < 0.1$]) during elevation of the arm after TSM and sham intervention in the SIS group only. Subjects with and without SIS who received TSM and asymptomatic subjects who received the sham intervention had a significant increase ($1.6^\circ \pm 2.7^\circ$) in scapular upward rotation postintervention ($P < .05$; small effect size [Cohen $d < 0.2$]), which was not considered clinically significant. Scapular anterior tilt increased $1.0^\circ \pm 4.8^\circ$ during elevation and lowering of the arm postmanipulation ($P < .05$; small effect size [Cohen $d < 0.2$]) in the asymptomatic subjects who received TSM.

CONCLUSION:

Shoulder pain in individuals with SIS immediately decreased after a TSM. The observed changes in scapular kinematics following TSM were not considered clinically important.

LEVEL OF EVIDENCE: Therapy, level 4.

McCoss CA, Johnston R, Edwards DJ, Millward C. Preliminary evidence of Regional Interdependent Inhibition, using a 'Diaphragm Release' to specifically induce an immediate hypoalgesic effect in the cervical spine. J Bodyw Mov Ther. 2017 Apr;21(2):362-374. doi: 10.1016/j.jbmt.2016.08.015. Epub 2016 Sep 9.

In clinical practice, Osteopaths and Manual Therapists commonly direct treatment towards the diaphragm by the use of a 'Diaphragm Release'. Currently, there is paucity within the literature to support the use of this technique, specifically in pain outcomes. This research aims to support a neurophysiological mechanism based upon the osteopathic principle "The body is a unit". Demonstrating that directing treatment to distal tissue which is neurologically related can reduce pain in the originating spinal segments. This study investigated the immediate hypoalgesic effects of a 'Diaphragm Release' on pain pressure thresholds in the cervical spine. A single-blind, randomised, sham-controlled, repeated measures within subject, crossover design was conducted on 17 asymptomatic subjects. Pain pressure thresholds were measured bilaterally in the C4 paraspinal musculature, lateral end of the clavicle and upper third of the tibialis anterior before and after a 'Diaphragm Release'. Results demonstrated a statistically significant hypoalgesic effect was only found in the spinal segment C4 in both the right ($p = 0.016$) and left ($p = 0.004$) sides. Averaging the hypoalgesic effect from both sides equates to a 17.17% change which is considered clinically significant, the effect magnitude was calculated to be small but educationally significant for the right ($d = 0.26$) and left ($d = 0.40$) sides. This study supports a novel neurophysiological mechanism, Regional Interdependent Inhibition, to induce a hypoalgesic state at segmentally related spinal segments, specifically C4. Suggesting that directing treatment towards the diaphragm, using a 'Diaphragm Release', could induce an immediate clinically and statistically significant hypoalgesic effect local to the fourth cervical segment due to its relationship with the phrenic nerve.

KEYWORDS:

Diaphragm; Manual therapy; Neurophysiological mechanism; Osteopathy; Pain pressure thresholds; Regional Inhibitory Interdependence

Lejkowski PM, Poulsen E. Elimination of intermittent chronic low back pain in a recreational golfer following improvement of hip range of motion impairments. J Bodyw Mov Ther. 2013 Oct;17(4):448-52. doi: 10.1016/j.jbmt.2013.01.004. Epub 2013 Feb 9.

BACKGROUND:

The biomechanical relationship between the hip and low back is well described and impairment of hip range of motion is thought to affect lumbar spine function, possibly

leading to increased loading and subsequent symptoms. However therapy for low back pain (LBP) patients is commonly directed solely to the low back area overlooking possible hip impairment.

CASE DESCRIPTION:

A 56-year-old male recreational golfer presented with a chronic golf-related low back complaint. Previous conservative therapy targeting the spine did not result in complete symptom relief. A working diagnosis of L4-S1 facet joint irritation and lower lumbar segmental instability secondary to bilateral hip ROM impairment was established. A trial of therapy strictly addressing the hip ROM impairments was initiated and following 2 treatment sessions, a complete resolution of symptoms was achieved and maintained at a 2-month follow-up.

DISCUSSION:

This case demonstrated a complete and rapid relief of un-resolving low back pain with a management strategy focused on hip ROM impairments. Clinicians should remember to look beyond the local area of complaint and appreciate the interdependent nature of the musculoskeletal system.

KEYWORDS:

Golf-related; Hip; Hypomobility; Low back pain; Regional interdependence

PMID: 24139002 DOI: 10.1016/j.jbmt.2013.01.004

Reiman MP, Weisbach PC, Glynn PE. The hips influence on low back pain: a distal link to a proximal problem. J Sport Rehabil. 2009 Feb;18(1):24-32.

Low back pain (LBP) is a multifactorial dysfunction, with one of the potential contributing factors being the hip joint. Currently, research investigating the examination and conservative treatment of LBP has focused primarily on the lumbar spine. The objective of this clinical commentary is to discuss the potential link between hip impairments and LBP using current best evidence and the concept of regional interdependence as tools to guide decision making and offer ideas for future research.

PMID: 19321904 DOI: 10.1123/jsr.18.1.24

Vaughn DW. Isolated knee pain: a case report highlighting regional interdependence. J Orthop Sports Phys Ther. 2008 Oct;38(10):616-23. doi: 10.2519/jospt.2008.2759.

STUDY DESIGN:

Case report.

BACKGROUND:

A number of pain referral patterns for sacroiliac dysfunction have been reported in the literature. However, very little has been written about pain localized to the knee joint for cases involving sacroiliac dysfunction.

CASE DESCRIPTION:

A 25-year-old female runner was self-referred to physical therapy for medial knee pain of 4(1/2) weeks' duration without a significant onset event. The pain completely curtailed her training for the Boston Marathon. Examination of the patient's knee and hip did not reveal any abnormal findings and there was no reproduction of pain with any test procedures except for medial knee joint tenderness to palpation. Additional, more proximal examination suggested significant asymmetry of sacral bony landmarks of the pelvic girdle without significant findings on the provocation tests of the sacroiliac joint. A single session of manual therapy procedures directed to the pubic symphysis and sacroiliac joint ipsilateral to the side of knee pain was provided.

OUTCOMES:

The patient was able to return to running without further incident of knee pain after a single therapy session.

DISCUSSION:

This case suggests the importance of regional interdependence in the examination of patients with an apparently common clinical problem. Furthermore, the case describes a previously unreported presentation of local knee pain possibly attributable to sacroiliac joint dysfunction.

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