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The Effects of Contralateral Exercise On Patient Pain and Range of Motion

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Section: Critically Appraised Topic

ArticleTitle: The Effects of Contralateral Exercise On Patient Pain and Range of Motion

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Running Head: Ipsilateral effects of contralateral maneuvers

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CLINICAL SCENARIO

Clinicians are commonly tasked with treating patients suffering from range of motion (ROM) deficits, pain, or both. Treatment options intended to increase ROM, decrease pain and restore function are vast. Often interventions are used that focus on a singular symptom location (e.g., stretching and joint mobilizations)although a long-standing call exists to utilize global approaches to treating dysfunction. This review was conducted to determine whether evidence exists to support the use of contralateral exercise (CE)to treatROM deficits or pain.

FOCUSED CLINICAL QUESTION

For patients with pain and/or ROM deficits, will CE decrease pain and increase ROM?

SUMMARY

- Ipsilateral muscle activation and muscular strength is significantly increased after performing contralateral maneuvers.
- Ipsilateral movement has a significant impact on available contralateral motion.
- No evidence currently exists exploring the effect of contralateral exercise on pain.

CLINICAL BOTTOM LINE

Clinicians should consider includingCE when treating patients with decreased ROM, as evidence exists supporting its utility[1-5]. Using the neuromuscular system to affect change in a regionally interdependent manner, the cross-limb effect increases strength, muscle activation, motor pattern transferenceand range of motion in the contralateral limb. In healthy subjects, specific contralateral maneuvers are more effective than traditional sport-specific warm-up for increasing ROM in the upper extremity. While no evidence was found exploring the effect of CE on pain, there are

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many reported benefits to using CE:[1-5]clinicians are more effective in targeting multiple patient issues simultaneously and improving patient complaints using a regionally interdependent model;[6] patients can utilize self-treatment, allowingthem to take charge of their own treatment and facilitate their healing, fostering patient compliance.

STRENGTH OF RECOMMENDATION

Studies of level 4 or higher on the CEBM Level of Evidence (randomized control trials, case series/studies), indicate level B evidence supports the use of CE to increase ROM.

SEARCH STRATEGY

An Internet based search was conducted using databases including Ebscohost, PubMed, Medline, CINAHL, JSTOR, and SPORTDiscus with Full Text. Articles were limited to those published in peer reviewed journals that had full text available online. A PICO search strategy was utilized for this CAT:

P: Active population with pain and/or range of motion deficit

I: contralateral exercise, total motion release

C: not applicable

O: change in movement, range of motion or pain

The following search terms and phrases were used: Contralateral Exercise (473), Total Motion Release (TMR) (2), Nerve Cross Education (239), Muscle Cross Education (346), Cross Education (44,499), "Cross Education" (44).

INCLUSION and EXCLUSION CRITERIA

Inclusion Criteria:

· Articles with a level of evidence 3 or higher

· Articles published within the last 10 years

· Articles limited to the English Language

· Use of contralateral exercises as a treatment for musculoskeletal disorders

· Analysis of contralateral movement as an indicator for performance

· Outcomes reported include the contralateral body segment in addition to the affected segment

· Participant ages range from teenage to early adult years (athletes and non-athletes)

Exclusion Criteria:

· Studies that used solely isometric or eccentric movements

· Studies that did not include a contralateral intervention

· Post-surgical cases

· Studies that include the use of electrical stimulation modalities

SEARCH RESULTS:

In total 1,102 studies were returned when the databases were searched. Five studies[1-5] were identified as best evidence (based on the Levels of Evidence, Center for Evidence Based Medicine, 1998) and were included in this review as shown in Table 1.

BEST EVIDENCE:

The studies in Table 1 were identified the "best" evidence and selected for inclusion in the CAT. The five articles[1-5] report increases in the contralateral joint movement with only same-side treatment. Articles included in this CAT provide evidence that neurological effects can be manipulated by the use of contralateral exercises. The characteristics of the included studies can be found in Table 2.

SUMMARY OF BEST EVIDENCE:

Lee et al. examined the effects of unilateral strength training to the upper extremity with focus on wrist abductors and wrist extensors[2], while Leplyet. al measured quadriceps activation and strength of the leg using an isokinetic dynamometer [4]. Researchers of both studies measuring muscle activation and strength reported positive statistically significant outcomes. Lee et al. found that after completing single side wrist training, maximal voluntary contraction (MVC) increased by 31.5% (± 18%) in the trained wrist and 8.2% (± 9.7%) in the untrained wrist. A control group who did no wrist training did not present with any significant change. Leply et al. found that participants who were part of an eccentric training group had increased eccentric strength by 30°/s (P = .05) in the unexercised limbs during preintervention-midintervention and 30°/s (P = .02) during preintervention-postintervention. Furthermore, Leply et al. were able to detect an overall trend of quad activation in the unexercised knee between preintervention-postintervention, (P=. 063) and finding alarge effect size d=.83[2]Morris et al. examined inter-limb transference of pattern movements using isokinetic ankle platforms and preset computer screen task [3].

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Results after testing showed that inter-limb transference occurred when the non-dominant limb is used to transfer patterns to the dominant limb (LR compared to RL group: FP (0.16 ± 0.06 versus 0.36 ± 0.06, $P<0.05$) and FD (0.26 ± 0.21 versus 0.96 ± 0.21) [3].

The result of a repeated within-subjects comparison study by Gamma et. al[1] illustrates statistically significant improvements in range of motion when using contralateral exercise, compared to a traditional warm up protocol, in healthy high school baseball pitchers.Participants were randomly assigned into a traditional warm-up group (TWG) or a TMR group (TMRG). Individuals placed in the TWG performed a 15-minute sport specific dynamic warm-up typical in baseball (e.g., sprints, high knees, lunges, power skips, static stretching). The TMRG participants performed a TMR protocol consisting of 3 sets of 30 second standing trunk twist to a reported good side and 2 sets of 30 second holds of a seated arm raise to a reported good side. Shoulder ROM measurements were taken pre and post interventions. Gamma et. al[1]found that TMR had a larger and faster effect on increasing shoulder internal and external rotation motions compared to traditional warm up exercises. Traditional warm-up group participants had a shoulder internal rotation change of 2.2° ± 8.73° and a shoulder external rotation change of -1.8° ± 9.20° compared to those in the TMRG who had a shoulder internal rotation change of 19.2° ± 10.78° and a shoulder external rotation change of 13.6° ± 5.98°.

In a case study by Baker et al.[5], TMR exercises coupled with instrument assisted soft tissue mobilization(mobilization of tissue with tools in lieu of clinician’s hands), were able to restore normal hamstring ROM in a patient with diagnosed hamstring contracture. A protocol was established wherein the patient performed a five-minute bike warm-up before treatment was given and treatment consisted of a TMR forward flexion trunk twist where for the first week. During the second week of treatment IASTM was used in conjunction with the first week TMR protocol. Instrument assisted soft tissue mobilization with moderate pressure was performed at the hamstrings for two minutes and the triceps surae for one minute. Orthopedic tests performed initially that were positive for hamstring contracture (i.e. sit & reach, finger-floor distance test, 90/90 (AKE) test, ASLR, tripod (sign) test, slump test, and PSFS scores) were considered within normal limits post treatment. Sit and reach measurements increased from, 26.2cm to 31.1cm, and supine active straight leg raise measurement by an average of 31.5 degrees bilaterally (Pre 61(L) & 56 (R), Post 94 (L), 86 (R)). All range of motion improvements were sustained through three-month follow up. While considered by the CEBM a lower level of evidence, both the case series and case report provide evidence for the use of contralateral exercise within a clinical context.

IMPLICATIONS FOR PRACTICE AND FUTURE RESEARCH:

In each of the 5 studies reviewed, active movement of one side of the body had a notable and significant impact on the motion available on the opposite side. Two studies measured muscle activation and muscular strength of the ipsilateral limb after performing contralateral maneuvers. In two articles[1,5] researchers demonstrate that it is plausible for a contralateral exercise treatment system, such as Total Motion Release, to improve upper and lower extremity ROM deficits in a clinical setting.

The five articles reviewed in this CAT help establish foundational evidence for manual therapy techniques such as TMR to be used in patient care settings and answer most of the clinical question posed in this CAT. All three studies that examined neurological effects of contralateral exercises had positive results and provide support for contralateral manual therapies such as TMR that have a notable neurological effect bilaterally. There is no current evidence exploring the use of contralateral exercise and its effect on pain; however there exists theoretical support that pain would be affected by contralateral exercises due to the nature of cross-education of neural pathways[2,3,4].

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Furthermore, there are very few published articles that are focused specifically on clinical contralateral techniques such as TMR. Further research must be done to gain a better understanding of the effects that occur in the body with such techniques. Research utilizing specific contralateral exercise techniques such as TMR would aid clinicians in learning about the usage and application of such manual therapies. Laboratory based research should also be conducted with the aim of better understanding the physiological and biomechanical effects of TMR in healthy and pathological subjects.This CAT should be reviewed in 2 years to determine whether additional best-evidence has ben published that could aid in answered our focused question.

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