

## Literature summary july-sept 2007 for SOM

### Debbie Cox

**Evaluation of the ability of physical therapists to palpate intrapelvic motion with the Stork test on the support side. Hungerford, Gilleard, Moran, Emmerson. Physical therapy july 2007 87 (7) p 879-87**

The background to this study gives a useful summary of sacroiliac biomechanics. It describes how small amounts of movement at the sacroiliac joint (SIJ) during load transfer between the spine and lower limbs are controlled by preactivation of the lumbopelvic muscles. The result is a self bracing mechanism which compresses the joint surfaces by tensioning of the pelvic ligaments and thoracolumbar fascia. It has been suggested that SIJ pain occurs in over 15% of people with non-specific chronic low back pain.

Further discussion is given to the poor reliability and validity demonstrated in SIJ mobility assessment tests. Pain provocation tests have demonstrated greater reliability but do not necessarily correlate with altered biomechanics.

The Stork Test is an assessment of the ability to maintain a stable alignment of the innominate bone relative to the sacrum during load transfer. Previous investigations showed the innominate bone on the side of single-leg support rotates posteriorly relative to the sacrum in healthy subjects. In subjects with pelvic girdle pain (PGP) the innominate bone rotates anteriorly relative to the sacrum on the side of pain suggesting a failure of the self-bracing mechanism. The Stork Test on the support side may therefore provide a useful tool for clinical evaluation of a subject's ability to stabilize intrapelvic motion.

The aim of this study was to determine whether experienced therapists could reliably detect the pattern of motion occurring between the innominate bone and the sacrum (intrapelvic motion) on the support side in a group of subjects with and without lumbopelvic pain. Three experienced manual therapists who regularly used the Stork test were randomly assigned to palpate the motion of the innominate bones and sacrum in 33 subjects during the Stork Test on the support side.

The version of the Stork Test used in this study was as follows. For support side on the right the right thumb was placed directly on the right PSIS with the rest of the right hand contacting the right innominate bone. The S2 spinous process was then palpated with the left thumb. The subject was then asked to raise the left leg into 90 degrees of hip flexion and 90 degrees of knee flexion while the therapist continued palpating the right PSIS and innominate bone relative to the sacrum.

The direction of bone motion was indicated on 2-point and 3-point scales. With the 2-point scale a positive result was given if the PSIS moved cephalad relative to the sacrum and a negative result was given if the PSIS stayed neutral or moved caudad relative to the sacrum. With the 3-point scale the therapist had to indicate whether the PSIS moved cephalad, stayed neutral, or moved caudad relative to the sacrum. All subjects were volunteers.

Use of the 2-point scale gave good and a 3-point scale moderate intertherapist reliability. This may be attributable to probability alone as an increase in the number of choices statistically decreases reliability. However the authors conclude that the application of the Stork Test on the support side will be more reliable if clinicians describe palpation findings on a 2 point scale as either positive or negative results.

**Changes in pelvic floor and diaphragm kinematics and respiratory patterns in subjects with sacroiliac joint pain following a motor learning intervention: a case series. O'Sullivan and Beales. Manual Therapy Aug 2007 12 (3) p 209-18**

The sacroiliac joint (SIJ) and surrounding ligamentous structures are reported to be a source of symptoms in subjects with non-specific chronic low back pain. The active straight leg raise (ASLR) test is a means of investigating the ability to transfer load between the lower limb and the trunk that has been established as both valid and reliable in subjects with clinically diagnosed SIJ pain.

The test involves lying supine and raising the leg 5 cm off the supporting surface. The test is positive when accompanied by a primary sensation of profound heaviness of the leg ( $\pm$ pain), which is relieved with the application of compression across the ilium which may enhance closure force through the SIJ.

This study investigated whether the application of a motor learning intervention directed to the local stabilizing muscles of the pelvis would result in the normalization of motor control strategies displayed by subjects with SIJ pain and hence reduce pain and disability.

Nine subjects (8 female and 1 male) with a clinical diagnosis of SIJP and a positive ASLR test were recruited for this study. Diagnosis was based upon at least three out of five positive pain provocation tests including, posterior shear test, sacral torsion test, sacral thrust test, distraction test and tenderness on palpation of the long dorsal SIJ ligament.

Respiratory rate, tidal volume, diaphragmatic motion and pelvic floor kinematics were measured in resting supine, during the ASLR and during the ASLR with the application of manual compression through the ilia.

A water-sealed spirometer was used to record respiratory rate and tidal volume from which minute ventilation was calculated. Movement of the leading edge of the diaphragm and pelvic floor motion was recorded with real-time ultrasound.

Motor learning interventions are based upon the idea painful disorders can be due to deficits in motor control producing strain and pain. Treatment aims to identify impairments and train correct patterns of movement within a cognitive and physical framework. The intervention in this study aimed to retrain local stabilizing muscles of the pelvis.

The physical components were;

- Elevating contraction of the pelvis floor with simultaneous co-contraction of transverse abdominus and transverse fibres of internal oblique (lower transverse abdominal wall) without associated breath holding or global bracing of the abdominal wall
- Train neutral lordosis in sitting with relaxed thoracic posture
- Train load transfer eg sit to stand
- Train aligned standing posture with neutral lumbar lordosis and relaxed thorax (avoid sway standing)
- Integrate postural alignment into single leg stance and walking
- Train trunk loading such as bending and lifting directed by patient reported aggravating factors

The cognitive components were;

- Enhanced understanding of the pain mechanism
- Enhanced body awareness and control
- Development of positive coping strategies and beliefs
- Self management
- Increased functional capacity
- Independence from passive treatment

There was a decrease in pelvic floor descent during the ASLR following the motor learning intervention. None of the subjects demonstrated any descent of the pelvic floor during the ASLR with compression post-treatment.

Following the intervention there was increased diaphragmatic excursion during the ASLR and respiratory rate was reduced. Multiple breath holds and erratic breathing patterns displayed during the ASLR pre-intervention were not observed after. Changes in minute ventilation were not statistically significant.

Prior to the intervention all subjects exhibited descent of the bladder with conscious pelvic floor contraction. After training all subjects demonstrated elevation and reported improved bladder function.

Significant differences were found between pre- to post-treatment for the Short Form McGill Pain Questionnaire, the VAS for pain and the Oswestry Low Back Pain Questionnaire. All subjects also reported reduced heaviness during the ASLR test following the intervention.

The specific motor learning intervention for subjects with SIJP used in this study appeared to positively change pelvic floor, diaphragm kinematics and patterns of respiration and this was associated with a reduction in pain and disability. The authors do recognise that these results require viewing with caution as no control group or blinding was used.

**Effect of low level laser therapy in rheumatoid arthritis patients with carpal tunnel syndrome. Ekim, Armagan, Tascioglu, Oner, Colak. Swiss medical Weekly June 2007 16, 137 (23-24) p 347-52**

This is a prospective, double-blind, randomised, placebo-controlled trial to evaluate the efficacy of low level laser therapy (LLLT) to treat carpal tunnel syndrome (CTS) in patients with rheumatoid arthritis (RA). CTS having a strong association with RA.

19 patients with the diagnosis of CTS were randomly assigned to two treatment groups; LLLT (10 patients) and placebo laser therapy group (9 patients).

Clinical assessments were performed at baseline, end of the treatment and 3 months post treatment. They consisted of a functional status scale, visual analogue scale for pain, symptom severity scale, grip-strength (measured with dynamometer) and electrophysiological examination.

Physical examination included Tinel, Phalen signs and grip strength measurement. Tinel sign was performed by the examiner gently tapping the area over the median nerve of the wrist and was considered positive if this produced tingling in the fingers but no indication was given as to how long tapping took place before a test was considered negative. Phalen sign was performed by full flexion of the patient's wrists for 60 seconds. If numbness and tingling were produced or exaggerated in the median nerve distribution of the hand within the sixty seconds, the test result was considered positive. Baseline parameters were found to be similar in both groups.

Treatment was given once a day on week days for 10 days. A thin clear plastic template with 1 cm grids was placed over the wrist and palm at an identical location at each session. A total of 5 points across the median nerve trace were irradiated for two minutes each. The dose per point was 1.5 joule. The total dose per treatment was 7.5 joule and accumulated dose for ten treatments was 75 joule. For placebo laser the same laser device and protocol was used with no laser beams being transferred to the treated area. All patients were treated by the same blinded physician unaware of treatment allocation or clinical and electrophysiological parameters.

Patients were not allowed to take any analgesics during the whole period of the study but no indication is given as to how this was monitored or enforced. Patients continued to take their disease-modifying anti-rheumatic drugs.

Improvements were significantly more pronounced in the LLLT group than placebo group in terms of pain score and functional status scale score. There were no statistically significant improvements in the other parameters.

The authors highlight two other controlled studies that evaluated the efficacy of LLLT in idiopathic CTS. One found laser to be no more effective than placebo in improving symptoms, pain, hand function and electrophysiological parameters. The other found active treatment to be more effective than placebo in relation to pain and electrophysiological parameters. Clinical results are controversial and optimal dosage, wavelength, area to be irradiated, application time and duration of treatment have not been established.

The mechanism of pain reduction by LLLT is not fully understood. Experimental studies suggest that LLLT has anti-inflammatory, analgesic and anti-oedematous effects due to it reducing prostaglandin synthesis.

The authors conclude that LLLT is an effective means of improving pain and hand function in RA patients with CTS but could find no statistical difference for electrophysiological and the other clinical parameters between LLLT and placebo groups.

**Blood flow changes in the trapezius muscle and overlying skin following transcutaneous electrical nerve stimulation. Sandberg, Sandberg and Dahl. Physical therapy Aug 2007 87 (8) p 1047-55**

This study examined the effects of transcutaneous electrical nerve stimulation (tns) on local blood flow in the trapezius muscle and overlying skin.

Physiological studies on the use of tns for pain relief suggest that afferent activity is induced that inhibits spinal cord nociceptive signals. In addition some studies have also found an effect on blood flow. Possible mechanisms by which such an effect can be produced have been suggested;

- Segmental inhibition of sympathetic vasoconstriction
- Release of vasodilator peptides from sensory neurones
- Muscle pump action if contraction is stimulated

The results of studies into blood flow and tns are inconsistent. This is likely due to differing stimulation parameters, stimulation sites and measurement techniques.

In this study 33 healthy women between the ages of 25 and 55 were randomly assigned to treatment with one of 3 different modes of tns for 15 minutes;

- high frequency 80 hz sensory level intensity
- low frequency 2hz motor level intensity
- subliminal 80hz (used as a control).

Blood flow was monitored simultaneously on stimulated and non stimulated shoulders. This was done because previous studies have demonstrated local temperature increases associated with use of the measuring equipment which may have an effect on blood flow.

A full description of the non invasive measurement technique used in this study is given in the article along some discussion of other frequently used techniques in the literature. However a gold standard technique has not been established.

Trapezius muscle blood flow increased significantly with low frequency motor level 2hz tns but there was no increase in skin blood flow. There was no increased blood flow associated with high frequency 80 hz sensory tns or subliminal tns. Blood flow measurement continued for 15 minutes after ceasing stimulation and blood flow rapidly returned to normal the significant increase in blood flow being recorded only during the stimulation period of low frequency 2 hz motor level tns.

The authors conclude that tns induced muscle contraction appears to be a pre requisite for production of increased blood flow to the trapezius muscle and that high stimulation intensity may prevent increased blood flow in the overlaying skin possibly due to increased sympathetic activity associated with what some patients reported to be an unpleasant sensation causing cutaneous vasoconstriction.

**Movement discrimination after intra-articular local anaesthetic of the ankle joint. Down, Waddington, Adams, Thomson. British journal of sports medicine Aug 2007 41 (8) p 501-5**

This is a randomised controlled trial investigating whether intra-articular local anaesthesia of the ankle predisposes recipients to altered ankle movement control and increased risk of ankle injury.

Participants were 22 healthy subjects aged 18–26 who were physically active. Recruitment was from health science faculties of education institutions by adverts on notice boards and email. This sample is therefore unlikely to be representative of all patients whose treatment involves intrarticular ankle injection of local anaesthetic and the results may not be generalisable.

Measurements of movement discrimination were recorded for both ankles before and after injection of either local anaesthetic (2% lignocaine hydrochloride) or normal saline. Injections were administered by an experienced musculoskeletal radiologist under ultrasound guidance. The subjects and all researchers involved were blinded as to the nature of the injection being given and an appropriate randomisation protocol was used and is described.

Movement discrimination was tested using the active movement extent discrimination apparatus (AMEDA). This apparatus requires a shoulder-width stance. The tested foot is centred on a tilt plate that has an axle beneath which runs along the long axis of the foot and subjects initiate inversion movements on the plate.

Subjects were familiarised with five set inversion positions from the horizontal on the apparatus prior to data collection. Each position was given a number where 1 was the least inversion and 5 the greatest.

Movement discrimination was tested using computer-randomised sets of 50 inversion positions, subjects were asked to provide the number that they thought represented the plate position.

Neither intra-articular anaesthetic nor an equivalent amount of normal saline had any significant effect on ability to discriminate between small differences in the extent of active ankle movement.

One subject experienced paraesthesia in the cutaneous distribution of the deep peroneal nerve which resolved fully in 9 days. No other adverse effects were documented.

The authors highlight these findings are consistent with research on anaesthesia of the knee and metacarpophalangeal joints and conclude that injections of local anaesthetic into the ankle joint are unlikely to significantly affect proprioception or increase injury risk. Such work suggests that input from afferent systems outside the joint, such as visual input and musculotendinous mechanoreceptors dominates and therefore injections used in normal clinical practice are unlikely to affect proprioception.

**Effects of intra-articular corticosteroids and anti-TNF therapy on neutrophil activation in rheumatoid arthritis. Wittkowski, Foell, af Klint, De Keyser, Frosch, Ulfgren, Roth. Annals of rheumatic disease Aug 2007 66 (8) p 1020-5**

RA is a chronic auto-inflammatory disease characterised by synovial inflammation and progressive bone destruction that leads to joint deformity and physical disability. Tumour necrosis factor alpha (TNF $\alpha$ ) has a central role in the pathogenesis of RA demonstrated by the clinical benefit of TNF $\alpha$ -neutralising therapy, but the exact molecular mechanism of this biological agent is still only partially understood. Some of its beneficial effects could be related to the induction of apoptosis (programmed cell death) in monocytes and reduction of neutrophil activation.

This project analysed the effect of intra-articular corticosteroids (IAC) and systemic anti-TNF treatment on synovial and serum levels of phagocytic proteins which mediate inflammatory responses in rheumatoid arthritis (RA). They are markers of neutrophil activation, released at the site of inflammation and correlate strongly with synovial fluid levels and disease activity in individual patients

Levels of these proteins in the synovium and serum were tested after either anti TNF treatment (infliximab infusion) which has a systemic action against innate immune mechanisms or after intrarticular corticosteroid injection which has a local immunosuppressive effect.

19 patients received intra-articular corticosteroids consisting of one knee joint injection with 40 mg of triamcinolone hexacetonide. 34 patients were treated with infliximab infusions, 3 mg/kg, at weeks 0, 2 and 6.

Responders in the infliximab group were defined having at least 20% improvement of clinical and laboratory parameters (serum samples, synovial biopsy, ESR and CRP). In patients treated with IAC, response to therapy was defined as absence of joint swelling in clinical examination.

Local treatment with immunosuppressive IAC produced a positive response to treatment in 95% of patients after 9–12 days. Serum levels of the phagocytic protein being measured were elevated in patients with active RA prior to therapy and reduced 2 weeks after successful intra-articular corticosteroid treatment. There was a more significant decrease in those treated with infliximab. A similar decrease in synovium levels was found after 8 weeks of successful infliximab treatment and those treated with IAC.

The authors conclude that successful direct blocking of TNF- $\alpha$  reduces phagocytic proteins responsible for synovitis in patients with RA and that IAC therapy is restricted to the site of inflammation and has very limited systemic effects.

**Reliability of MRI assessment of supraspinatous tendinopathy. Sein, Walton, Linklater, Harris, Dugal, Appleyard, Kirkbride, Kuah, Murrell. British journal sports medicine aug 2007 41 (8)**

The aim of this study was to determine interobserver and intraobserver reliability when identifying supraspinatus tendinosis on magnetic resonance imaging (MRI). Results were that supraspinatus tendinosis can be accurately identified and graded on MRI with little variation by a single well-trained observer but that interobserver reliability was only fair to good.

Some good examples of shoulder MRI images are given along with an explanation of what to look for in order to identify supraspinatous pathology which is useful.

Abnormal signal intensity of the supraspinatus tendon has in some studies been identified in asymptomatic individuals. In this study MRI-determined supraspinatus tendinosis correlated well with positive impingement sign.

Other studies are mentioned that have compared MRI and histological analysis of cadaveric shoulders. Increased signal intensity and an indistinct margin at the articular side of the supraspinatus tendon correspond to eosinophilic, fibrillar, and mucoid degeneration, scarring and tendon disruption. A relationship has also been found between gross anatomical and MRI abnormalities of the rotator cuff and histological changes consistent with tendon degeneration.

**Prevention of anterior cruciate ligament injury in the female athlete. Silvers and Mandelbaum. British journal of sports medicine August 2007 41 (Suppl 1) p 52-9.**

This is a review article summarising the literature regarding anterior cruciate injury (ACL) in female athletes, who have a higher incidence of ACL injuries than male athletes

It gives a good revision of the anatomy, structure and function of acl and mechanisms of injury. A number of the prevention programmes are also reviewed in this article it therefore may be a useful resource for anyone wanting to set up such a programme.

Risk factors for ACL injury in the female athlete are identified and categorised as anatomical, environmental, hormonal and biomechanical/neuromuscular.

### **Anatomical factors**

- Female athletes have increased femoral anteversion and Q angle, excessive tibial torsion, and excessive subtalar pronation when compared with male athletes.
- The intercondylar notch of the femur is wider and U-shaped in men compared to a narrower cresting wave or A-shaped notch in women which may increase the likelihood of ACL impingement on the medial border of the lateral femoral condyle under valgus load.
- ACL diameter is smaller in women but no studies have indicated a correlation between ACL size and injury. The smaller diameter may actually reduce the risk of impingement by the mechanism described above.

### **Environmental factors**

These include prophylactic and functional knee bracing, footwear choice, playing surface and weather

- Functional knee braces were not in this review demonstrated to conclusively prevent ACL injuries
- Footwear design should aim to minimise rotational friction to avoid injury and optimise transitional friction to allow peak performance (e.g when decelerating or changing direction).
- Risk of ACL injury for women is higher than for men on artificial floors than wooden. Uneven playing surfaces and when outside a dry field have been identified as risk factors.
- Cold weather is associated with lower knee and ankle injury risk outdoors on both grass and AstroTurf and is thought to be directly related to lower shoe–surface friction coefficients at lower temperatures.

### **Hormonal factors**

- Fluctuations in progesterone, oestrogen and relaxin throughout the menstrual cycle may be a factor as oestrogen, progesterone and relaxin receptor sites have been found in the ACL.
- At days 15–28 there is a rise in progesterone and relaxin.
- Increases in oestrogen and relaxin levels have been shown to coincide with a decrease in the rate of collagen synthesis.

- A decrease in the tensile properties of the ACL and failure load have been demonstrated in the presence of increased oestrogen levels.

### **Biomechanical and neuromuscular factors**

The quadriceps serves as an antagonist to the ACL increasing the anterior shear force on the tibia. The hamstrings act as an agonist to the ACL, reinforcing the ligament by preventing the excessive anterior translation of the tibia. If the hamstring shows weakness or a delay in contraction time in comparison with the quadriceps, the ACL may be at increased risk of injury, leading to tensile failure.

In one study reviewed female athletes showed less knee flexion and greater knee valgus when landing from a jump and when changing direction. In addition female athletes showed greater quadriceps activity with decreased intensity and frequency of hamstring activity on electromyographic analysis compared with male athletes.

### **Prevention**

Injury prevention programmes demonstrated a reduction in severe ACL injuries ranging from 60% to 89%. Detailed descriptions of the programmes reviewed are given in this article, components included;

- proprioceptive balance training
- stretching
- plyometrics – loading of a muscle with an eccentric action followed immediately by a concentric action enabling the muscle to reach maximum force in the shortest possible time.
- weight training
- changing technique to encourage knee flexion on landing, use of rounded turns, and a multi-step stop when decelerating.

It takes 6–8 weeks for a biomechanical intervention programme to have a neuromuscular effect and it is not known if fatigue negates the preventive benefit of such programmes. An area the authors identify as appropriate for further research.

### **Acupuncture as an adjunct to exercise based physiotherapy for osteoarthritis of the knee: randomised controlled trial. Foster, Thomas, Barlas, Young, Mason, Hay. British medical journal 2007 sep 1, 335 (7617):436 PMID 17699546**

The purpose of this trial was to investigate the additional benefit of integrating acupuncture with exercise based physiotherapy for osteoarthritis of the knee. The background being recent systematic reviews concluding exercise therapy is effective and acupuncture is more effective than placebo for patients with knee osteoarthritis. In addition studies have also shown patient enthusiasm for non-pharmacological pain relief options.

This was a multicentre (37) randomised controlled trial in primary care. 352 adults aged 50 or older with a clinical diagnosis of knee osteoarthritis who had not previously been treated with acupuncture were randomised to advice and exercise, advice and exercise plus true acupuncture, or advice and exercise plus non-penetrating acupuncture. Researchers collecting, entering, and analysing data were unaware of treatment allocation. It was not possible to blind the physiotherapists delivering the interventions.

Interventions were delivered within 10 working days of randomisation by 67 physiotherapists trained in acupuncture to at least minimum national standards for membership of the Acupuncture Association of Chartered Physiotherapists.

The advice and exercise package was developed from reviews of best evidence, clinical guidelines, a survey of physiotherapy practice for knee pain, and a consensus workshop. Individual strengthening, stretching, and balance exercises were given using PhysioTools and could be concentric, eccentric, isometric, non-weight bearing and weight bearing. Exercise intensity was progressed and home exercise programmes were given. Participants were seen up to six 30 minute sessions over six weeks. The advice was supplemented by a leaflet and those taking non-steroidal anti-inflammatory drugs were allowed to continue

Both true acupuncture and non penetrating acupuncture was delivered in up to six treatment sessions over three weeks in conjunction with advice and exercise.

The true acupuncture protocol was based on survey results, consensus workshop, and recommendations from traditional Chinese protocols. Between six and 10 acupuncture points from 16 commonly used local (Sp 9, Sp 10, St 34, St 35, St 36, Xiyan, Gb 34, trigger points) and distal points (LI 4, TH 5, Sp 6, Liv 3, St 44, Ki 3, BI 60, Gb 41) were selected. Sterilised disposable steel needles (30×0.3 mm) were used; depth of insertion was between 5 mm and 25 mm, depending on the points selected. Needles were left in for between 25 to 35 minutes and manipulated to achieve the de qi sensation using rotation or thrust and withdraw techniques if necessary. Moxibustion, cupping, herbs, or electroacupuncture were not used.

Non-penetrating acupuncture was delivered through needles with a blunt tip where the shaft collapses into the handle. These needles meet recommendations for acceptable controls for acupuncture research. It is possible a small acupressure effect may be induced by this method. The same contact time, interaction between therapist and patient, manual contact during the search for acupuncture points, and attention to elicited sensations was used as for true acupuncture. No attempt was made to elicit the de qi sensation. Participants were told they may experience sensations and to report what they felt. A number of participants did report sensations consistent with descriptions of de qi making it difficult to consider this intervention as inert.

The primary outcome measure was the Western Ontario and McMaster Universities osteoarthritis index pain subscale at six months. Secondary outcomes included function, pain intensity, and unpleasantness of pain at 2 and 6 weeks and 6 and 12 months.

No adverse events occurred in the advice and exercise or non-penetrating acupuncture groups. 5 adverse events were reported in the true acupuncture group, pain, sleepiness, fainting, nausea, and swelling around the treated knee.

Acupuncture provided no additional improvement in pain scores compared with advice and exercise alone measured on the Western Ontario and McMaster Universities osteoarthritis index at six and 12 months.

The results at six and 12 months for both pain intensity and pain unpleasantness favoured the group receiving advice and exercise plus non-penetrating acupuncture.

Satisfaction with care was significantly greater for participants receiving advice and exercise plus non-penetrating acupuncture than for those receiving advice and exercise alone.

At 2 and 6 weeks there were small, statistically significant improvements in pain intensity and unpleasantness for true acupuncture and at all follow-up points for non-penetrating acupuncture compared with advice and exercise alone suggesting this change was unlikely to be due to needling effects.

At two weeks statistically significant trends were found in favour of better global outcome for each of the acupuncture groups compared with the advice and exercise alone group

There were no significant differences in pain or function in the true acupuncture group between those participants reporting de qi in more than 50% of treatment sessions compared with those who reported de qi less often.

No significant differences were found between groups in the number of reported general practitioner consultations over six months or in the use of non-steroidal anti-inflammatory or simple analgesics.

The authors conclude small additional benefits from acupuncture limited to pain intensity and unpleasantness were unlikely to be clinically significant and therefore failed to show acupuncture is a useful adjunct to a course of individualised, exercise based physiotherapy for older adults with knee osteoarthritis. However they acknowledge this study used fewer treatment sessions (6) compared with previous studies (10, 12, 15, 24). It is therefore possible the true acupuncture intervention was suboptimal.

The authors suggest non-penetrating acupuncture may harnesses some of the benefits of acupuncture, such as acupressure or participants' expectations of benefit, without any adverse or unpleasant side effects and this may explain why patient satisfaction, credibility of intervention, and reduction in pain intensity and unpleasantness were significantly greater for the non-penetrating acupuncture group. Possible mechanisms could include placebo, effects on the limbic system or mechanoreceptor stimulation.