The Effectiveness of Exercise for the Management of Musculoskeletal Disorders and Injuries of the Elbow, Forearm, Wrist, and Hand: A Systematic Review by the Ontario Protocol for Traffic Injury Management (OPTIMa) Collaboration

Roger Menta, DC,[a] Kristi Randhawa, MPH,[b, c, d] Pierre Côté, DC, PhD,[e, f, g] Jessica J. Wong, DC,[b, d, h] Hainan Yu, MBBS, MSc,[b, c] Deborah Sutton, MEd, MSc,[b, i] Sharanya Varatharajan, MSc,[b, c, d] Danielle Southerst, DC,[b, j] Kevin D'Angelo, DC,[a] Jocelyn Cox, DC,[a] Courtney Brown, MSc, DC,[a] Sarah Dion, DC,[a] Silvano Mior, DC, PhD,[k, l] Maja Stupar, DC, PhD,[c, m] Heather M. Shearer, DC, MSc,[c, n] Gail M. Lindsay, RN, PhD,[b, o] Craig Jacobs, DC, MSc,[p, q] and Anne Taylor-Vaisey, MLS[b]

Abstract

Objective: The purpose of this systematic review was to evaluate the effectiveness of exercise compared to other interventions, placebo/sham intervention, or no intervention in improving self-rated recovery, functional recovery, clinical, and/or administrative outcomes in individuals with musculoskeletal disorders and injuries of the elbow, forearm, wrist, and hand.

Methods: We searched MEDLINE, EMBASE, CINAHL, PsycINFO, and the Cochrane Central Register of Controlled Trials from 1990 to 2015. Paired reviewers independently screened studies for relevance and assessed the risk of bias using the Scottish Intercollegiate Guidelines Network criteria. We synthesized the evidence using the best evidence synthesis methodology.

Results: We identified 5 studies with a low risk of bias. Our review suggests that, for patients with persistent lateral epicondylitis, (1) adding concentric or eccentric strengthening exercises to home stretching exercises provides no additional benefits; (2) a home program of either eccentric or concentric strengthening exercises leads to similar

[a] Graduate Student, Department of Graduate Studies, Canadian Memorial Chiropractic College, Toronto, Ontario, Canada.

[b] Research Associate, UOIT-CMCC Centre for the Study of Disability Prevention and Rehabilitation, University of Ontario Institute of Technology (UOIT) and Canadian Memorial Chiropractic College (CMCC), Toronto, Ontario, Canada.

[c] Adjunct Professor, Division of Graduate Education and Research, Canadian Memorial Chiropractic College, Toronto, Ontario, Canada.

[d] Instructor, Division of Undergraduate Education, Canadian Memorial Chiropractic College, Toronto, Ontario, Canada.

[e] Canada Research Chair in Disability Prevention and Rehabilitation, University of Ontario Institute of Technology, Oshawa, Ontario, Canada.

[f] Associate Professor, Faculty of Health Sciences, University of Ontario Institute of Technology, Oshawa, Ontario, Canada.

[g] Director, UOIT-CMCC Centre for the Study of Disability Prevention and Rehabilitation, Toronto, Ontario, Canada.

[h] Instructor, Department of Graduate Studies, Canadian Memorial Chiropractic College, Toronto, Ontario, Canada.

[i] Adjunct Professor, Division of Undergraduate Education, Canadian Memorial Chiropractic College, Toronto, Ontario, Canada.

[j] Research Coordinator, Department of Medicine, Division of Rheumatology, Mount Sinai Hospital, Toronto, Ontario, Canada.

[k] Professor, Graduate Education and Research, Canadian Memorial Chiropractic College, Toronto, Ontario, Canada.

[l] Adjunct Professor, Faculty of Health Sciences, University of Ontario Institute of Technology, Oshawa, Ontario, Canada.

[m] Postdoctoral Fellow, UOIT-CMCC Centre for the Study of Disability Prevention and Rehabilitation, Toronto, Ontario, Canada.

[n] Clinical Research Manager, UOIT-CMCC Centre for the Study of Disability Prevention and Rehabilitation, Toronto, Ontario, Canada.

[o] Associate Professor, Faculty of Health Sciences, University of Ontario Institute of Technology, Oshawa, Ontario, Canada.

[p] Assistant Clinical Professor, Graduate Education and Research, Canadian Memorial Chiropractic College, Toronto, Ontario, Canada.

[q] Director, Division of Clinical Education and Patient Care, Canadian Memorial Chiropractic College, Toronto, Ontario, Canada.

Submit requests for reprints to: Kristi Randhawa, BHSc, MPH, Research Associate, UOIT-CMCC Centre for the Study of Disability Prevention and Rehabilitation, 6100 Leslie St, Toronto, ON M2H 3J1, Canada. (e-mail: *Kristi.randhawa@uoit.ca*).

Paper submitted November 6, 2014; in revised form May 2, 2015; accepted May 26, 2015.

0161-4754

http://dx.doi.org/10.1016/j.jmpt.2015.06.002

outcomes; (3) home wrist extensor strengthening exercises lead to greater short-term improvements in pain reduction compared to "wait and see"; and (4) clinic-based, supervised exercise may be more beneficial than home exercises with minimal improvements in pain and function. For hand pain of variable duration, supervised progressive strength training added to advice to continue normal physical activity provides no additional benefits.

Conclusion: The relative effectiveness of stretching vs strengthening for the wrist extensors remains unknown for the management of persistent lateral epicondylitis. The current evidence shows that the addition of supervised progressive strength training does not provide further benefits over advice to continue normal physical activity for hand pain of variable duration. (J Manipulative Physiol Ther 2015;38:507-520)

Key indexing terms: *Lateral Humeral Epicondylitis; Exercise Therapy; Upper Extremity; Review; Systematic; Elbow; Hand*

Musculoskeletal disorders and injuries of the upper limb are associated with significant disability in the population.[1] In 2013, arm, wrist, and hand injuries accounted for 12.1% of lost time claims in Canadian workers.[2] Musculoskeletal disorders and injuries of the elbow, forearm, wrist, and hand may occur in their supporting and related muscles, ligaments, and capsules. Injuries resulting in neuropathy may involve peripheral entrapment of the median, ulnar, or radial nerve near the elbow or wrist.

The most common conditions affecting the elbow, forearm, wrist, and hand include lateral epicondylitis, medial epicondylitis, and carpal tunnel syndrome. In the general population, the point prevalence of lateral epicondylitis varies from 1% to 3%.[3] Lateral epicondylitis affects as many as 15% of workers who perform tasks involving repetitive hand movements.[4,5] Medial epicondylitis is less common than lateral epicondylitis and accounts for 10% to 20% of all epicondylitis diagnoses.[6] In the United States, medical care and lost work time associated with epicondylitis are estimated to cost more than US $22 billion annually.[7] Carpal tunnel syndrome is also more common in the general population with a point prevalence ranging from 2.7% to 7.8%.[8,9] Furthermore, carpal tunnel syndrome is one of the most costly work-related upper extremity disorders, accounting for direct and indirect costs in excess of US $2 billion per year in the United States.[10]

Patient care is dependent on a clinician's training, beliefs, preferences, and understanding of the evidence. Clinicians often choose to combine various interventions when managing patients; this is also known as multimodal care. Exercise is frequently incorporated into multimodal programs of care; however, it is important to understand if exercise, in isolation, is effective in managing musculoskeletal disorders and injuries of the elbow, forearm, wrist, and hand, in addition to determining what types of exercises are effective for these conditions. This will inform which exercise offers benefits to patients when given alone and whether it likely contributes to the effectiveness of multimodal programs of care.

Previous systematic reviews have examined the effectiveness of exercise for the management of lateral epicondylitis[11-14] and carpal tunnel syndrome.[15,16] One systematic review found that an eccentric exercise program was effective for the management of lateral epicondylitis.[13] Furthermore, 2 other systematic reviews supported the use of stretching and strengthening for lateral epicondylitis.[11,12] The last review on lateral epicondylitis found inconclusive evidence to support the use of exercise.[14] In 2007, Piazzini et al[15] suggested that exercise therapy was not effective for carpal tunnel syndrome. However, Page et al[16] in 2012 suggested that neurodynamic mobilization (stretching/nerve flossing exercises) may be beneficial for the management of pain in those with carpal tunnel syndrome. The conclusions of these reviews may have been influenced by methodological limitations. Specifically, all reviews synthesized evidence from all eligible studies regardless of their scientific quality.[11-16] Second, all reviews included studies with small sample sizes.[11-16] Studies with small sample sizes may be underpowered and unable to detect differences between groups. Furthermore, small samples increase the likelihood that randomization will fail to equalize baseline characteristics across the intervention arms. Therefore, a systematic review of adequate methodological quality is needed to evaluate the effectiveness of exercise for musculoskeletal disorders and injuries of the elbow, wrist, and hand.

The purpose of this systematic review is to investigate the effectiveness of exercise compared to other interventions, placebo/sham interventions, or no intervention in improving self-rated recovery, functional recovery, or clinical outcomes in adults and children with musculoskeletal disorders and injuries of the elbow, forearm, wrist, or hand regions.

Methods

Registration

This review protocol was registered with the International Prospective Register of Systematic Reviews on March 12, 2014 (CRD42014008911).

Eligibility Criteria

Population. Our review targeted studies of adults or children with musculoskeletal disorders and injuries of the elbow, forearm, wrist, or hand region. Based on the