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CONFERENCE ABSTRACTS



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Abstracts are listed in order by first-named author. The presenting author's name(s) is underlined.

ARE ORTHOPAEDIC SPECIAL TESTS OBSOLETE IN THE DIAGNOSIS OF ACROMIOCLAVICULAR JOINT AND SUB-ACROMIAL PATHOLOGY?

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Introduction: An accurate diagnosis of shoulder pain is integral to forming a prognosis and management plan. Chronic shoulder pathologies are often misdiagnosed due to the poor validity of tests and an over-reliance on imaging. For many clinicians the assumption is that clinical tests can discriminate between different structures in the shoulder. They are still widely used despite sufficient evidence calling into question the diagnostic accuracy of these tests.

Aims: To investigate the diagnostic accuracy of commonly utilised clinical tests for identifying acromioclavicular joint (ACJ) and subacromial (SA) pain in patients with chronic shoulder pathologies.

Methods: A diagnostic accuracy study was conducted in a tertiary care environment. Participants with chronic ACJ or SA pain were recruited. Two orthopaedic surgeons and one physiotherapist conducted the assessments. Each participant underwent a standardised interview and physical assessment followed by an anaesthetic injection (AI) into the SA space +/- the ACJ. A positive anaesthetic response threshold was set at $\geq 65\%$ improvement on the numeric pain rating scale.

Results: Of the 38 participants, 17 had a positive anaesthetic response. None of the orthopaedic special tests (OSTs) demonstrated a statistically significant relationship with the anaesthetic response, and none demonstrated levels of accuracy that suggest they have any clinical utility as stand-alone tests to either rule in or out ACJ or SA pain in this cohort. A multivariate analysis identified a combination of positive and negative variables that have the potential to be clinically useful to predict a positive response to a SA AI. The variables were difficulty with overhead tasks, a strain injury onset, lowest pain $\geq 5/10$, presence of muscle wasting, onset of pain from a repetitive activity, worst pain $\geq 8/10$, the primary pain site over or above the clavicle, painful horizontal adduction with external rotation, painful passive internal rotation, and painful resisted flexion at 10° .

Conclusion: The study findings support the current research that OSTs as stand-alone tests are not able to identify an ACJ or SA diagnoses. In contrast, this research suggests that a combination of findings from the patient history and physical assessment can help to predict the presence or absence of these pathologies. Hence, clinicians should consider placing less emphasis on OSTs and more on the overall clinical picture.

These findings are specific to patients with chronic shoulder pain. Further research is required to determine if the results are reproducible and if they might be generalisable to patients with less severe pathology.

METASTATIC MELANOMA IN A PATIENT WITH UNRESOLVING KNEE PAIN – A CASE REPORT

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Introduction: The prevalence of serious pathology in the knee is low and, as a result, physiotherapists often have a low index of suspicion regarding serious pathology such as bony tumours and infections. While these causes are relatively rare, it is imperative

to discern them from more benign causes of knee pain, as they require early diagnosis and escalation of care. The following case describes the clinical reasoning employed in the triage of a patient with unresolving knee pain, that led to the timely diagnosis of metastatic melanoma.

Case Presentation: A 33-year-old female presented with a 1-month history of anteromedial knee pain, mild swelling, and instability following a twisting injury while descending stairs. Despite restricting her activity levels, these symptoms had not improved since the date of injury. Findings from the history and clinical examination were consistent with meniscal or chondral pathology. Despite manual and exercise therapy, her symptoms continued to worsen over the following month. An ongoing 5° painful loss of terminal knee extension and persisting pain and instability with short distances of walking warranted referral for radiographs and orthopedic consultation. She had no constitutional features of cancer-related pain but recalled a previous history of melanoma 4 years prior affecting her face.

Results: Radiographs were reported on and interpreted as being unremarkable both by the referring physiotherapist and upon orthopedic consultation. Magnetic resonance imaging revealed a large cystic bone lesion in the medial femoral condyle, which was subsequently characterised as metastatic melanoma by a specialist oncology team. Retrospective orthopedic review of the initial radiographs highlighted a lytic bone lesion, which was initially missed by the radiologist, specialist, and referring physiotherapist. The patient went on to develop further subcutaneous, intramuscular, and cerebral metastasis, the latter of which warranted craniotomy. At the time of publishing, the patient remains under the care of a specialised oncology team with the plan to continue immunotherapy treatment for a 2-year period.

Conclusion: Clinicians should have a high index of suspicion in patients with a prior cancer diagnosis and unresolving, worsening, or unexplained pain. The critical analysis of treatment response is an important facet of the clinical screening process and should aid clinical decision making towards appropriate escalation of investigations and care, where presumed timeframes are exceeded. The early recognition of a lack of anticipated improvement and referral to a specialist oncology team for further investigation was crucial to this patient having her cancer identified and undergoing timely intervention.

USE OF ELECTROMYOGRAPHY FOR DETERMINATION OF NECK MUSCLE FATIGUE; CAN IT STRENGTHEN VALIDITY OF CLINICAL OUTCOME MEASURES? A SCOPING REVIEW

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Introduction: Tests of neck muscle fatigue are commonly used to inform diagnostic and treatment decisions; however, very few have been validated.

Aim: The main aims of the scoping review were therefore to (1) identify and map literature examining use of electromyography (EMG) to measure neck muscle fatigue to inform validation experimental protocols; and (2) identify studies which had already used EMG to validate clinical measures of neck muscle fatigue.

Methods: Health-related databases: CINAHL, Cochrane Library, Embase, PubMed, Scopus, and Web of Science were searched from December 2022 to January 2023. Search terms based on population, concept, and context (PCC) criteria were developed with input from a specialist subject librarian and informed title and abstract screening and full text selection. Full texts included studies using EMG to evaluate muscle endurance or fatigue of a set of pre-defined neck muscles in adults aged 18 years and over.

Results: Three hundred and eighty-nine titles were screened with 48 full texts eligible for inclusion. Assessment of neck muscle fatigue was commonly performed during standardised submaximal isometric flexion and/or extension tasks, performed for specified durations (50%, $n = 24$), and or to exhaustion (31%, $n = 15$), or at varying % maximal voluntary contractions (19%, $n = 9$). Inclusion of neck muscles were specific to tasks performance with sternocleidomastoid most measured during flexion and splenius capitis during extension movements. Sixty-seven percent ($n = 32$) of studies used median frequency as the primary EMG outcome to evaluate fatigue with RMS of mean amplitude the second most used outcome (33%, $n = 16$). Analysis of outcomes was performed using overlapping and non-overlapping epochs although 69% ($n = 33$) of studies did not report window preference. Only one article used EMG to infer construct validity of the cervical flexor and extensor endurance tests.

Conclusion: Current evidence suggests that evaluation of neck muscle fatigue is possible using EMG; however, only one study has used EMG to evaluate validity of commonly used clinical outcomes of neck muscle fatigue.

THE EFFECT OF POSTERIOR PASSIVE ACCESSORY GLENOHUMERAL MOBILISATION ON SHOULDER AND SCAPULAR MUSCLE ACTIVITY DURING RESISTED SHOULDER ABDUCTION: A REPEATED-MEASURES STUDY ON ASYMPTOMATIC INDIVIDUALS

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Introduction: Shoulder mobilisations are commonly used by physiotherapists to treat shoulder disorders. The mechanisms through which they provide clinical benefit are unestablished. Investigation into the effect of shoulder mobilisation on muscle activity provides insight into the neurophysiological mechanisms of joint mobilisation. Knowledge of these mechanisms is important to enhance (1) research into the efficacy of mobilisations, and (2) the targeted use of mobilisation in clinical populations.

Aim: To assess the effect of posterior glenohumeral mobilisation on shoulder and scapular muscle activity during resisted shoulder abduction in asymptomatic individuals.

Methods: Laboratory-based, repeated measures, randomised crossover trial. Twenty-five asymptomatic participants took part in the study. Participants were randomised into one of two sequences corresponding to the order interventions delivered. Interventions consisted of the mobilisation condition (60 s, 3 sets, grade IV+ posterior shoulder mobilisation) and control (no mobilisation). Five repetitions of resisted shoulder abduction were performed before and after each intervention. Surface electromyography was used to assess muscle activity (expressed as % of maximal voluntary contraction) of eight shoulder and scapular muscles: upper and lower trapezius, middle and posterior deltoid, infraspinatus, serratus anterior, pectoralis major and latissimus dorsi muscles. A linear mixed effect model was used to assess the immediate effect of posterior mobilisation on shoulder muscle activity levels. Muscle activity for the concentric and eccentric phases of shoulder abduction were analysed separately using this model.

Results: No between-condition differences were observed for any muscle during both the concentric and eccentric phases of shoulder abduction (Table 1).

Table 1

Shoulder Muscle Activity Measured with EMG – Between Conditions

Movement phase and muscle	Mean difference	95% CI	
		LL	UL
Concentric phase			
Upper trapezius	5.2	-6.4	16.9
Lower trapezius	-1.2	-15.2	12.8
Infraspinatus	0.6	-8.8	10.1
Middle deltoid	1.6	-6.3	9.5
Posterior deltoid	0.6	-5.0	6.3
Latissimus dorsi	-0.3	-5.8	5.0
Serratus anterior	0.6	-8.1	9.4
Pectoralis major	-0.4	-3.3	2.4
Eccentric phase			
Upper trapezius	2.3	-11.5	16.2
Lower trapezius	-0.1	-21.4	21.2
Infraspinatus	-0.4	-10.7	9.8
Middle deltoid	2.8	-7.0	12.6
Posterior deltoid	1.7	-6.3	9.8
Latissimus dorsi	-1.5	-9.2	6.1
Serratus anterior	-0.8	-10.4	8.6
Pectoralis major	-0.3	-4.8	4.1

Note. CI = confidence interval; LL = lower limit; UL = upper limit. All values expressed as a percentage of maximal voluntary isometric contraction.

Conclusion: Findings from this exploratory study suggest that posterior shoulder mobilisation had no effect on shoulder or scapular muscle activity levels compared to control in young asymptomatic individuals. Further research is required to assess the effects of

posterior shoulder mobilisation on muscle activity during different shoulder movements and in symptomatic populations. These findings may help future researchers in two ways: (1) in the design of studies that investigate the neuromuscular response of posterior mobilisation in patients with various shoulder disorders; and (2) in the design of studies investigating the mechanisms of manual therapy.

AUTONOMIC NERVOUS SYSTEM AND ENDOCRINE SYSTEM RESPONSE TO UPPER AND LOWER CERVICAL SPINE MOBILISATION IN HEALTHY MALE ADULTS: A RANDOMISED CROSSOVER TRIAL

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Introduction: Peripheral components of the stress response consist of the autonomic nervous system (ANS) and hypothalamic pituitary adrenal-axis (HPA-axis), the latter of which is the endocrine component of the stress response. Cervical spine mobilisations may differentially modulate both components of the stress response, depending on whether the target location is the upper or lower cervical spine. To date, this is the first study that has investigated the differential response of mobilisations applied to the cervical spine on both components of the stress response. This study provides a deeper understanding of the mechanisms of cervical spine mobilisation. Its results have important implications for clinicians, who may be able to selectively modulate the stress response depending on whether they mobilise the upper or lower cervical spine.

Aim: The aims of this study were to explore the physiological effects of mobilisation to the upper versus lower cervical spine in healthy male adults, by comparing (1) HPA-axis response measured with salivary cortisol, and (2) the ANS response measured with heart rate variability (HRV). Cortisol is the primary stress hormone and end-product of the HPA-axis, and HRV is a proxy measure of ANS activity.

Methods: A randomised controlled crossover trial investigated the effects of upper versus lower cervical spine mobilisation on both components of the stress response simultaneously. The primary outcome was salivary cortisol concentration. The secondary outcome was HRV 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 then upper cervical mobilisation, $n = 10$), separated by a one-week washout period. All interventions were performed in the same room (University clinic), at the same time, by the same operator, under controlled conditions. Statistical analyses were performed with a Friedman's Two-Way ANOVA and Wilcoxon Signed Rank Test.

Results: Within groups, salivary cortisol concentration reduced thirty minutes following lower cervical mobilisation ($p = 0.049$). Between groups, salivary cortisol concentration was different at thirty minutes following the intervention ($p = 0.018$). Although non-significant, within groups, there was a trend for lower cervical mobilisation to increase salivary cortisol concentration the night following the intervention.

Conclusion: The results of this trial indicate that mobilisations applied to separate target locations within the cervical spine can differentially modulate the stress response.

AGE, GENDER, DELAY TO SURGERY, AND VOCATIONAL REHABILITATION SIGNIFICANTLY INFLUENCE OUTCOMES FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION IN NEW ZEALAND

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Introduction: Rates of anterior cruciate ligament reconstruction (ACLR) have increased significantly in recent years. Patient outcomes following ACLR are variable and potentially influenced by multiple factors, including, but not limited to, age, gender, level of activity, time to surgery, and concomitant injury. However, the factors that may influence patient outcomes following ACLR in New Zealand (NZ) are currently unknown.

Aim: To determine the relationship between patient, treatment, and rehabilitation factors and patient-reported outcomes following ACLR in NZ.

Methods: Patient-reported outcome data from the NZ ACL Registry was matched to the corresponding Accident Compensation Corporation (ACC) claim under which the ACLR was funded, with relevant patient data extracted from the ACC claims management database. The patient-reported outcome measures used were the Knee Injury and Osteoarthritis Outcome Score (KOOS) and Marx Activity Rating Scale (MARS), with data collected pre-ACLR, and at 6, 12, and 24 months post ACLR. Outcomes of interest were the achievement of a Patient Acceptable Symptom State (PASS) on the KOOS4 or a normative score on the MARS. Variables included in the repeated measures logistic regression model were patient age at ACLR, gender, number of days between ACL injury and ACLR, presence of physiotherapy treatment, and presence of vocational rehabilitation (VR).

Results: The initial data set of 9,562 individuals was reduced to 5,345 once exclusion criteria were applied. Individuals over 21 years of age at ACLR were less likely to achieve a KOOS4 PASS score and a normative MARS score prior to, and following, surgery. Females were less likely to achieve a KOOS4 PASS score prior to ACLR and at six months post-ACLR, and less likely to achieve a normative MARS score following ACLR. A longer delay to ACLR increased the likelihood of achieving a KOOS4 PASS score prior to and following surgery; however, a longer delay to ACLR decreased the likelihood of achieving a normative MARS score following surgery. Physiotherapy treatment increased the likelihood of achieving a KOOS4 PASS score in the first 12 months following ACLR. Individuals who received VR were less likely to achieve a KOOS4 PASS and normative MARS score prior to, and following, ACLR.

Conclusion: Patient age, gender, delay to surgery, and physiotherapy treatment influence patient-reported outcomes following ACLR in NZ. Specific to the NZ context, the presence of VR decreased the likelihood of achieving a KOOS4 PASS and normative MARS score before and after ACLR. Awareness of factors that can affect outcomes following ACLR may influence decision making regarding how the initial ACL injury is managed, can assist with setting realistic post-operative goals, can help manage post-operative expectations, and enable optimisation of the rehabilitation programme.

A STREAMLINED APPROACH TO IDENTIFYING ADULTS SUITED TO NECK REHABILITATION ACUTELY FOLLOWING CONCUSSION: PROTOCOL FOR A FEASIBILITY STUDY

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Introduction: Concussion is a heterogeneous injury resulting in a diverse range of subsystem impairments of the head-neck complex. To address this, multidisciplinary assessment is often advised, although multidisciplinary management may not always be indicated. This raises a need to streamline processes directing patients to optimal treatment plans.

Aim: To examine feasibility of implementing a simplified physical examination (SPE) aimed at identifying concussion patients suited to neck rehabilitation within a New Zealand primary health care setting.

Methods: 160 acutely concussed adults aged 18–60 years, and 10 health service providers will be recruited between May 2023 and January 2024. A feasibility study will investigate health service provider and patient response to the SPE. A mixed methods study will examine health service provider attitudes toward use of the SPE in identification of individuals appropriate for neck rehabilitation, in the context of current practice. Exploration of patient reported compliance, satisfaction, and adverse reaction outcomes will inform feasibility from the patient perspective. A single-group pretest-posttest clinical design (including a 3-month follow up [part 3]) will provide preliminary evidence of efficacy of the SPE to preselect those suited to neck rehabilitation post-concussion.

Results: It is estimated that of 160 acutely concussed adults, 60 individuals suited to neck rehabilitation will be identified, and 30 will volunteer to receive treatment. We anticipate that use of the SPE will result in better identification of individuals suited to neck rehabilitation and, overall, health service providers attitudes toward the SPE will be positive. We also anticipate, due to perceived benefit of treatment, participant compliance will be high, dropouts low, and adverse events negligible. Based on previous randomised control trial results, we anticipate using the SPE will result in overall improvement in experimental outcomes of neck musculoskeletal and sensorimotor outcomes at 1-week and 3-month follow ups.

Conclusion: Results from this study will provide evidence of health service provider attitudes toward using the SPE in a primary health care setting, and participant compliance and satisfaction. Changes over time of experimental outcomes of neck musculoskeletal and sensorimotor function will provide preliminary evidence regarding the efficacy of the SPE to improve patient outcomes.

RETURNING FEMALES TO RUNNING FOLLOWING A TIBIAL BONE STRESS INJURY: EXPERT INTERVIEWS

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Introduction: Tibial bone stress injuries (BSI) are common among female runners and have one of the highest recurrence rates of all running-related injuries. Prior BSI has been shown to increase the recurrence rate 5–6 times among female runners. Following a tibial BSI, a critical component to complete rehabilitation is the successful return to running. While there is some evidence to guide clinicians in the return to running process, there are still areas where evidence is lacking.

Aim: To establish the process of how expert sport medicine clinicians return female athletes to running following tibial BSIs, while determining critical components of management.

Methods: A qualitative study design was used to investigate the knowledge and perceptions of Sports Medicine Clinicians on the return to running process following a tibial BSI in females. Semi-structured interviews were completed with 10 participants (four physiotherapists, five sports doctors, and one physiologist), and a reflexive thematic analysis was used to establish key themes.

Results: Three themes were established. With the first theme, “Health and Wellness”, clinicians emphasised the importance of addressing the underlying reasons for the tibial BSI occurring, such as training errors, RED-S, and psychological health. In the second theme, “Bone Healing”, clinicians described using clinical findings as opposed to radiological findings to guide the return to running process. The importance of symptom resolution and careful load management to build bone tolerance was emphasised when managing tibial BSIs. Finally, in the third theme, “Functional Return”, clinicians described using functional tests to ensure adequate tissue capacity and movement competency, and to guide progression through the return to running process. Regular functional testing allows an individualised approach to management. Multiple progressions were discussed throughout the process in terms of building running distance, intensity, and frequency. These progressions were all guided by the athlete’s end goal. Clinicians acknowledged the extensive literature citation of the “10% rule”, which refers to progressively increasing running distance by 10% per week, but did not support its use following a tibial BSI due to the lack of scientific evidence to support it and a need for individuality. Introducing running on softer surfaces was recommended, while also including the athlete’s normal training surfaces early in the process. The importance of addressing biomechanical factors was acknowledged; however, clinicians advised careful modification as athletes may adapt to their individual biomechanics.

Conclusion: When returning female athletes to running following a tibial BSI, their health should first be optimised. Progression should be gradual and guided by subjective and objective clinical findings. Expert clinicians identified the need to veer away from a “one size fits all approach” and individualise the return to running process. A notable thread that stretched across all three themes was the importance of establishing a multi-disciplinary management approach, reflecting the many facets involved in tibial BSI in female athletes.

IMAGING FOR LOW BACK PAIN – WHAT INFORMS CLINICAL DECISION MAKING? A SCOPING REVIEW

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Introduction: The overuse of imaging in the management of low back pain has been well documented. This has led to wasteful expenditure and potentially harmful consequences. ACC data 2009–2020 shows imaging makes up 17% of the total ACC spend of health care for LBP. Several strategies have been employed to encourage clinicians to use imaging more judiciously, with limited success. A number of factors have been shown to influence clinical decision making; however, these have not been fully explored. Investigating these factors would provide insight into how clinicians decide which person with LBP is appropriate for imaging.

Aim: The aim of this scoping review was to explore the literature on clinicians’ decision making when referring for imaging for LBP. Identified factors were considered in the context of impact on clinical practice within Aotearoa New Zealand.

Methods: A scoping review was conducted following the PRISMA-ScR guidelines using the following databases: Medline, CINAHL, EBSCO, Scopus, and Cochrane Reviews. These databases were searched using the following key concepts: healthcare providers, clinical decision-making, LBP (all ages), medical imaging. Full text English language peer-reviewed articles published between 2010 and 2023 were included. Studies of elite athletes, wheelchair users, and people with neoplastic disease were excluded.

Results: Thirty-two peer-reviewed articles were included for final analysis. Data extracted covered 12 countries of study, 10 locations of service, and seven professions. Key factors influencing the decision-making process were charted and included *clinical setting* covering emergency care, primary care, community clinics, and specialist departments; *clinical features* such as pain characteristics, presence of red flags, and neurological symptoms; *patient characteristics* including age, sex, ethnicity, comorbidities, and socioeconomic factors; *patient beliefs* and expectations, for example demand for imaging and low expectation of recovery; *clinician characteristics* such as years' experience and workload; and *clinician beliefs* such as patient pressure and fear of consequences.

Conclusion: There are various influences on a clinician's decision-making process when referring patients with LBP for imaging. These are dependent on aspects related to the patient, the clinician, and the location of service. This study highlights those factors relevant to clinical practice in Aotearoa New Zealand. However, further investigation is required to examine these factors, how they relate to best practice guidelines, and how they could inform mechanisms to reduce unwarranted imaging. The current findings will inform a qualitative descriptive study interviewing clinicians to gain more insightful understanding of clinical decision making within an Aotearoa New Zealand context.

CLIENTS AND CONDITIONS ENCOUNTERED BY FINAL-YEAR PHYSIOTHERAPY STUDENTS IN PRIVATE PRACTICE. A RETROSPECTIVE ANALYSIS

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Introduction: Currently, little is known about the clients and conditions final-year physiotherapy students are exposed to in private practice settings. Private practices are community-based clinics where clients can access physiotherapy directly, and in New Zealand are the largest practice setting in which physiotherapists work. An understanding of the clients and conditions encountered by final-year students is needed to support physiotherapy students to transition to new graduate roles in private practice settings.

Aim: The aim of this study is to describe the clients and conditions encountered by final-year physiotherapy students during a six-week full-time private practice clinical placement.

Methods: Client data of conditions were collected over 11 years (2008–2018) from final-year physiotherapy students' client reports in a university clinic, Christchurch, New Zealand. Data for anatomical site and pathology were categorised using the Orchards Sports Injury Classification System 10 and descriptive analyses completed.

Results: Reports were collected from 190 students including data from 4,117 clients. In a clinical placement students saw a mean of 22 (*SD* 5) unique clients. The anatomical sites most encountered were the shoulder (97.4% of students), lumbar spine (96.3%), knee (95.8%), and ankle (91.2%). The pathologies most encountered were joint sprain (100%), muscle injury (90%), and tendon injury (88.4%).

Conclusion: While final-year physiotherapy students are exposed to a substantial number of clients encompassing major regions and condition types, this exposure is limited in scope. This contributes to our understanding of why the transition from final-year student to new graduate in a private practice setting is challenging, especially when considering skill development in areas such as manual therapy. When considering support initiatives, the data presented offer a basis for discussion.

SCREENING FOR DEGENERATIVE CERVICAL MYELOPATHY – PRELIMINARY RESULTS OF A NEW ZEALAND BASED NATIONWIDE PRIMARY HEALTHCARE SURVEY

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Introduction: Degenerative cervical myelopathy (DCM) is the most common cause of spinal cord impairment in adults, affecting 2% worldwide. Patients experience symptoms including balance decline, upper and lower limb weakness, pain, and/or paraesthesia from degenerative cervical spinal elements causing stress on the spinal cord. Unfortunately, due to a lack of condition awareness and defined diagnostic criteria, people with DCM face significant diagnostic delays leading to progressive functional decline. Early

identification and diagnosis are key as timely intervention can cease progression and reduce impacts on quality of life. Primary healthcare clinicians are likely to encounter DCM in its early and mid-stages as it masquerades as benign musculoskeletal problems such as neck pain. Therefore, the awareness of DCM in primary care is essential for early identification and referral of suspected cases.

Aim: This survey aims to establish the current awareness and confidence to detect DCM among primary care clinicians in New Zealand.

Methods: Cross-sectional quantitative survey methodology was employed to collect anonymised responses from consenting New Zealand-registered primary healthcare clinicians, including GPs, physiotherapists, nurse practitioners, osteopaths, and chiropractors. After relevant literature review, survey questions were developed and modified after piloting the survey. The 12-question survey includes 5 demographic-based questions, two categorical questions on perceived awareness and screening confidence, and 5 condition knowledge-based, multiple-choice questions. Ethics approval was granted by the Auckland University of Technology Ethics Committee (23/113). Prospective clinicians were invited to participate via their respective professional organisations and social media groups. The data was analysed using descriptive statistics.

Results: Preliminary data surveyed from 255 primary healthcare clinicians, including GPs (28%), physiotherapists (44%), chiropractors (16%), nurse practitioners (12%), and osteopaths (2%). The mean years of clinical experience was 14.52 years ($SD = 8.52$). Over half had not received prior education on DCM (54%). Only 21% of clinicians rated their awareness as “very good” or “excellent”, whereas 35% had limited or no awareness of DCM. Confidence to identify signs and symptoms was similar, with 44% of clinicians feeling “slightly” or “not confident at all” compared to 15.2% who felt “extremely” or “very confident”. GPs reported receiving significantly less training ($p = 0.95$) than chiropractors and physiotherapists, and were significantly more likely to report limited awareness and lower confidence to detect the condition. The most recognised signs and symptoms among slightly to extremely confident clinicians were upper limb pain/paraesthesia (96.53%), neck pain and stiffness (91.91%), hand dexterity decline (87.28%), and gait disturbance (73.99%). Commonly recognised objective signs were tandem gait disturbance (65.90%), age > 45 years (61.85%), Babinski sign (57.23%), and Hoffman’s sign (49.71%). Overall, 88% of surveyed clinicians were keen to attend further education on DCM.

Conclusion: In this survey only one in five primary care clinicians in New Zealand had good awareness of DCM and even fewer felt confident to detect the signs and symptoms clinically. This is likely to contribute to diagnostic delays and poorer outcomes for individuals with DCM. Clinicians who had undergone prior training reported higher levels of awareness and confidence. There is a large appetite for further training among surveyed clinicians at all career stages. The survey was limited by the low response rate and self-selection bias may overstate the actual percentage of clinicians who are aware of DCM.

RELIABILITY AND VALIDITY OF THE BRIEF PAIN INVENTORY SHORT-FORM IN INDIVIDUALS WITH ROTATOR CUFF-RELATED SHOULDER PAIN

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Introduction: Rotator cuff-related shoulder pain (RCRSP) is the term encompasses pain experience due to various shoulder disorders. Characterising pain experience and its associated interference is essential to optimise research and clinical outcomes in people with RCRSP. The Brief Pain Inventory-Short Form (BPI-SF) is a standardised tool for measuring pain severity and interference in people with chronic pain. However, the reliability and validity of the BPI-SF in individuals with RCRSP are undetermined. This study aimed to investigate the test-retest reliability and construct validity of the BPI-SF in individuals with RCRSP.

Methods: Sixty-one participants with RCRSP completed the BPI-SF twice with an interval of two to seven days and shoulder pain and disability index (SPADI) at the initial visit. The BPI-SF pain severity subscale, pain interference subscale, and stand-alone pain severity items were analysed using intraclass correlation coefficients (ICC) and minimal detectable change (MDC95). The construct validity of BPI-SF was assessed against SPADI using Pearson’s correlation.

Results: The BPI-SF pain severity subscale demonstrated satisfactory test-retest reliability (ICC: 0.73, 95% CI: 0.58, 0.83) and an MDC95 of 2.05. Conversely, the BPI-SF pain interference subscale demonstrated low reliability (ICC: 0.53, 95% CI: 0.13, 0.75) and an MDC95 of 2.36. Of the stand-alone BPI-SF pain severity items, only “worst” pain demonstrated satisfactory test-retest reliability (ICC: 0.70, 95% CI: 0.55, 0.81). The correlation coefficients between the BPI-SF and SPADI subscales or total scores were high ($r = 0.61$ to 0.75 , $p < 0.001$).

Conclusion: BPI-SF pain severity subscale and stand-alone pain severity item (i.e., “worst pain”) are reliable in individuals with RCRSP. Both BPI-SF pain severity and interference subscales are valid in individuals with RCRSP. The MDC values can be useful metrics for interpreting a true change in BPI-SF scores following interventions in individuals with RCRSP.

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PHYSIOTHERAPISTS’ ATTITUDES AND BELIEFS ABOUT SELF-MANAGEMENT AS PART OF THEIR MANAGEMENT FOR LOW BACK PAIN

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Introduction: Low back pain (LBP) is a major cause of years lived with disability (YLDs) in New Zealand (NZ) and internationally, and places a large burden on individuals and health systems. Up to two thirds of people with LBP have symptoms a year after onset, with 70% having a recurrence within a 5-year period. Self-management is the ability of a person to make decisions and implement behaviours to manage their condition, including seeking health care support when required. Self-management for LBP thereby potentially reduces the burden on people with LBP and health care systems. To encourage physiotherapists to support self-management as part of their management for LBP, it is important to understand their current attitudes and beliefs, and to explore perceptions of how they implement self-management strategies in clinical practice.

Aim: This study aimed to explore physiotherapists’ understanding of LBP; ascertain their knowledge of self-management concepts; and explore their attitudes and beliefs about supporting self-management for LBP within present NZ physiotherapy practice.

Methods: Interpretive Description qualitative methodology, involving in-depth data interpretation, was used. Semi-structured interviews with physiotherapists throughout NZ were conducted via video conferencing. Data was analysed and themes were defined.

Results: Seventeen physiotherapists (24–65 years old), with between one and 40+ years of experience, participated. Four main themes were defined:

1. Evolving understanding of LBP. Participants understood the complexity of LBP and were comfortable with the “non-specific LBP” diagnosis. Participants were empathetic to the multifactorial impacts of LBP on the person. However, most believed an episode LBP should fully resolve within a 6–12-week timeframe.
2. Apportioning responsibility. The reasons suggested for LBP persistence or recurrence were the person’s lack of adherence with exercises and advice, or their lack of control over their psychological or behavioural barriers to recovery.
3. Self-management is important. Participants believed a greater focus on self-management could reduce LBP burden on the health system and individuals.
4. Understanding self-management. All participants considered exercises and individualised education as key components of self-management, but few could describe what self-management entails.

Conclusion: Novel findings from this research demonstrate examples of attitudes and beliefs that determine when and how self-management for people with LBP is implemented. In particular, beliefs about the natural history of back pain and how self-management skills are enabled may lead to inconsistencies in how physiotherapists throughout the profession provide self-management for people with LBP. Participants had good understanding of LBP, but lacked a contemporary knowledge of the natural history of LBP and tended to apportion responsibility for persistent or recurrent LBP to the person. Physiotherapists should be encouraged to assimilate more contemporary research evidence into their expectations of recovery for LBP. Further education about the role of physiotherapists in supporting self-management, the core components of self-management, including engagement, and reflection upon individual unconscious bias should be encouraged.

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EXPLORING DRIVERS AND BARRIERS TO THE DEVELOPMENT OF MUSCULOSKELETAL ADVANCED PHYSIOTHERAPY PRACTITIONER ROLES IN NEW ZEALAND

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Introduction: Musculoskeletal conditions represent 12% of the non-communicable diseases in New Zealand (NZ) affecting one in four New Zealanders and accounting for 23% of its total annual health spend. The current model of musculoskeletal care in NZ has significant shortfalls leading to compromised access to care, long waiting times, resulting in increased chronicity and ultimately increased financial burden to the country. Internationally, advanced physiotherapy practitioner (APP) roles have demonstrated the ability to impact on orthopaedic waiting lists and improve timely patient access to specialist care and services. NZ policies such as the Musculoskeletal Workforce Review, advocate upskilling of physiotherapists into APP roles. Nevertheless, these roles have not gained traction in NZ.

Aim: This research investigated the drivers and barriers to APP role development in the NZ context.

Methods: An exploratory single embedded case study design was used. Document analysis, qualitative survey data analysis, and semi-structured interviews were utilised as data sources. A purposive sampling strategy was used. Data were analysed using qualitative content analysis and triangulated to ensure rigour.

Results: This research identified various drivers and barriers to the APP role development in NZ. Most facilitators echoed international shortfalls such as limited access to care, inability to meet patient needs, workforce shortages, and fiscal constraints. However, the unique NZ-relevant enablers related to surgeon as a champion, legislative driver, and profession-led catalysts. A dominant theme from the interviews focused on developing the APP role as an important area of workforce growth in NZ to help reduce musculoskeletal burden and improve patient journey. Interviewees identified unique NZ-related barriers connected to structural determinants in terms of duality of healthcare and intra-professional barriers. Others reflected global impediments to these roles such as lack of recognition, lack of training and career pathways, and inter-professional drivers.

Conclusion: This timely study provides a thought-provoking analysis of APP roles in NZ by examining their drivers and barriers. Currently, the APP roles in NZ are ad-hoc and opportunistic, dependent on the reactive needs of the organisation. There are drivers for these roles; nevertheless, the barriers are stronger. Stakeholders, policymakers, and professional and legislative bodies need to recognise these findings and overcome the barriers when considering developing and implementing APP roles in the NZ context.

UNDERSTANDING MUSCULOSKELETAL PHYSIOTHERAPY PRACTICE IN AOTEAROA: AN EXPLORATION OF MUSCULOSKELETAL PHYSIOTHERAPISTS' PERSPECTIVES OF PRACTICE

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Introduction: A contemporary musculoskeletal physiotherapy curriculum taught in Aotearoa New Zealand (AoNZ) must be responsive to the unique conditions shaping our society. However, little is known about the unique experience of becoming and being a musculoskeletal physiotherapist in AoNZ and the bespoke conditions that influence this. What does it mean to be a musculoskeletal physiotherapist in AoNZ? An inquiry into contemporary perspectives and the modern physiotherapy landscape in AoNZ is needed to inform the newest generation of physiotherapists and guide future curriculum development.

Aim: We aimed to (1) understand what it means to be a musculoskeletal physiotherapist in AoNZ, (2) explore musculoskeletal physiotherapists' perspectives of their physiotherapy practice, and (3) identify potential changes that could improve musculoskeletal physiotherapy curriculum design and implementation.

Methods: A diverse group of 15 musculoskeletal physiotherapists practising in AoNZ were individually interviewed. A qualitative Interpretive Descriptive approach alongside a reflexive thematic analysis framework was utilised. Data were coded and grouped independently, with provisional theme names and definitions constructed. The groupings and theme structure were discussed within the research team before being finalised.

Results: Four themes were generated. Theme 1, "Musculoskeletal physiotherapy is much more", described a narrow public view of musculoskeletal physiotherapy, as participants thought they had more to offer than "... the sports physio on TV". In Theme 2, "Evidence versus (patient) expectations", participants shared tensions between patient expectations and best practice: "Are we providing healthcare or hospitality?". Theme 3, "Being conflicted", included or referred to professional conflicts primarily shaped by bespoke AoNZ conditions, including ACC/funding, multi-culturalism, and cost versus quality. Theme 4, "My navigator", explored the need for patient support to navigate the health system, but also mentorship and career progression within the profession itself.

Conclusion: Our participants highlighted external (narrow public view and conflicting expectations) and internal (AoNZ-specific contexts and mentorship) conflicts that shaped their clinical practice. Within this study, challenges identified by the participants

centred around the perception of physiotherapy, balancing evidence and expectation, maintaining professional identity, and the need for advocacy. More so, it became apparent from this research the need to define musculoskeletal physiotherapy and improve awareness of our roles. Our participants provided valuable insights into contemporary musculoskeletal physiotherapy practice and education development in AoNZ.

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EXPLORING THE CURRENT AND FUTURE OSTEOARTHRITIS HEALTH SERVICE DELIVERY NEEDS IN AOTEAROA NEW ZEALAND

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Introduction: Globally, osteoarthritis (OA) is a leading cause of chronic pain and disability. OA can affect all aspects of a person's sense of hauora (health), including hinengaro (mental and emotional), tinana (physical), and whānau (social). In Aotearoa New Zealand (AoNZ), OA affects one in eight people and prevalence is predicted to increase by 76% in the next 20 years due to obesity and population demographics, and drive healthcare costs up by 86%. The rising burden of OA will place greater demand on clinical services. International OA clinical management guidelines recommend people with OA should have access to care that provides appropriate person-centred education, exercise, and weight loss (if applicable) before employing pharmacological or surgical management. In contrast to these recommendations, OA management in AoNZ has been described as fragmented and regionally variable. Still, little research has been undertaken on service delivery for people living with OA in AoNZ.

Aim: This study aimed to describe the views of interested people from the health sector regarding current and future OA health service delivery in the public health system in AoNZ.

Methods: Data were collected via a co-design approach within an interprofessional workshop at the Taupuni Hao Huatau Kaikōiwi: Osteoarthritis Aotearoa New Zealand Basecamp symposium in 2021 and analysed using direct qualitative content analysis. Participants came from various clinical (dietetics, general practice, nursing, orthopaedic surgery, physiotherapy, podiatry, psychology, rheumatology, sports medicine, and clinical exercise physiology), health research, and health funding backgrounds across AoNZ.

Results: The results highlighted several promising current healthcare delivery initiatives, such as steps to improve collaboration across primary and secondary care services, an appreciation for the need to develop health delivery fit for all (especially for Māori), and the success of more person-centred inter-professional approaches to care (i.e., Mobility Action Programme). Health literacy and obesity prevention policies featured in the thematic analysis suggesting a lifespan or systemwide approach is needed. Data highlighted a need for reformed systems that enhances hauora/wellbeing, promotes physical activity, and facilitates interprofessional service delivery and collaboration across care settings.

Conclusion: Our study identified several promising healthcare delivery initiatives for people with OA in AoNZ. Furthermore, our analysis recognised factors that could enhance OA care across the lifespan, including a greater focus on prevention, hauora/wellbeing rather than the disease, incorporation of a wider range of healthcare professionals, addressing capacity constraints, the potential value of a Model of OA Care or pathway that is evidence-based and integrates healthcare from OA prevention to secondary care. Yet, more work is needed to prioritise what stakeholders consider high-value care. Any Model of OA Care or pathway would need to acknowledge and support the diversity of needs within AoNZ and place value on interprofessional collaboration and practice and improvements in health literacy and self-management.

EXPLORING THE MEDIUM- TO LONG-TERM WELL-BEING OF PEOPLE WITH POST-TRAUMATIC KNEE OSTEOARTHRITIS FOLLOWING ANTERIOR CRUCIATE LIGAMENT RUPTURE IN AOTEAROA NEW ZEALAND: A QUALITATIVE STUDY

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Introduction: Osteoarthritis (OA) management has traditionally focused on the later stages in older adults. Recently, researchers have argued that to have a greater impact on the burden of OA, the focus should shift to earlier stages in younger adults. Anterior cruciate ligament (ACL) rupture frequently leads to post-traumatic osteoarthritis (PTOA) of the knee. Up to 75% of people with ACL-deficient knees develop PTOA, regardless of whether they have surgical management. Costs (healthcare, productivity, unemployment) of knee OA in Aotearoa New Zealand (AoNZ) are considerable. The presence of the Accident Compensation Corporation (ACC) in AoNZ creates a funding environment that can impact people with PTOA, with care only funded if a mechanism of injury is identified. This structure means people may be supported during the initial stages of ACL rehabilitation but receive little longer-term support. Management programmes to reduce the impact of PTOA are under development (Stop OsteoARthritis, Canada), promoting self-management, exercise, and healthy lifestyles to reduce the risk of PTOA after ACL rupture. Little is currently known about the longer-term experiences of people with PTOA in AoNZ, a better understanding of which is vital for developing management programmes bespoke to AoNZ.

Aim: To gain insight into the longer-term impacts of PTOA on the well-being of people in AoNZ following ACL rupture.

Methods: Qualitative study: Participants were 12 people in AoNZ with PTOA who experienced ACL rupture \geq five years ago. Purposive sampling recruited participants with varying characteristics (age, symptoms duration, gender, perceived disability, ethnicity, geographical location). Data collection was through semi-structured interviews guided by literature about the lived experience of ACL rupture and PTOA, patient partners, and researcher experience. Data were analysed using an Interpretive Descriptive approach alongside a reflexive thematic analysis framework. Data were coded and grouped independently, with provisional theme names and definitions constructed. The groupings and theme structure were discussed before being finalised.

Results: Three themes emerged:

1. "Nobody ever told me ...": There is a lack of evidence-based information given, immediately post-injury, to people who suffer ACL injury regarding their prognosis (e.g., return to sport, PTOA). Where PTOA was discussed, participants appeared to hold a very pessimistic view of the condition.
2. The post-rehabilitation void: Once people have completed their post-operative rehabilitation, they receive little information on longer-term knee management and are likely to only access care when symptoms have significantly worsened. Those doing well longer-term perceive they were motivated to do their initial rehabilitation well and have maintained their activity levels.
3. The elephant in the room – the psychological and social impact: This included perceived changes in identity related to sports/family participation, job loss, and rumination on the injury (even decades later). Participants suggested clinicians need to manage the psychological impact of the condition from immediately post-injury.

Conclusion: Our study explored people's experiences in AoNZ following ACLR and identified barriers to living well post-injury, most notably the gap in resources or services between the end of ACC-funded post-operative rehabilitation and re-entering the health care system with symptomatic PTOA. However, we also have enablers and opportunities, potential ways of providing ongoing support that would reduce the long-term burden for patients and the health system. Future health research and service planning should leverage these opportunities and enablers.

THE EFFECT OF MENSTRUAL CYCLE PHASE-BASED REHABILITATION FOR WOMEN FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION: A RANDOMISED CONTROLLED TRIAL

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Introduction: This study investigated menstrual cycle phase-based rehabilitation programme (MCPBR) versus usual care (UC) on limb symmetry index (LSI), quadriceps maximum strength, and self-reported lower limb function for women following anterior cruciate ligament reconstruction (ACLR).

Methods: Forty-one women participated in a 12-week intervention from six to 18 weeks post ACLR. Participants were randomly assigned to one of two groups: MCPBR or UC. Knee extensor strength of the non-injured leg was measured at baseline. Knee extensor strength of both legs and the LSI of participants' maximum isometric knee extensor strength were calculated at the end of the trial. Self-reported symptoms and function were also taken at baseline and at the end of the trial using the International Knee Documentation Committee Questionnaire (IKDC), the Knee Injury and Osteoarthritis Outcome Score (KOOS), and the Knee Self-Efficacy Scale (K-SES).

Results: Thirty-eight women completed the study, and four women's data that did not comply with menstrual cycle verification criteria were excluded, leaving 34 women's data for analysis. There was high engagement with both MCPBR and UC, with participants attending 19.7 and 18 sessions of out 24 available over the trial. MCPBR did not result in a significantly higher limb symmetry index at 18 weeks post-ACLR as compared to UC (LSI following MCPBT was 84% (74–93%) and 81% (62–88%) following UC ($p = .24$)). However, the injured leg strength trended higher at 18 weeks post ACLR following MCPBR, 39.3kg (14.1), compared to UC, 30.8kg (11.9) ($p = .07$). These findings demonstrate that MCPBR is feasible to carry out in physiotherapy clinics. MCPBR and UC resulted in similar LSI and self-reported function at 18 weeks post ACLR.

Discussion: Both groups achieved excellent outcomes and, therefore, this study supports twice-weekly, supervised, gym-based rehabilitation, with targeted quadriceps strengthening and regular strength testing. However, women in the MCPBR group had slightly higher LSI, and superior quadriceps maximum strength scores in their injured and non-injured legs following MCPBR. Therefore, while this study did not demonstrate differences in LSI following MCPBR, there is a possibility that female hormones may affect maximum isometric strength in women post ACLR. Future research should investigate a larger cohort of women, including pre and post strength measures of both legs over a longer period. Similarly, it would be pertinent to understand women's experience of and preferences for MCPBR post-ACLR.

THE EFFECT OF A TARGETED PREOPERATIVE REHABILITATION PROGRAMME ON POSTOPERATIVE OUTCOMES FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

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Introduction: Anterior cruciate ligament (ACL) ruptures are a common sporting injury in New Zealand, with an incidence that is increasing over time. ACL injury management in New Zealand typically involves reconstructive surgery, with almost 3,000 surgeries completed each year. Pre- and post-operative quadriceps strengthening has been shown to improve outcomes for patients after ACL injury and reconstructive surgery. However, previous studies lack sufficient detail for key strength exercise descriptors.

Aim: To compare a documented targeted preoperative exercise programme, KneeCare (KC) with usual physiotherapy care (UC) in participants who have experienced an ACL injury followed by reconstructive (ACLR) surgery.

Methods: Thirty-two eligible and consented participants awaiting ACLR were randomised into either KC or UC groups. Outcome measures included isokinetic quadriceps and hamstring strength, and the Knee Osteoarthritis Outcome Score (KOOS) self-reporting tool. Outcome measures were assessed and analysed at baseline (T1), after 6 weeks of preoperative rehabilitation (T2) and 12 weeks after ACLR surgery (T3) using two-factor repeated measure ANOVA.

Results: No significant differences were found between groups in preoperative and postoperative strength measures, or patient-reported outcomes across the three time points.

Conclusion: Targeted preoperative exercise and usual physiotherapy care were both effective at improving preoperative quadriceps strength and postoperative outcomes after ACLR. These results are in keeping with other similar studies and reflect current best practice. To fully understand if a documented and targeted rehabilitation programme is superior to usual physiotherapy care in New Zealand, future studies need to be extended with larger cohorts.

ESCALATED CARE TO INTEGRATED CARE – THE FUTURE FOR MSK PRACTICE

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Introduction: In 2020 the Accident Compensation Corporation (ACC) initiated a series of pilot programmes named Escalated Care Pathways (ECP) to improve the pathway of people with knee, shoulder, and spinal injuries. The pilots were aimed to improve four key areas: faster return to work, improved utilisation of services, more timely access to surgery and rehabilitation, and improved

equity and access for Māori and Pacific peoples. Careway, based in Auckland, was one of the five successful pilot groups and was an inclusive model to join physiotherapists and specialists. These pilots will be completed by the end of 2023 and ACC will progress this to Integrated Care Pathways as a new way of managing key musculoskeletal conditions.

Aim: The aim of this presentation is to outline the processes and systems that were developed by Careway to meet the goals of ECP, current outcomes, and the next steps.

Methods: A series of working groups were set up to develop clinical pathways for acute knee injuries (ACL), traumatic rotator cuff tears, and leg dominant low back pain and ankle sprain. The groups consisted of leading orthopaedic surgeons, private practice physiotherapists, sports physicians, academics, and consumer groups. These groups developed resources and processes that were innovative, evidence-based, and patient centred.

Results: The new areas of innovation were (1) tight criteria for entry to the pathway for surgery and/or well-guided conservative care, (2) The use of patient-reported outcome measures at baseline and 6-weekly intervals, (3) the use of key strength measures per body site, (4) clear measures of success at discharge, and (5) the early implementation of vocational rehabilitation.

To date, the Careway education packages have engaged over 84 orthopaedic surgeons and sports medicine specialists, over 30 Careway trained vocational therapists, and over 700 physiotherapists across Auckland and Northland. Large-scale volumes (> 7,000 patients now; > 12,000 by end 2023) have been achieved, with a large dataset showing good-for-patient outcomes, and engagement with ACC and other stakeholders. Careway pathways have demonstrated that knee targets for reinjury rates are 339% ahead of target, spine 400.76% ahead of target, and ankle 608.51% ahead of target.

Conclusion: To date, these pathways have been well accepted by patients, surgeons, sports physicians, physiotherapists, and vocational therapist. Results indicate good outcomes ahead of ACC targets. The next steps are to engage with general practice to get a greater whole-of-system change with physiotherapists leading the initial triage process to determine the best pathway for the patient: surgical or conservative. Integrated care will be rolled out by ACC over 2024 so that all physiotherapy practices have access to this way of working. The future is here, time to engage!

MEDIATORS OF THE EFFECTS OF EXERCISE AND MANUAL THERAPY FOR PEOPLE WITH KNEE AND HIP OSTEOARTHRITIS: A SECONDARY, EXPLORATORY ANALYSIS OF THE MOA TRIAL

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Introduction: The mechanisms of action through which exercise and manual therapy may improve pain and function are unknown. Theoretically, these interventions may improve other variables (i.e., mediators), which, in turn, cause improvement in pain and function. Previous research has revealed some possible mediators of treatment effect in patients with hip or knee osteoarthritis. Those variables include lower limb muscle strength, self-efficacy, pain beliefs, and pain catastrophising thoughts. Better understanding of the mechanisms through which these interventions act may inform ways of enhancing the design of interventions for individuals with hip and/or knee osteoarthritis in the Management of OsteoArthritis (MOA) trial.

Aim: To explore whether pain beliefs, self-efficacy, fear, avoidance, catastrophic thinking, and functional strength mediate the treatment effect of manual therapy (MT) and exercise therapy (ET) on the Western Ontario and McMaster Osteoarthritis Index (WOMAC) composite scores and its subscales in individuals with hip and/or knee osteoarthritis in the MOA trial.

Methods: Secondary analysis of a randomised controlled trial that compared the incremental effects of supervised MT and ET in addition to usual care in patients with osteoarthritis of the hip or knee. Data from 206 participants enrolled in the MOA trial were analysed. The primary outcome measure was the WOMAC composite score after 1 year (MCID = 28 out of 240). We assessed the following variables as mediators: pain beliefs, self-efficacy, fear, avoidance, catastrophic thinking, and functional strength. These variables were measured at baseline and 6-month follow-up. We performed mediation analyses within the counterfactual framework. When performing mediation analyses, we assumed there was (1) no unmeasured confounding between the intervention-mediator relationship; (2) no unmeasured confounding between intervention-outcome relationship; (3) no unmeasured confounding between mediator and outcome; and (4) no mediator-outcome confounder that is affected by the intervention. In addition, we assumed the presence of temporal sequence from exposure (i.e., intervention), mediator to outcome. We performed mediation analysis by fitting two linear models: the mediator model and the outcome model. We performed sensitivity analyses to assess the robustness of our mediation analyses to the no unmeasured confounding assumption.

Results: Improvements in pain belief mediated the effect of MT (b: -10.7, 95% CI: -21.1, -2.6), ET (b: -8.8, 95% CI: -17.4, -1.9) and MT+ET (b: -8.3, 95% CI: -16.3, -1.7); improvements in catastrophic thinking mediated the effect of MT+ET (b: -6.5, 95% CI: -13.8, -0.8); and improvements in functional strength mediated the effect of ET, although this was a weak causal effect (b: -4.6, 95% CI: -11.3, -0.2) and MT+ET (b: -5.3, 95% CI: -13.0, -0.4) on WOMAC composite score. We did not observe a mediation effect for other putative mediators, when considering WOMAC composite scores as the outcome. Mediation sensitivity analyses suggest findings are likely to change if small confounding is present between those mediators and WOMAC composite score.

Conclusion: We identified possible mediators of MT, ET, or MT+ET. Future confirmatory studies could be designed to assess the mechanisms through which manual therapy and exercise cause improvements in pain and function scores in patients with hip or knee osteoarthritis.

MODERATORS OF THE EFFECTS OF EXERCISE AND MANUAL THERAPY FOR PEOPLE WITH KNEE AND HIP OSTEOARTHRITIS: A SECONDARY ANALYSIS OF THE MOA TRIAL

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Introduction: There is limited information about how to target exercise and manual therapy interventions to patients with hip or knee osteoarthritis. According to a recent review, there is insufficient evidence, with low risk of bias, for the following moderators of exercises interventions in patients with hip or knee osteoarthritis: presence, number and type of comorbidity, and psychosocial factors (e.g., anxiety or depression). When comparing therapeutic exercise versus another form of exercise for pain and function outcomes, there is (a) insufficient evidence with low risk of bias for number and type of comorbidities and psychological factors (e.g., anxiety or depression); and (b) mixed quality and unclear risk of bias for obesity and quadriceps strength. The review highlighted the need for RCTs to explore potential moderators of treatment effect in patients with hip or knee osteoarthritis.

Aim: To explore potential moderators of the effect of manual and exercise therapy in pain and function scores in individuals with knee and/or hip osteoarthritis.

Methods: Secondary analysis of a randomised controlled trial that compared the incremental effects of supervised MT and ET in addition to usual care in patients with osteoarthritis of the hip or knee. Data from 206 participants enrolled in the Management of OsteoArthritis (MOA) trial were analysed. The primary outcome measure was the WOMAC composite score after 1 year. Putative moderators included body mass index (BMI), pain self-efficacy, quadriceps strength, mental health, and education. We used linear regression models for assessing whether the effect of randomised interventions on pain and function were moderated by selected characteristics of participants at baseline. We performed linear regressions using composite WOMAC score at 1-year follow-up as dependent variable. Treatment allocation was included as independent variable, with age, BMI, number of years since symptom onset, quadriceps muscle strength, mental health, and pain self-efficacy as covariates. Regression models were adjusted to composite WOMAC scores at baseline. For assessing whether treatment effects were moderated by one of the putative moderators, we included a standard interaction term between the selected moderator and group intervention. We used R Software for conducting all analyses and set alpha at 0.05.

Results: BMI moderated the treatment effect of manual therapy interventions (effect = -4.6, 95% CI: -7.1 to -2.0), but did not moderate the effect of other interventions. Our findings suggest mental health, quadriceps muscle strength at baseline, or education do not moderate treatment effects.

Conclusion: Our findings suggest that BMI moderated the treatment effect of manual therapy on composite WOMAC scores in patients with hip or knee osteoarthritis, suggesting individuals with higher BMI presented better response to manual therapy techniques. Future confirmatory studies should be designed to assess the role of BMI as a moderator of manual therapy interventions in patients with hip or knee osteoarthritis.

TRANSLATING PACIFIC CULTURAL KNOWLEDGE INTO PHYSIOTHERAPY CLINICAL GUIDANCE

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Introduction: A culturally safe health workforce has the capability to remove or reduce the barriers Pacific peoples face in accessing and receiving high-quality health services. This type of workforce will have a greater ability to meet Pacific peoples' needs and improve health outcomes by translating cultural practices, concepts, and diverse world views into high-quality, evidence-informed health services. This is particularly important in the Aotearoa New Zealand context, where only 1% of physiotherapists identify as being of Pacific heritage. However, there is no available guidance on the physiotherapy profession's practice and standards of care when working with Pacific peoples. This research aims to explore the cultural knowledge, specifically pertaining to health, of Samoan families and physiotherapists living in Aotearoa and Samoa, with the view of illuminating how understandings of Samoan and Pacific cultural philosophies, ways of being, and practices can enhance the rehabilitative and healing role of physiotherapists when providing health services to Pacific families in Aotearoa. The lessons from this work include the importance of Indigenous-led health research, the importance of centralising Indigenous wisdoms and ways of being, and the critical roles non-Indigenous people play in promoting optimal Indigenous health and wellbeing.

Aim: To explore how Samoan and Pacific cultural knowledge can enhance the theory and practice of physiotherapy in Aotearoa New Zealand. One of the key outcomes of this research is to construct a model of health and/or guideline that may support physiotherapists working with Pacific peoples in Aotearoa and abroad, to provide health services that are not only clinically sound but culturally dignifying.

Methods: With the imperative of employing Pasifika research methodologies to seek more contextualised solutions for Pasifika issues, this qualitative research study is employing Talanoa and Kakala research methodologies as well as the Uputaua therapeutic approach. The themes distilled through the research process would form the basis of the guideline and/or model of care, which will be presented to the peak physiotherapy professional bodies in Aotearoa. These approaches are employed to conduct respectful dialogues with Samoan physiotherapists operating in Aotearoa and Samoan families who have received physiotherapy in Aotearoa. In a second arm of the study, these dialogues are then carried out with Samoan physiotherapists operating in Samoa and Samoan families who have received physiotherapy in Samoa. These two sets of interview data will be analysed, compared, and contrasted with the view of distilling the key themes that would inform the construction of a model of health and/or a clinical guideline.

Results: As this study is currently in progress, preliminary findings from the Talanoa dialogues in Aotearoa and Samoa will be presented. The model and/or guideline will also be presented at this conference to seek feedback from the physiotherapy profession.

Conclusion: These findings will have implications for clinical practice, health service delivery, health policy development, health curriculum development, and cultural competency evaluation not only for physiotherapists, but for all health professionals who serve Pacific peoples.

THE 'GLASS SHOULDER': INDIVIDUALS' PERSPECTIVES OF LIVING WITH TRAUMATIC GLENOHUMERAL DISLOCATION – A QUALITATIVE STUDY

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Introduction: Recurrence rates following traumatic anterior glenohumeral dislocations remain as high as 50%, even following surgical stabilisation. Fear of movement or re-injury is an unsurprising and rational response to the injury, influencing decisions for return to sport, work, and daily and social activities. More specific information is needed to fully understand the consequences of glenohumeral dislocations at a personal level.

Aim: To explore the lived experiences of persons with traumatic anterior glenohumeral dislocations and highlight strategies to manage fear of reinjury.

Methods: We interviewed 14 individuals (median age 27.5 years, range 21–40; two women) with traumatic anterior glenohumeral dislocation within 5 years (> 6 months), with or without past stabilising surgery, via Zoom or in person. They completed the Tampa Scale of Kinesiophobia (TSK-11; median 42.5/68, 33–54), QuickDASH (median 15/100, 0–55), and the Shoulder Instability Return

to Sport after Injury (median 34/100, 0–90). Recordings were transcribed verbatim and we analysed transcriptions using Interpretive Description.

Results: We developed three main themes with sub-themes:

1. Downward wellness spiral: The injury had shattered their lives, with immediate influences on their self-identity and confidence in their body, sleep disturbances adding to stress levels, grief and loss, and some describing bouts of severe depression and social isolation. The ‘invisibility’ of the injury and unrelenting risk could lead to being excluded by friends or sports mates.
2. Out of arm’s reach: Each recurrence led to frustration as the prior disciplined rehabilitation (and surgery) appeared to have been unsuccessful, only to have to start again. Confidence and hope had to be constantly rebuilt. Support from clinicians and whānau was crucial to regain trust in the body. Yet communication with some clinicians could also lead to feeling misunderstood and that their individual context was not considered.
3. Obligatory compromise: Over time, some individuals accepted the re-injury risk, learned to head warning signals, or compromised by avoiding specific social and recreational activities, changing their sports or to other roles in their preferred sport, and adapting work-related and daily tasks wherever possible.

Conclusion: Participants described an in-depth emotional response following primary and recurrent shoulder dislocations. Regardless of undergoing surgical or non-surgical management, most participants described an ongoing interplay between fear and confidence in themselves and their shoulder, some were concerned about return to work, and others chose a different sport and ways to socialise with friends. All levels of postinjury experiences appeared to contribute to re-injury fear. A metaphor of a river can describe the outcomes: the physical consequences of the unstable ‘glass shoulder’ are represented by turbulence around large rocks visible to others. Ongoing emotional and social consequences are deeper turbulence around smaller rocks, invisible to people surrounding the individual, yet sufficiently strong to interrupt life. Ultimately, participants developed individual strategies to adapt to the ongoing re-injury risk, realising this may stay with them for life. The emotional and psychosocial consequences need to be recognised by clinicians and addressed as part of long-term rehabilitation and maintenance programmes.

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EXPLORING HEALTH PROFESSIONALS’ PERCEPTIONS OF IMPLEMENTATION OF THE ADVANCED PRACTICE PHYSIOTHERAPY (APP) SCOPE OF PRACTICE IN NEW ZEALAND IN PRIMARY HEALTHCARE

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Introduction: Globally, advanced physiotherapy practice, titles, definition, scope, level of practice, and competencies vary. In New Zealand, advanced practice physiotherapist (APP) scope was approved by the Physiotherapy Board in 2021 to recognise physiotherapists who are practising at an advanced level and have met the specific competencies and academic qualifications. Formal assessment and recognition of an APP’s clinical skills and their area of expertise would enable consumers and health professionals within and external to the physiotherapy profession to identify an APP.

Aim: This study aimed to explore physiotherapists’ and other health professionals’ understandings and views of advanced physiotherapy practice within the context of musculoskeletal management in New Zealand primary healthcare.

Methods: A qualitative study was conducted using the methodology of Interpretive Description. Fifteen participants from a variety of professional and stakeholder groups, including physiotherapists ($n = 6$), general practitioners ($n = 4$), medical specialists ($n = 3$), and Accident Compensation Corporation case managers ($n = 2$) were interviewed face to face. Interviews were audio-recorded, transcribed verbatim, and analysed.

Results: Three themes identified in the data will be presented. In the theme “Perceptions of current musculoskeletal management in primary healthcare”, participants discussed the complexity of musculoskeletal presentations and challenges with management. Participants highlighted variability in physiotherapists’ diagnostic accuracy; inappropriate use of investigations; lack of clear clinical pathways; fragmentation of (and delayed access to) services; and poor interprofessional communication. In the theme “How APPs might facilitate change in primary healthcare and what their role would be”, participants discussed opportunities for APPs to address musculoskeletal management challenges including improving health system efficiency and patient journeys. Participants considered an APP could inform diagnosis and rehabilitation management options for complex cases and provide a clinical case review for patients who are not responding to the current management. This would provide an alternative patient review pathway.

Mentoring, peer support, and clinical supervision were noted as important roles for the APP. The theme “Implementation of the APP role into practice” identified potential opportunities, risks, and barriers for implementation of the APP role into practice. There was widespread support from participants for the APP role and the opportunities it provided for physiotherapists, other health professionals, and patients. Despite agreement regarding the need for the role, participants raised several risks, challenges, and barriers to the successful implementation of this new scope. Key among these were lack of stakeholder understanding and acceptance of the role; the need for APPs to demonstrate value and improve patient outcomes; formal recognition by funders; and how APPs would be integrated into new models of service delivery.

Conclusion: The APP scope of practice will enable health professionals, funders, the public, and physiotherapists to recognise physiotherapists with specific levels of expertise and skills in musculoskeletal management in primary healthcare. To improve recognition and acceptance of the role, APPs must demonstrate their value to healthcare delivery by improving patient pathways and outcomes.

DIAGNOSTIC ACCURACY IN THE CLINICAL EXAMINATION FOR IDENTIFYING A TRIANGULAR FIBROCARILAGE COMPLEX INJURY

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Introduction: Triangular fibrocartilage complex (TFCC) injuries are a common cause of ulnar wrist pain. Diagnostic tests are routinely used to diagnose TFCC injuries; however, the reliability and diagnostic accuracy of such tests has not been established.

Aim: 1. To investigate the reliability and diagnostic accuracy of TFCC tests. 2. To determine if any combination of findings obtained from the clinical examination can accurately identify TFCC injuries.

Methods: A prospective pilot study was undertaken. Twenty-three participants were recruited from hand orthopaedic specialists. A standardised clinical examination was performed and information from that examination was compared against the criterion measure of specialist diagnosis based on MRI scans.

Results: This study demonstrated that the accuracy of TFCC diagnostic tests was limited. None of the included tests had high sensitivity or negative likelihood ratios (LRs) that suggest they would be useful clinically to rule out the presence of TFCC pathology. Two tests, the ‘shear’ and ‘grind’, had high specificity (both 0.86) and moderate positive LRs (3.0 and 3.5, respectively) suggesting they have some clinical utility; however, the LRs were not statistically significant.

The concurrent reliability study demonstrated moderate levels of inter-rater reliability for the ‘grind’, ‘ulnar fovea sign’, and ‘piano key’ tests with kappa scores of 0.57, 0.57, and 0.51, respectively. Similarly, reliability of the ‘gripping rotational impaction’ test was acceptable with an intra-class correlation of 0.60. The ‘shear’ test had poor reliability ($k = 0.01$).

In contrast, multivariate analysis identified a model that contained nine variables obtained from the clinical examination that predicted the diagnosis of TFCC injuries with 100% accuracy (within sample). With this model, the contribution of each variable is quantified, enabling an overall probability score that takes into account the presence or absence of that variable, to be calculated for individual patients. Male gender, strain injury, higher pain intensity with pronation-based ADLs, pain with supination-based ADLs, higher pronation range of motion (ROM), and higher grip strength in a neutral position all increased the probability of a TFCC injury. Passive radial deviation ROM, the presence of constant symptoms, and presence of crepitus all decreased this probability.

Conclusion: This pilot study demonstrates that diagnostic tests for the TFCC have insufficient accuracy to warrant their use as stand-alone tests. However, it provides evidence that information obtained from both the history and clinical examination can be combined to better predict the presence of this pathology. This is the first-known study to have investigated predictability of TFCC injuries based on combinations of findings. It provides new evidence to support the importance of considering the “whole” clinical picture during the diagnostic process and reinforces current evidence of the limited value for most “diagnostic” tests. These findings are preliminary and need to be confirmed by similar studies undertaken in a different population before clinicians can be confident the model we have proposed can be used clinically with confidence.

TEST-RETEST RELIABILITY OF MOVEMENT-EVOKED PAIN AND SENSITIVITY TO MOVEMENT-EVOKED PAIN IN PATIENTS WITH ROTATOR CUFF-RELATED SHOULDER PAIN

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Introduction: Movement-evoked pain (MEP) is defined as pain experienced during bodily movements, and sensitivity to movement-evoked pain (SMEP) is defined as an increase in pain intensity in response to repeated movements (e.g., repeated shoulder elevation). Although MEP and SMEP are used routinely to characterise rotator cuff-related shoulder pain (RCRSP), the test-retest reliability of such constructs is unknown.

Aim: We aimed to examine the test-retest reliability of MEP and SMEP measures in people with RCRSP.

Methods: Seventy-four participants with RCRSP participated in this test-retest study with an interval of 10 min. In each testing session, all participants performed five trials of active shoulder abduction to elicit pain under two experimental conditions in the following sequence: active shoulder abduction to the onset of pain and maximum range of motion (ROM). The primary outcome measures were average MEP intensity (measured via numeric pain rating scale, 0–10), the average SMEP index (mean of 4th and 5th trials of pain intensity minus mean of 1st and 2nd trials of pain intensity), and the average ROM measured during the experimental conditions. Test-retest reliability of MEP scores and SMEP index was examined using the intra-class correlation coefficients (ICC_{3,1}). The minimal detectable change (MDC_{90%}), an index of measurement error, was determined.

Results: The reliability of MEP under both experimental conditions was good to excellent (ICC: 0.81 to 0.95), while the reliability of the SMEP index was poor in both conditions (ICC ≤ 0.45). The MDC_{90%} for pain intensity scores was 1.6 and 1.8 during shoulder abduction to the onset of pain and maximum ROM, respectively. The MDC_{90%} for ROM was 17.5° and 11.2° during shoulder abduction to the onset of pain and maximum ROM condition, respectively.

Conclusion: Movement-evoked pain is a reliable way to assess pain associated with shoulder movements in people with RCRSP. The derived measurement errors of MEP and ROM can help to interpret changes in pain intensity and shoulder ROM, thus making informed decisions regarding treatment plans.

TEST-RETEST RELIABILITY OF QUANTITATIVE SENSORY TESTING IN PATIENTS WITH ROTATOR CUFF-RELATED SHOULDER PAIN

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Introduction: Sensitisation could play an important role in the prognosis of patients with rotator cuff-related shoulder pain. Although there is no gold standard measure for sensitisation, quantitative sensory testing (QST) has been suggested for measuring sensitisation. The QST is a standardised psychophysical test procedure to characterise the somatosensory phenotype of patients with pain. QST can provide information about the potential underlying peripheral and central mechanisms contributing to pain. The reliability of QST procedures in people with rotator cuff-related shoulder pain (RCRSP) has yet to be established.

Aim: We aimed to examine the test-retest reliability of static and dynamic QST procedures in people with RCRSP.

Methods: Seventy-four participants with RCRSP participated in test-retest measurements of static (pressure pain threshold-PPT) and dynamic (mechanical temporal summation-MTS) QST procedures with an interval of 10 min. Both procedures were administered at the painful shoulder (local site) and the tibialis anterior muscles (remote site) contralateral to the painful shoulder. We tested the PPT of both sites alternatively using an electronic handheld pressure algometer, and the procedure was repeated three times. The average value of the three trials was calculated for each testing site and used for statistical analysis. We tested the MTS of both sites alternatively using a nylon monofilament, and the procedure was repeated twice. In each trial, we delivered 10 repetitive stimuli at each site with a frequency of 1 Hz. Participants immediately rated their pain level after the first stimulus and the worst pain experienced during the 10th stimulus on the numeric pain rating scale (NPRS). The index of MTS was calculated for each participant by subtracting the first stimulus rating from the highest pain rating from the 10th stimulus. The average of the two trials was calculated for each participant for each site. Test-retest reliability of PPT scores (kPa) and MTS index was examined using the intra-class correlation coefficients (ICC_{3,1}). The minimal detectable change (MDC_{95%}), an index of measurement error, was determined.

Results: PPT scores demonstrated excellent reliability (ICC = 0.93 to 0.95), whereas the MTS index demonstrated good reliability (ICC = 0.77 to 0.83) at local and remote sites. The MDC95% of PPT and MTS ranged from 102.8 to 118.1kPa and 1.7 to 1.9 (NPRS), respectively.

Conclusion: Good to excellent test-retest reliability of selected static and dynamic QST procedures in people with RCRSP was established. The derived measurement error of PPT scores and MTS index can help interpret scores when administering those tests in people with RCRSP.

SCOPING REVIEW FOR DOSAGE OF JOINT MOBILISATION FOR THE MANAGEMENT OF PATIENTS WITH ROTATOR CUFF-RELATED SHOULDER PAIN

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Introduction: Shoulder pain is one of the most common musculoskeletal complaints that patients consult in primary care. Rotator cuff-related shoulder pain (RCRSP) is the most common diagnosis of shoulder pain and accounts for approximately 50% of all cases of shoulder pain. Evidence supporting specific type and dosage of joint mobilisations and rationale for selecting a specific dosage of joint mobilisation for patients with RCRSP are limited.

Aim: To systematically (1) search, identify, and map the type and dosage of joint mobilisations used in previous trials for managing patients with RCRSP; and (2) summarise the rationale for adopting a specific joint mobilisation dosage.

Methods: We followed the methodological framework outlined by Arksey and O'Malley. We searched six databases (i.e., PubMed, Scopus, Web of Science, CINAHL, Cochrane Library, and SPORTDiscus) until August 2022 to identify studies. We included randomised controlled trials using joint mobilisation for patients with RCRSP if they reported at least some information on types or dosages of joint mobilisation. We extracted technique, within-session, and overall treatment dosages of joint mobilisation and rationale for adopting that specific dosage.

Results: We included 30 studies. Most studies did not report or only partially reported technique (71%) and within-session dosage (67%) of passive joint mobilisation, whereas overall treatment was fully reported in 95% of studies. The dosage used for passive joint mobilisation was heterogeneous. Most studies did not report or only partially reported technique (83%) of MWM, whereas within-session and overall treatment dosages were fully reported in more than 91% of studies. Three sets of 10 repetitions were commonly used in within-session dosage for MWM, while overall treatment dosage was heterogeneous. We found very limited information on the rationale for selecting dosage of joint mobilisation.

Conclusion: There was little information on dosage and rationale of selecting joint mobilisation, with a heterogeneous dosage being tested across trials. Our findings highlight the importance of detailed reporting for dosage and rationale for selecting a specific dosage of joint mobilisation.

THE INITIAL EFFECT OF MOBILISATION WITH MOVEMENT ON SHOULDER RANGE OF MOTION AND PAIN IN PATIENTS WITH ROTATOR CUFF-RELATED SHOULDER PAIN: A RANDOMISED CONTROLLED TRIAL (EVOLUTION TRIAL)

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Introduction: Mobilisation with movement (MWM) is commonly used to treat patients with rotator cuff-related shoulder pain (RCRSP). However, the evidence supporting MWM efficacy for improving range of motion (ROM) and pain in patients with RCRSP is limited. It is also unclear whether the volume of MWM affects the effect of MWM on clinical outcomes in people with RCRSP.

Aim: We aimed to assess (1) the initial effects of MWM on the angular onset of pain in people with RCRSP, and (2) the incremental effect of receiving two additional sets of 10 repetitions of the MWM treatment after receiving one single set of 10 repetitions of treatment.

Methods: Sixty-three participants with RCRSP were randomised to receive MWM or sham MWM intervention. Participants received three sets of 10 repetitions of MWM or sham MWM with a minute rest between each set. The primary outcome was the angular onset of pain during shoulder abduction. The angular onset of pain during shoulder abduction, pain at rest, and pain intensity during shoulder abduction to the onset of pain were measured at baseline, immediately after receiving one set and three sets of 10 repetitions of interventions. Global rating of change scale (GROC) was measured immediately after receiving three sets of 10 repetitions of interventions and follow-up on day 3. Brief pain inventory-short form (BPI-SF) was measured at baseline and follow-ups on days 1, 3, 5, and 7 post-intervention. Other secondary outcomes were measured at baseline and immediately after receiving three sets of 10 repetitions of interventions. A mixed-effects model with a random intercept was used to compare differences in changes in the outcome measures between MWM and sham MWM interventions.

Results: Compared with the sham MWM group, the between-group difference in change of the angular onset of pain was 6.5° (95% CI 6.3 to 21.0) and 13.7° (95% CI 6.3 to 21.0) immediately after receiving one set and three sets of 10 repetitions of interventions from baseline, respectively. The between-group difference in change of the angular onset of pain was 7.2° (95% CI -0.3 to 14.6) after receiving additional two sets of 10 repetitions of interventions from receiving one set of 10 repetitions of interventions. The between-group difference in change of the GROC was 1.1 (95% CI 0.4 to 1.8) immediately after receiving three sets of 10 repetitions of interventions. There was no difference between groups for other secondary outcomes.

Conclusion: In patients with RCRSP, MWM can improve the angular onset of pain when receiving one set or three sets of 10 repetitions of MWM. An additional two sets of 10 repetitions of MWM can also improve the angular onset of pain.