

Manual Therapy Research Review



Issue 30
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Autonomic nervous system and endocrine system response to upper and lower cervical spine mobilisation in healthy male adults: a randomised crossover trial. - P1

Effectiveness of adding rehabilitation of cervical related sensorimotor control to manual therapy and exercise for neck pain: A randomised controlled trial. - P2

Immediate response to injection is associated with conservative care outcomes at 12 weeks in subacromial shoulder pain. - P2

Loaded open-kinetic-chain exercises stretch the anterior cruciate ligament more than closed-kinetic-chain exercises: In-vivo assessment of anterior cruciate ligament length change. - P3

Welcome

Welcome to the 30th edition of the MT Research Review. I have included a wide range of recent research for you to read. There is a paper by Farrell et al (2023) investigating the mechanisms behind cervical spine mobilisation and the effect on the autonomic nervous system, a paper by Sremakaew et al (2023) looking at the effect of manual therapy plus balance/oculomotor retraining on patients with neck pain, a study by Marks et al (2023) looking at the impact of cortisone plus physiotherapy in those with a rotator cuff injury, and finally, a paper by Wang et al (2023) looking at the length changes in the ACL with open and closed chain knee exercises.



Enjoy! Duncan Reid

Paper One

Gerard Farrell, Matthew Bell, Cathy Chapple, Ewan Kennedy, Kesava Sampath, Angela Spontelli Gisselman, Chad Cook, Rajesh Katare & Steve Tumilty (2023): Autonomic nervous system and endocrine system response to upper and lower cervical spine mobilisation in healthy male adults: a randomised crossover trial, Journal of Manual & Manipulative Therapy, DOI: 10.1080/10669817.2023.2177071

Abstract

Background: Cervical spine mobilisations may differentially modulate both components of the stress response, consisting of the autonomic nervous system and hypothalamic pituitary adrenal-axis, depending on whether the target location is the upper or lower cervical spine. To date, no study has investigated this.

Methods: A randomised, crossover trial investigated the effects of upper versus lower cervical mobilisation on both components of the stress response simultaneously. The primary outcome was salivary cortisol (sCOR) concentration. The secondary outcome was heart rate variability measured with a smartphone application. Twenty healthy males, aged 21–35, were included. Participants were randomly assigned to block-AB (upper then lower cervical mobilisation, n = 10) or block-BA (lower than upper cervical mobilisation, n = 10), separated by a one-week washout period. All interventions were performed in the same room (University clinic) under controlled conditions. Statistical analyses were performed with a Friedman's Two-Way ANOVA and Wilcoxon Signed Rank Test.

Results: Within groups, sCOR concentration reduced thirty-minutes following lower cervical mobilisation (p = 0.049). Between groups, sCOR concentration was different at thirty-minutes following the intervention (p = 0.018).

Conclusion: There was a statistically significant reduction in sCOR concentration following lower cervical spine mobilisation, and between-group difference, 30 min following the intervention. This indicates that mobilisations applied to separate target locations within the cervical spine can differentially modulate the stress response.

Commentary

This paper from my colleagues at the Otago School of Physiotherapy is a good example of manual therapy research investigating the mechanisms behind manual therapy. It is often easy to stick to basic mechanical models of how manual therapy works but I really liked how this paper looked at other effects on the autonomic nervous system and endeavours to expand our knowledge in this area. The work also supports the many effects of manual therapy as proposed by Bialosky et al (2009). It was interesting to see that in normal populations (without significant stress responses) that cortisol levels can increase or decrease depending on the levels mobilised. The next phase of this research will be exciting to follow to see if these stress responses can be modulated in those with conditions such as concussion.

Paper Two

Sremakaew, M., Jull, G., Treleaven, J., & Uthakhip, S. (2022). Effectiveness of adding rehabilitation of cervical related sensorimotor control to manual therapy and exercise for neck pain: A randomised controlled trial. *Musculoskeletal Science and Practice*, <https://doi.org/10.1016/j.msksp.2022.102690>

Abstract

Background: Local neck treatments and sensorimotor training can improve cervical proprioception and balance, but it remains unclear what treatments and treatment combination achieve the best outcomes.

Objectives: To investigate the most effective interventions to improve disturbances in joint position sense (JPS) and balance and their effects on neck pain, dizziness and related features in the short- and long-terms. Design: 2x2 factorial, randomised controlled trial. Methods: Participants with neck pain (n = 152) were randomly allocated to one of four intervention groups: i) local neck treatment (NT), ii) NT + JPS/oculomotor exercises (JPS/OC), iii) NT + balance exercises, and iv) all treatments. Participants received 12 treatments over 6 weeks. Primary outcomes were postural sway and joint position error. Secondary outcomes included gait speed, dizziness, pain intensity and disability, cervical range of motion, functional ability, and quality of life. Outcome measures were taken at baseline, posttreatment and 3-, 6- and 12-month follow-ups.

Results: All four interventions resulted in short- and long-term improvements in primary and secondary outcomes with medium to large effect sizes, but JPS and balance in neck torsion improved most with the addition of a combined program of JPS/OC + balance exercises to NT while balance in neck neutral improved most with the addition of balance exercises. Adding sensorimotor training was also more effective in maintaining levels of improvement in neck pain and disability at 6- and 12-months. Effect sizes of additional treatment benefits were medium to large.

Conclusions: Adding specific training of JPS/OC and balance to NT best addresses deficits in cervical proprioception and balance.

Commentary

Gwen Jull and her team of researchers at the University of Queensland have created a great body of research into the assessment and management of neck pain over many years. This paper by Sremakaew et al. is yet another piece of great research that unpacks one of the more challenging areas of patients presenting with neck pain, with dizziness and disturbances on the oculomotor systems. The study design of dividing the participants into four clear groups to look at different aspect of the care was the usual robust design we expect from Gwen and her researchers! The outcomes of this work show that adding joint position sense and oculomotor training to the local neck pain manual therapy had the greatest response in symptom reduction. These dizziness, neck pain and oculomotor symptom presenting patients are always tricky. This paper provides great clarity in how to move forward with these patients.

Paper Three

Marks, D., Thomas, M., Newans, T., & Bisset, L. (2023). Immediate response to injection is associated with conservative care outcomes at 12 weeks in subacromial shoulder pain. *Musculoskeletal Science and Practice*, <https://doi.org/10.1016/j.msksp.2023.102726>

Abstract

Background: Subacromial injection is known to influence pain of subacromial origin, yet its association with conservative care outcomes is unknown. This study investigated whether immediate response to subacromial injection of corticosteroid and local anaesthetic is associated with conservative care outcomes at 12 weeks post injection and/or progression to surgery.

Design: Prospective prognostic cohort study.

Methods: Sixty-four participants with subacromial related shoulder pain attending initial orthopaedic outpatient appointment at an Australian public hospital, received subacromial injection of corticosteroid and local anaesthetic followed by up to 12 weeks of physiotherapy. Immediate response to injection was measured by change in shoulder range of motion (ROM) and pain immediately (within 20 min) before and after injection. The Shoulder Pain and Disability Index (SPADI) was measured at baseline, 6 and 12-weeks.

Results: Backward stepwise linear regression revealed immediate post-injection improvement in pain-free ROM ($p = 0.001$) and higher baseline symptoms ($p = 0.016$) were significantly associated with better 12-week SPADI outcomes. Longer symptom duration ($p = 0.029$) and higher age ($p = 0.013$) were significantly associated with poorer outcomes. Only 11 individuals progressed to surgery. The resultant model could explain 35% of the variation in change in SPADI at 12 weeks.

Conclusion: Improvement in pain-free shoulder ROM immediately post injection is significantly associated with better 12-week conservative care outcomes. This information, derived from within consultation injection responses, could help inform decisions about potential treatment options. Further research with higher numbers and longer-term patient-reported outcomes could further clarify these findings. Registration: Australia and New Zealand Clinical Trials Registry 21 May 2012: 12612000532808.

Commentary

I have been involved in running a significant piece of work in NZ to better manage patients presenting with trauma related rotator cuff disorders and getting better decision making around who needs surgery and who needs comprehensive conservative care. In the current study we are running, the conservative care group can have up to 2 cortisone injections before surgical referral may be required if they have not settled. I really found this study helpful to support the fact that cortisone plus physiotherapy has a good result by the 12 week mark. This is in keeping with the milestones we are trying to reach in the study. It was also great to see the age and longer symptom duration were associated with a poorer outcome. Getting people to skilled physiotherapists and using cortisone to settle the pain early so they can engage in the rehabilitations seems like a really good message here.

Paper Four

Wang, C., Qiu, J., Wang, Y., Li, C., Kernkamp, W. A., Xi, X., ... & Tsai, T. Y. (2023). Loaded open-kinetic-chain exercises stretch the anterior cruciate ligament more than closed-kinetic-chain exercises: In-vivo assessment of anterior cruciate ligament length change. *Musculoskeletal Science and Practice*, 63, <https://doi.org/10.1016/j.msksp.2022.102715>

Abstract

Background: Usage of open-kinetic-chain (OKC) or closed-kinetic-chain (CKC) exercises during rehabilitation planning after anterior cruciate ligament (ACL) reconstruction has been debated for decades. However, the ACL elongation pattern during different rehabilitation exercises at different loadings remains unclear.

Objectives: This study aimed to determine the effects of OKC and CKC exercises on the length of ACL anteromedial bundle (AMB) and posterolateral bundle (PLB) to provide biomechanical support for making rehabilitation schedules.

Design: Laboratory Descriptive Study.

Method: Eighteen healthy volunteers were asked to perform two OKC motions, including non-weight-bearing and 10 kg loaded seated knee extension (OKC-0, OKC-10), as well as two CKC motions, including box squat (BS) and deep single-legged lunge (Lunge). Techniques of 2D-to-3D image registration and 3D ligament simulation were used to quantify length changes of ACL.

Results: The motion which led to the least and most ACL elongation were OKC-0 and OKC-10, respectively. The AMB and PLB were significantly longer in OKC-10 than those in OKC-0 during 0–60° and 0–55° of knee flexion ($p < 0.01$). Compared with reference length, the AMB and PLB were stretched during 0–30° and 0–10° respectively during OKC-10. During CKC exercises, the AMB and PLB were also stretched from 0 to 25° and 0–5°, respectively. Additionally, no significant difference was found in the length change of ACL bundles between BS and lunge.

Conclusions: OKC-0 may be safe for the rehabilitation program after ACL reconstruction, and loaded exercises shall be applied when restricted with $>30^\circ$ in early-stage rehabilitation.

Commentary

Once again, the debate around open kinetic chain vs closed kinetic chain following ACL reconstruction continues. This study, using real time MRI imaging, aimed to look at the amount of stretch on the ACL with a range of open and closed kinetic chain exercises. This study was done on a normal population with intact ACL's. The results show that in open chain exercise with no weight there was little to no elongation of the ACL ligament but with 10 kgs of weight added there was up to a 4% lengthening.

With the box squat and lunge activities there was a 2-3 % length change. Based on these findings the author suggests that open chain exercises at 0 degrees extension place little to no stretch on the ACL but loaded exercise should be restricted to less than 30 degrees knee extension so as not to stretch the ACL. The nature of this research is the results (based on normal ACL) are then extrapolated to those who have had an ACL reconstruction with the view that restricting certain activities (e.g., open chain with weight) that will reduce the chance of graft rupture. To my knowledge I have yet to read a report of patients undergoing graduated resisted exercises following ACLR that has resulted in graft rupture! Most patients I have seen who have ruptured the graft have done so with falling, twisting or not following the prescribed rehabilitation outside the rehab setting. Another way to interpret these findings is that the graft (most often a tendon) is a collagenous structure. Collagen responds to load when healing, so a 3-4% lengthening stress while doing open chain knee extension with 10 Kgs might actually help with collagen maturation!



Ghent
September 2023
Update
BELGIUM ECMT 2023

<https://willbethere.be/ecmt2023/>

**EUROPEAN
CONGRESS
MANUAL THERAPY**

IFOMPT Membership Meeting

16:00-18:30 - 13 September 2023

Vandervalk Hotel, Akkerhage 10, 9000 Gent



IFOMPT Belgian Dinner

19:00-13 September 2023

T'Pakhuis

Please let the IFOMPT office know if you will be attending

IFOMPT Teachers Meeting

09:00-17:00 - 14 September 2023

Faculty of Medicine, University Ghent

Register [here](#)

ECMT CONFERENCE

08:30-17:00 - 15 and 16 September 2023

University Forum, Ghent

IFOMPT Teachers Meeting

09:00 Welcome - Laura Finucane

09:15 Update - Ronel Jordaan

09:30 Keynote - Tim Noblet

OMPT Specialisation across the globe: How can we help each other?

11:00 Workshops (2 Concurrent)

12:30 Lunch

13:30 Workshops (2 Concurrent)

15:15 Debrief

16:30 Closing remarks - Laura Finucane

Workshops:

Eric Robertson - Teaching the integration of clinical reasoning models into manual therapy (Hybrid)

Euson Yeung - Designing effective learner assessments (In person only)

Details on registration, accommodation, etc available on the [website](#)