



ACUPUNCTURE AND SPORTS INJURIES

About sports injuries

Sports injuries are common, and vary from minor toe injuries to major complex trauma. Usually, only soft tissue is damaged, but there can also be fracturing of bone. Soft tissue injuries include sprains, strains and bruising. A sprain is a partial or complete rupture of a ligament, a strain is a partial tear of muscles and a bruise is a rupture of tissue leading to a haematoma. Any soft-tissue injury can lead to a tenderness, swelling, haematoma, scarring, fibrosis and loss of function.

Most commonly, sports injuries affect the lower limb, particularly the ankle (e.g. Achilles tendinopathy, sprains) and knee (e.g. patellofemoral pain syndrome, ligament injuries). (Murray 2004) Other common sporting injuries include those of the shoulder (e.g. dislocations, acromioclavicular joint injuries, rotator cuff injuries); elbow (e.g. tennis, golfer's); wrist (e.g. strains, sprains, breaks); leg (e.g. shin splints, stress fractures, hamstring injuries); foot (e.g. plantar fasciitis); groin (strain); and back (e.g. acute lumbar sprain). (Andres 2008; Arthritis Research Campaign 2004; Jarvinen 2000, McGriff-Lee 2003; Mitchell 2005; Wolfe 2001) Injuries can be caused by trauma as a result of a sudden impact or awkward movement, or can develop over time often due to continual use of the same joints or muscle groups. Contributing factors can be not warming, using inadequate equipment or training too hard for current level of fitness.

The aims of therapy are to relieve pain, control inflammation, hasten resolution of a haematoma, and accelerate repair. Also, there should be restoration of function and recovery of muscle power. Conventional approaches to sports injuries include RICE (rest, ice, compression and elevation), anti-inflammatory drugs and analgesics, immobilisation, corticosteroid injections, physiotherapy and surgery.

References

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How acupuncture can help

One systematic review found strong evidence suggesting that acupuncture is effective in the short-term relief of lateral epicondyle pain (Trinh 2004). This updated an earlier review on the same subject where there was insufficient evidence to either support or refute the use of acupuncture (Green 2002). The only other systematic review on sports injuries found that, based on the results of trials exhibiting a sufficient level of quality, treatments that were effective in decreasing pain and improving function in patients with patellofemoral pain syndrome were acupuncture, quadriceps strengthening, and the use of a resistive brace (Bizzini 2003). There is also positive evidence from individual randomised controlled trials, showing that:

acupuncture reduced pain in patients with plantar fasciitis (Zhang 2001);
electroacupuncture had better therapeutic effects than medication, both in the short and long term, in patients with acute lumbar strain (Yao-chi 2007);
acupuncture plus warmed needle relieved the pain of chondromalacia patella (Qui 2006);
acupuncture reduced NSAID intake and relieved pain in patients with shin splints (Callison 2002);
acupuncture reduced the pain of patellofemoral pain syndromes (Jensen 1999);
acupuncture was effective for soft tissue disease (Yuan 1989).

Altogether, there is a paucity of controlled trials of acupuncture for sports injuries, so we also refer to some of the uncontrolled studies. Case series suggest acupuncture might be helpful in the treatment of shoulder injuries (Osborne 2010), medial collateral ligament injuries of the knee (Yan 2008) and plantar fasciitis (Tillu 1998), but these results need confirming. (See Table below).

Other Factsheets that relate to sports injuries include: Acupuncture and Back Pain; Acupuncture and Frozen Shoulder; and Acupuncture and Headache.

In general, acupuncture is believed to stimulate the nervous system and cause the release of neurochemical messenger molecules. The resulting biochemical changes influence the body's homeostatic mechanisms, thus promoting physical and emotional well-being. Stimulation of certain acupuncture points has been shown to affect areas of the brain that are known to reduce sensitivity to pain and stress, as well as promoting relaxation and deactivating the 'analytical' brain, which is responsible for anxiety (Wu 1999).

Acupuncture may help relieve symptoms of sports injuries, such as pain and inflammation by:

- stimulating nerves located in muscles and other tissues, which leads to release of endorphins and other neurohumoral factors (e.g. neuropeptide Y, serotonin), and changes the processing of pain in the brain and spinal cord (Pomeranz 1987, Han 2004, Zhao 2008, Zhou 2008, Lee 2009, Cheng 2009);
- delivering analgesia via alpha-adrenoceptor mechanisms (Koo 2008);
- increasing the release of adenosine, which has antinociceptive properties (Goldman 2010);
- modulating the limbic-paralimbic-neocortical network (Hui 2009);
- reducing inflammation, by promoting release of vascular and immunomodulatory factors (Kavoussi 2007, Zijlstra 2003);
- improving muscle stiffness and joint mobility by increasing local microcirculation (Komori 2009), which aids dispersal of swelling.

About traditional acupuncture

Acupuncture is a tried and tested system of traditional medicine, which has been used in China and other eastern cultures for thousands of years to restore, promote and maintain good health. Its benefits are now widely acknowledged all over the world and in the past decade traditional acupuncture has begun to feature more prominently in mainstream healthcare in the UK. In conjunction with needling, the practitioner may use techniques such as moxibustion, cupping, massage or electro-acupuncture. They may also suggest dietary or lifestyle changes.

Traditional acupuncture takes a holistic approach to health and regards illness as a sign that the body is out of balance. The exact pattern and degree of imbalance is unique to each individual. The traditional acupuncturist's skill lies in identifying the precise nature of the underlying disharmony and selecting the most effective treatment. The choice of acupuncture points will be specific to each patient's needs. Traditional acupuncture can also be used as a preventive measure to strengthen the constitution and promote general well-being.

An increasing weight of evidence from Western scientific research (see overleaf) is demonstrating the effectiveness of acupuncture for treating a wide variety of conditions. From a biomedical viewpoint, acupuncture is believed to stimulate the nervous system, influencing the production of the body's communication substances - hormones and neurotransmitters. The resulting biochemical changes activate the body's self-regulating homeostatic systems, stimulating its natural healing abilities and promoting physical and emotional well-being.

About the British Acupuncture Council

With over 3000 members, the British Acupuncture Council (BAcC) is the UK's largest professional body for traditional acupuncturists. Membership of the BAcC guarantees excellence in training, safe practice and professional conduct. To find a qualified traditional acupuncturist, contact the BAcC on 020 8735 0400 or visit www.acupuncture.org.uk

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The evidence

Research	Conclusion
Systematic reviews	
Trinh KV et al. Acupuncture for the alleviation of lateral epicondyle pain: a systematic review. <i>Rheumatology</i> 2004; 43: 1085-90.	A systematic review that evaluated the effectiveness of acupuncture as a treatment for lateral epicondylitis. Six randomised controlled trials (4 sham-controlled) were included. All the studies suggested that acupuncture was effective in the short-term relief of lateral epicondyle pain. Five of six studies indicated that acupuncture treatment was more effective compared to a control treatment. <u>The reviewers concluded that there was strong evidence suggesting that acupuncture is effective in the short-term relief of lateral epicondyle pain.</u>
Bizzini M et al. Systematic review of the quality of randomized controlled trials for patellofemoral pain syndrome. <i>Journal of Orthopaedic and Sports Physical Therapy</i> 2003; 33: 4-20.	A systematic review of published randomised controlled trials that assessed non-operative treatments for patellofemoral pain syndrome (PFPS). <u>The reviewers found that, based on the results of trials exhibiting a sufficient level of quality, treatments that were effective in decreasing pain and improving function in patients with PFPS were acupuncture, quadriceps strengthening, and the use of a resistive brace.</u>
Green S et al. Acupuncture for lateral elbow pain. <i>Cochrane Database of Systematic Reviews</i> 2002, Issue 1. Art. No.: CD003527. DOI: 10.1002/14651858.CD003527.	A systematic review that included four small randomised controlled trials. One trial found that needle acupuncture resulted in relief of pain for significantly longer than placebo and was more likely to result in a 50% or greater reduction in pain after 1 treatment (RR 0.33, 95% CI 0.16 to 0.69). A second trial demonstrated needle acupuncture to be more likely to result in overall participant reported improvement than placebo in the short term (RR = 0.09, 95% CI 0.01 to 0.64). No significant differences were found in the longer term (after 3 or 12 months). A third trial of laser acupuncture versus placebo demonstrated no differences between laser acupuncture and placebo with respect to overall benefit. A fourth trial found no difference between Vitamin B ₁₂ injection plus acupuncture, and Vitamin B ₁₂ injection alone. <u>The reviewers concluded that there is insufficient evidence to either support or refute the use of acupuncture (either needle or laser) in the treatment of lateral elbow pain, but that needle acupuncture is of short term benefit with respect to pain.</u>
Controlled trials	
Zhang SP et al. Acupuncture treatment for plantar fasciitis: A randomized controlled trial with six months follow-up. <i>Evidence-based Complementary and Alternative Medicine</i> 2011: 154108.	A randomised controlled trial that assessed the efficacy and specificity of acupuncture treatment for plantar fasciitis in 53 patients. The treatment group received needling at the acupoint PC 7, which is purported to have a specific effect for heel pain. The control group received needling at the acupoint LI 4, which has analgesic properties. Significant differences in reduction in pain scores, favouring the treatment group, were seen at 1 month for morning pain (22.6 vs. 12.0), overall pain (20.3 vs. 9.5) and pressure pain threshold (145.5 vs. -15.5). <u>The researchers concluded that the results showed that acupuncture can provide pain relief to patient with plantar fasciitis, and that PC 7 is a relatively specific acupoint for heel pain.</u>
Yao-chi W et al. Observation on short-term and long-term therapeutic	A randomised controlled study that compared the therapeutic effects of electroacupuncture (EA) at the acupoint SI 3 with medicine on acute lumbar

effects of electroacupuncture at Houxi (SI 3) on acute lumbar sprain. *Chinese acupuncture & moxibustion* 2007; 27: 3-5.

sprain in 300 patients. Their therapeutic effects were evaluated after treatment for 7 days and 1 month respectively. In the short-term, the effective rate was 97.3% in the EA group and 89.2% in the medication group ($p < 0.01$). In the long-term, the effective rate was 99.3% in the EA group and 93.2% in the medication group ($p < 0.01$). The researchers concluded that both the short-term and the long-term therapeutic effects of electroacupuncture at the acupoint SI 3 on acute lumbar sprain are better than those of medication.

Qiu L et al. Combined therapy of acupuncture with warmed needle and muscle strength training in the treatment of 34 chondromalacia patellae patients: Randomized controlled observation on curative effect. *Chinese Journal of Clinical Rehabilitation* 2006; 10: 170-1.

A randomised controlled trial that looked at the effect of acupuncture with warmed needle in 64 patients with chondromalacia patellae compared with oral NSAIDs (meloxicam). After treatment, the pain scores of the two groups were significantly decreased ($p < 0.05$ and 0.01 , respectively); Compared with the control group, pain decreased significantly more in the acupuncture group ($p < 0.05$). The total efficacy in the acupuncture group was significantly higher than that of the control group ($p < 0.01$). The researchers concluded that, combined with muscle strength training, both acupuncture with warmed needle and oral meloxicam can relieve pain in patients with chondromalacia patellae, but that acupuncture with warmed needle is better at relieving pain and improving curative efficacy.

Callison M. Clinical study: Acupuncture & tibial stress syndrome (Shin splints). *Journal of Chinese Medicine* 2002; 70: 24-7.

A controlled trial that compared acupuncture with sports medicine and a combination of the two in 40 athletes with tibial stress syndrome (shin splints). Participants answered questions concerning intensity and duration of pain during and between activities, in addition to amount of NSAIDs taken. Athletes in the acupuncture alone and the acupuncture plus sports medicine groups experienced the most pain relief, were least hindered by pain during sporting and non-sporting activities, and felt overall that the treatments were more effective than those reporting in the sports medicine alone group. The perception of pain, pain relief, and effectiveness was not significantly improved for athletes in the sports medicine alone Group. Athletes in the acupuncture alone and acupuncture plus sports medicine group who were taking NSAIDS took significantly fewer doses during the course of the study than athletes in the sports medicine only group.

Jensen R et al. Acupuncture treatment of patellofemoral pain syndrome. *Journal of Alternative & Complementary Medicine* 1999; 5: 521-7.

A randomised controlled trial that evaluated the effect of acupuncture treatment compared to no treatment in 75 patients with patellofemoral pain syndrome. At 12 months, there was a significant difference in favour of acupuncture in the Cincinnati Knee Rating System (CKRS) score (75.2 vs. 61.7 with no treatment, $p = 0.005$). The Number Necessary to Treat (NNT) to cure one patient was 3.0 for the CKRS pain subscale and $NNT = 3.7$ for the CKRS function subscale. The researchers concluded that acupuncture may be an alternative treatment for patellofemoral pain syndromes.

Yuan CX et al. Observations on clinical therapeutic effect in treating soft tissue injuries by acupuncture, with pain threshold and electromyography as parameters. *J Tradit Chin Med* 1989; 9: 40-4.

A controlled study that assessed the clinical effect of acupuncture in the treatment of soft tissue injuries in 120 patients. Among the 100 patients in the acupuncture treatment group, 300 observations were made; among the 20 controls there were 60 observations. The effective rate in the acupuncture treatment group was 85.00% compared to 41.67% in the control group ($p < 0.01$). There was very significant difference ($p < 0.01$) in the degree of pressed pain on the patient's tender spot before and after acupuncture treatment. The researchers concluded that acupuncture treatment is effective for soft tissue disease.

Case reports

<p>Osborne NJ, Gatt IT. Management of shoulder injuries using dry needling in elite volleyball players. <i>Acupuncture in medicine</i> 2010; 28: 42-5.</p>	<p>Four case reports that described the short-term benefits of dry needling in shoulder injuries in international female volleyball athletes during a month-long intense competitive phase, using both replicable subjective and objective measures. Dry needling of scapulohumeral muscles was carried out. Range of movement, strength and pain were assessed before and after treatment, with a functional assessment of pain immediately after playing and overhead activity, using the short form McGill Pain Questionnaire. All scores were improved post-treatment and athletes were able to continue overhead activities. <u>The researchers concluded that these cases support the use of dry needling in elite athletes during a competitive phase with short-term pain relief and improved function in shoulder injuries. They suggested it may help maintain rotator cuff balance and strength, reducing further pain and injury.</u></p>
<p>Yan XN, Ren CX. Cause and treatment of sports injury in knee joint medial collateral ligament. <i>Journal of Clinical Rehabilitative Tissue Engineering Research</i> 2008; 12: 5567-70.</p>	<p>A case series comprising 30 female football players with injury of the medial collateral ligament of the knee, who were given electroacupuncture, manipulation and rehabilitation training. Recovery was rapid in 23.33% players and, in all, 40% players completely recovered and 53.33% partly recovered. <u>The researchers concluded that the combination of electroacupuncture, manipulation and rehabilitation training is effective in treating the medial collateral ligament injuries.</u></p>
<p>Tillu A, Gupta S. Effect of acupuncture treatment on heel pain due to plantar fasciitis. <i>Acupuncture in Medicine</i> 1998; 16: 66-8.</p>	<p>A case series of 18 patients attending an orthopaedic outpatient clinic with a year or more's history of heel pain due to plantar fasciitis. All had had conservative treatment of physiotherapy and shoe-support without significant pain relief before acupuncture was offered, and thus acted as their own controls for the purposes of the study. The Visual Analogue Score (VAS) data obtained after 4 and 6 weeks of acupuncture treatment showed a significant improvement compared to the VAS before acupuncture ($p < 0.0009$ and $p < 0.0001$, respectively). <u>The researchers concluded that the results demonstrated that acupuncture is effective in treating patients with chronic heel pain due to plantar fasciitis.</u></p>

Research on mechanisms for acupuncture

<p>Goldman N et al. Adenosine A1 receptors mediate local anti-nociceptive effects of acupuncture. <i>Nat Neurosci</i> 2010 May 30. [Epub ahead of print]</p>	<p>A study that found the neuromodulator adenosine, which has anti-nociceptive properties, was released during acupuncture in mice, and that its anti-nociceptive actions required adenosine A1 receptor expression. Direct injection of an adenosine A1 receptor agonist replicated the analgesic effect of acupuncture. Inhibition of enzymes involved in adenosine degradation potentiated the acupuncture-elicited increase in adenosine, as well as its anti-nociceptive effect. <u>The r concluded that their observations indicate that adenosine mediates the effects of acupuncture and that interfering with adenosine metabolism may prolong the clinical benefit of acupuncture.</u></p>
<p>Hui K.K.-S. The salient characteristics of the central effects of acupuncture needling: limbic-paralimbic-neocortical network modulation. <i>Human Brain Mapping</i> 2009; 30: 1196-206.</p>	<p>A study that assessed the results of fMRI on 10 healthy adults during manual acupuncture at 3 acupuncture points and a sham point on the dorsum of the foot. Although certain differences were seen between real and sham points, the hemodynamic and psychophysical responses were generally similar for all 4 points. Acupuncture produced extensive deactivation of the limbic-paralimbic-neocortical system. Clusters of deactivated regions were seen in the medial prefrontal cortex, the temporal lobe and the posterior medial cortex. The sensorimotor cortices, thalamus and occasional paralimbic structures such as the insula and anterior middle cingulate cortex showed activation. <u>The researchers concluded that their</u></p>

	<p><u>results provided additional evidence that acupuncture modulates the limbic-paralimbic-neocortical network. They hypothesised that acupuncture may mediate its analgesic, anti-anxiety, and other therapeutic effects via this intrinsic neural circuit that plays a central role in the affective and cognitive dimensions of pain.</u></p>
<p>Cheng CH et al. Endogenous Opiates in the Nucleus Tractus Solitarius Mediate Electroacupuncture-induced Sleep Activities in Rats. <i>Evid Based Complement Alternat Med</i> 2009 Sep 3. [Epub ahead of print]</p>	<p>An animal study that investigated the involvement of the nucleus tractus solitarius opioidergic system in electroacupuncture-induced alterations in sleep, the findings of which suggested that mechanisms of sleep enhancement may be mediated, in part, by cholinergic activation, stimulation of the opioidergic neurons to increase the concentrations of beta-endorphin and the involvement of the μ-opioid receptors.</p>
<p>Lee B et al. Effects of acupuncture on chronic corticosterone-induced depression-like behavior and expression of neuropeptide Y in the rats. <i>Neuroscience Letters</i> 2009; 453: 151-6.</p>	<p>In animal studies, acupuncture has been found to significantly reduce anxiety-like behaviour, and increase brain levels of neuropeptide Y, the brain levels of which appear to correlate with reported anxiety.</p>
<p>Komori M et al. Microcirculatory responses to acupuncture stimulation and phototherapy. <i>Anesth Analg</i> 2009; 108: 635-40.</p>	<p>Experimental study on rabbits in which acupuncture stimulation was directly observed to increase diameter and blood flow velocity of peripheral arterioles, enhancing local microcirculation.</p>
<p>Koo ST et al. Electroacupuncture-induced analgesia in a rat model of ankle sprain pain is mediated by spinal alpha-adrenoceptors. <i>Embase Pain</i> 2008; 135: 11-9.</p>	<p>An animal study that investigated the underlying mechanism of electroacupuncture (EA) analgesia, and the effects of various antagonists on known endogenous analgesic systems in a rat model of ankle sprain. EA significantly improved the weight-bearing capacity of the affected hind limb for 2 hours, suggesting an analgesic effect. The alpha-adrenoceptor antagonist phentolamine completely blocked the EA-induced analgesia, whereas naloxone failed to block the effect. Further experiments showed that intrathecal administration of yohimbine, an alpha2-adrenergic antagonist, reduced the EA-induced analgesia in a dose-dependent manner, whereas terazosin, an alpha1-adrenergic antagonist, did not produce any effect. <u>The researchers concluded that the results suggest EA-induced analgesia is mediated by alpha-adrenoceptor mechanisms and, at least in part, mediated by spinal alpha2-adrenoceptor mechanisms.</u></p>
<p>Zhao ZQ. Neural mechanism underlying acupuncture analgesia. <i>Prog Neurobiol</i> 2008; 85: 355-75.</p>	<p>Review article that discusses the various peripheral and central nervous system components of acupuncture anaesthesia in detail.</p>
<p>Zhou Q et al. The effect of electro-acupuncture on the imbalance between monoamine neurotransmitters and GABA in the CNS of rats with chronic emotional stress-induced anxiety. <i>Int J Clin Acupunct</i> 2008 ;17: 79-84.</p>	<p>A study of the regulatory effect of electro-acupuncture on the imbalance between monoamine neurotransmitters and GABA in the central nervous system of rats with chronic emotional stress-induced anxiety. The levels of serotonin, noradrenaline and dopamine fell significantly, while GABA levels were significantly higher in the rats given acupuncture ($P < 0.05$, or $P < 0.0$). The researchers concluded that the anti-anxiety effect of electro-acupuncture may relate to its regulation of the imbalance of neurotransmitters.</p>
<p>Kavoussi B, Ross BE. The neuroimmune basis of anti-inflammatory acupuncture. <i>Integr Cancer Ther</i> 2007; 6: 251-7.</p>	<p>Review article that suggests the anti-inflammatory actions of traditional and electro-acupuncture are mediated by efferent vagus nerve activation and inflammatory macrophage deactivation.</p>

<p>Han JS. Acupuncture and endorphins. <i>Neurosci Lett</i> 2004; 361: 258-61.</p>	<p>A literature review of studies relating to the release of endorphins by acupuncture.</p>
<p>Zijlstra FJ et al. Anti-inflammatory actions of acupuncture. <i>Mediators Inflamm</i> 2003; 12: 59-69.</p>	<p>An article that suggests a hypothesis for anti-inflammatory action of acupuncture: Insertion of acupuncture needles initially stimulates production of beta-endorphins, CGRP and substance P, leading to further stimulation of cytokines and NO. While high levels of CGRP have been shown to be pro-inflammatory, CGRP in low concentrations exerts potent anti-inflammatory actions. Therefore, a frequently applied 'low-dose' treatment of acupuncture could provoke a sustained release of CGRP with anti-inflammatory activity, without stimulation of pro-inflammatory cells.</p>
<p>Wu MT et al. Central nervous pathway for acupuncture stimulation: localization of processing with functional MR imaging of the brain--preliminary experience. <i>Radiology</i> 1999 ; 212: 133-41.</p>	<p>An experimental study using MRI to characterise the central nervous system pathway for acupuncture stimulation, which found that acupuncture activates structures of descending antinociceptive pathway and deactivates areas mediating pain modulation.</p>
<p>Pomeranz B. Scientific basis of acupuncture. In: Stux G, Pomeranz B, eds. <i>Acupuncture Textbook and Atlas</i>. Heidelberg: Springer-Verlag; 1987: 1-18.</p>	<p>Needle activation of A delta and C afferent nerve fibres in muscle sends signals to the spinal cord, where dynorphin and enkephalins are released. Afferent pathways continue to the midbrain, triggering excitatory and inhibitory mediators in spinal cord. Ensuing release of serotonin and norepinephrine onto the spinal cord leads to pain transmission being inhibited both pre- and postsynaptically in the spinothalamic tract. Finally, these signals reach the hypothalamus and pituitary, triggering release of adrenocorticotrophic hormones and beta-endorphin.</p>

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