



Review Article

The Utility of Acupuncture in Sports Medicine: A Review of the Recent Literature

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Keywords: Acupuncture; Sports medicine; Review

ABSTRACT

Introduction: Acupuncture is a practice that has been used to treat multiple medical conditions for thousands of years and is one of the most popular alternative treatments applied in Western medical practice. Acupuncture is a modality that has significant potential for further integration into the treatment of sports medicine conditions.

Methodology: The search strategy in this review included electronic databases-MEDLINE, Cochrane Library, PubMed, Web of Science, and Science Direct. Randomized controlled trials and systematic reviews were preferred for article inclusion, but other study types were included when the number or quality of evidence was limited.

Results: Back pain, neck pain, shoulder pain, and knee pain related to OA tend to respond well to acupuncture treatment. There is evidence to support the use of acupuncture for the short-term treatment of plantar fasciitis, although long-term efficacy data is lacking. Acupuncture may be a useful treatment modality for epicondylitis and Achilles tendinopathy, but the current data is limited. While acupuncture may improve athletic performance and prevent Delayed-Onset Muscle Soreness (DOMS) symptoms, there is little current evidence to support this use.

Conclusion: Further studies are needed to assess the usefulness of acupuncture in sports medicine. However, there is good evidence for the current use of acupuncture in treatment of multiple pain conditions.

INTRODUCTION

Acupuncture is a practice that has been used to treat multiple medical conditions for thousands of years and is one of the most popular alternative treatments applied in Western medical practice. In the modern era, treating sports medicine conditions with medications can be limited by significant medication side-effects. Therefore, many athletes and physicians have considered the virtues of acupuncture. In some countries acupuncture is a common modality of sports medicine injuries [1]. For example, a survey of physicians regarding sports injury treatments for the Korean national volleyball teams noted that acupuncture was the most commonly utilized treatment modality and was used almost three times as often as physical therapy [1]. It has been noted that acupuncture could be an ideal treatment modality for further integration in sports medicine [2]. Although further studies are needed to assess the usefulness of acupuncture in sports medicine, there are some areas where the data is significant. This article will review the current evidence on acupuncture for conditions commonly seen in sports medicine and discuss some of the strengths and weaknesses of the current literature in this area.

METHODOLOGY

The search strategy in this review included electronic databases- MEDLINE,

Cochrane Library, PubMed, Web of Science, and Science Direct. The initial search included articles between 2007-2017, but when evidence was limited the search criteria was expanded. Randomized controlled trials and systematic reviews were preferred for article inclusion, but other study types were included when the number or quality of evidence was limited.

Search terms consisted of variations of the terms: acupuncture, needling, randomized, review, back pain, shoulder pain, Achilles tendinopathy, epicondylitis, neck pain, low back pain, sciatica, piriformis syndrome, sports medicine, physical performance, delayed onset muscle soreness, pain, plantar fasciitis, controlled, and electroacupuncture.

Evidence for each condition was evaluated using *Strength of Recommendation Taxonomy* [3]

A-level recommendation is based on consistent and good-quality patient-oriented evidence

B-level recommendation is based on inconsistent or limited-quality patient-oriented evidence

C-level recommendation is based on consensus, usual practice, opinion, disease-oriented evidence, or case series for studies of diagnosis, treatment, prevention, or screening.

RESULTS

Acupuncture for improved physical performance

Strength of Recommendation: C

In addition to its curative properties in various sports injuries, as noted above, acupuncture has been recently applied as a possible enhancer of sports performance. The evidence, while mainly encouraging, has some conflicting results. Further studies are clearly needed.

In a single blind study of thirty-six healthy young men acupuncture was able to produce an increase in physical performance capacity and better regulation of heart rate and blood pressure compared to placebo acupuncture and control [4]. The subjects from the group receiving acupuncture were able to increase maximum performance capacity significantly and physical performance at the anaerobic threshold. There was no significant effect produced by the placebo acupuncture or control group [4].

A trial by Benner in 2010 studied three groups of runners at different performance levels preparing for a marathon [5]. The subjects were treated with acupuncture, a placebo treatment, or no treatment as a control group. All groups showed statistically significant enhancements in their running times, but runners treated with acupuncture had significantly greater improvement [5]. The study concluded that acupuncture had a significant impact on the performance of the athletes in endurance sports [5].

A 2010 brief review of the medical literature on the effect of acupuncture in sport and exercise concluded that acupuncture treatment improved hemodynamic parameters but not aerobic performance [6]. A case report of a 30-year-old sedentary, non-smoking male patient exhibited a large improvement in his exercise capacity after acupuncture therapy, as measured by treadmill cardiopulmonary exercise with a ramp protocol before and after each session of acupuncture [7].

While these studies are encouraging, there are other studies with less optimistic conclusions. A randomized controlled crossover trial of 33 recreational athletes

looked at the efficacy of acupuncture compared to sham acupuncture and placebo laser acupuncture on strength performance with 1 week between crossover trials [8]. The study showed that a single acupuncture treatment was efficacious for improving isometric quadriceps strength in recreational athletes compared to placebo laser acupuncture ($p < 0.05$), but no significant difference was found between acupuncture and sham acupuncture [8]. A prospective, single-blind, crossover trial by Dhillon did not show a significant acute effect of acupuncture on 20-km cycling performance [9].

Use of acupuncture for pain

Acupuncture for shoulder pain

Strength of Recommendation: B- for both short-term and long-term treatment of shoulder pain.

Electro acupuncture appears effective at treating shoulder pain. A RCT suggested that electro acupuncture is more effective than placebo non-penetrating acupuncture in improving shoulder pain [10]. Subjects were randomized to electro acupuncture, or non-penetrating needles without electrical current for seven sessions over seven weeks [10]. The electro acupuncture group reported statistically and clinically significant improvements in shoulder pain over the 6-month follow-up with statistically significant improvements in disability, range of motion, and quality of life [10].

Manual acupuncture has also been shown to be effective for the treatment of shoulder pain as demonstrated by Molsberger and colleagues in a RCT for shoulder pain [11]. This study compared the effectiveness verum acupuncture for shoulder pain with both superficial “sham” acupuncture and 50mg oral diclofenac [11]. Statistically significant improvements in pain intensity, shoulder mobility, and full elevation of the arm immediately post-procedure were found in the verum acupuncture group [11]. In another RCT, patients were randomized to 3 weeks of acupuncture at a single acupuncture point and multimodal physical therapy, or mock transcutaneous electrical nerve stimulation and multimodal physical therapy [12]. Statistically significant improvement in the acupuncture group resulted for pain, disability, and patient self-reported improvement, but these differences did not appear clinically significant [12]. Studies comparing acupuncture with standard treatment modalities were sparse, but a RCT comparing acupuncture and ultrasound suggest similar outcomes in shoulder disability over the 12-month follow-up [13].

Acupuncture for knee pain

Strength of Recommendation:

A- for short term improvement in pain and function of knee pain related to OA

C- for treatment of other knee conditions

Knee Osteoarthritis (OA)

Acupuncture appears to relieve chronic knee pain and improves physical function in patients diagnosed with osteoarthritis, but the duration of these effects is more controversial. A single-blinded controlled study of 77 patients comparing high-intensity and low-intensity electro acupuncture for knee OA, found that both high-intensity and low-intensity electro acupuncture treatments improved the clinical symptoms of pain, stiffness, and physical function [14]. However, high-intensity EA was more effective than low-intensity electro acupuncture [14].

A 2016 systematic review was performed of ten randomized controlled acupuncture trials comparing acupuncture with sham acupuncture, usual care, or no intervention for chronic knee pain in patients with knee osteoarthritis [15]. The

review showed statistically significant improvement in pain and physical function in short term (<13wks). For long-term efficacy, the acupuncture groups only showed significantly improved physical function but not pain improvement between 13 and 26 weeks post-treatment [15]. The Meta-analysis concluded that acupuncture can improve short and long-term physical function, but it appears to provide only short-term pain relief in patients with chronic knee pain due to osteoarthritis [15].

Acupuncture for knee pain other than OA

Evidence for knee pain related to conditions other than osteoarthritis is limited. A RCT with methodological limitations suggested that needle acupuncture might decrease pain and increase mobility in patellofemoral syndrome [16]. A case report also noted acupuncture improved pain and function in the management of patellofemoral syndrome [17]. The case report also noted acupuncture improved pain and reduced the need for oral analgesics in the management of Osgood-Schlatter disease [18]. The effect of dry needling of 20 patients following ACL reconstruction during late stage rehabilitation showed reductions in pain, resting activation, decrement, and resistance [19].

Acupuncture for neck pain

Strength of Recommendation- B-for short-term treatment of neck pain.

Neck pain is a common A Cochrane Systematic Review of acupuncture for neck pain concluded: "There is moderate evidence that acupuncture relieves pain better than some sham treatments, measured at the end of the treatment. There is moderate evidence that those who received acupuncture reported less pain at short term follow-up than those on a waiting list. There is also moderate evidence that acupuncture is more effective than inactive treatments for relieving pain post-treatment and this is maintained at short-term follow-up" [20]. Another systematic review of ten trials also had a similar conclusion noting moderate evidence for short term improvement in neck pain with acupuncture [21].

Acupuncture for back pain

Strength or Recommendation: A- for the short term treatment of chronic low back pain.

Acupuncture appears to relieve chronic low back pain and improves physical function in patients diagnosed with osteoarthritis, although long-term efficacy is uncertain. A Cochrane Systematic Review of 35 RCTs concluded the "for chronic low-back pain, acupuncture is more effective for pain relief and functional improvement than no treatment or sham treatment immediately after treatment and in the short-term" [22]. A more recent systematic review and meta-analysis of twenty-five randomized controlled trials (RCTs) found that acupuncture had a clinically meaningful reduction in levels of self-reported pain and improved function when compared with no treatment immediately post-intervention [23]. When acupuncture was compared with medications (NSAIDs, muscle relaxants, and analgesics) and usual care, there were statistically significant differences between the control and the intervention groups but these differences were too small to be of any clinical significance [23]. However, multiple limitations were identified in the studies, particularly in relation to the heterogeneity in the study characteristics and the low methodological quality of many of the included studies [23].

There is also evidence for the use of acupuncture in the treatment of specific back pain conditions. A 2015 meta-analysis concluded that acupuncture appears to be more effective than typical medication in treating pain associated with sciatica with few side-effects, but noted evidence was limited [24]. Low-level evidence also suggests that acupuncture may be useful in the treatment of piriformis syndrome [25, 26].

Acupuncture for plantar fasciitis; Strength of Recommendation

A-For short term relief of plantar fasciitis with acupuncture

C- For long-term relief of plantar fasciitis with acupuncture

A RCT compared electroacupuncture coupled with conventional treatments to conventional treatments alone for patients with chronic plantar fasciitis [27]. Subjects in the acupuncture group obtained significant reduction in pain and foot function than those in control group with the effects lasting for at least six weeks [27]. Similar results were noted in a 2016 systematic review of three RCTs evaluating the effectiveness of acupuncture for reducing pain due to plantar fasciitis [28]. Acupuncture was noted to significantly reduce pain levels in patients with plantar fasciitis, as measured on the Visual Analogue Scale and the Plantar Fasciitis Pain/Disability Scale [28]. These benefits were noted between four and eight weeks of treatment, but evidence on long-term effectiveness was lacking [28].

Acupuncture for epicondylitis

Strength of recommendation: C

Both lateral and medial epicondylitis are common sports medicine conditions. Regarding the efficacy of acupuncture, however, most of the evidence relates to the treatment of lateral epicondylitis. A RCT suggests that traditional needle acupuncture may be more effective than superficial acupuncture in the short term for lateral epicondylitis [29]. Adults were randomized to 10 sessions of either needle acupuncture, or superficial acupuncture. Although the superficial needle treatment is clearly not inert, the needle acupuncture group was more likely to report improvement than the superficial needle acupuncture group [29]. Another RCT suggests that floating acupuncture is more effective than routine acupuncture in the short term treatment of lateral epicondylitis [30]. Participants were randomized to 20 days of floating acupuncture (needles retained 1-2 days), or conventional acupuncture [30]. The floating-acupuncture group was more likely to report improved pain, reduced edema, and normal movement [30].

A 2004 systematic review of six studies concluded that acupuncture is effective in the short-term relief of lateral epicondyle pain [31]. However, a 2015 systematic review of the effectiveness and safety of acupuncture for lateral epicondylitis was inconclusive due to the small number of studies with poor methodological quality [32].

Acupuncture for achilles tendinopathy

Strength of recommendation: C

Achilles tendinopathy is a common condition thought to be caused by repetitive microtrauma that causes pain, swelling and stiffness of the Achilles tendon. It can be difficult to treat and take months to heal. Acupuncture may be useful as a treatment or adjunctive treatment for Achilles tendinopathy. Unfortunately, there is very little data in the medical literature, although a RCT by Zhang and colleagues comparing acupuncture or eccentric exercises suggests that acupuncture is significantly more effective than eccentric exercise in improving symptom severity for chronic Achilles tendinopathy immediately post-treatment and at 16 weeks. [33]

Acupuncture for delayed onset muscle soreness

Strength of recommendation: C

Delayed-onset muscle soreness (DOMS) is a common symptom in people participating in exercise, sport, or recreational physical activities. Acupuncture has been proposed to be a possible treatment to prevent and alleviate DOMS. A



five-arm randomized control trial of 60 subjects from 2016 examined the effect of acupuncture on eccentric exercise-induced DOMS of the biceps brachii muscle [34]. However, acupuncture did not significantly improved outcomes within 72 hours when compared with no treatment control in this study [34]. It was noted, though, that different results may have been obtained with more intensive regional needling as the traditional regimen used in the study.

In another randomized controlled double-blinded trial of traditional acupuncture in twenty-two healthy subject, DOMS of the elbow-flexors was induced through eccentric contractions until exhaustion [35]. Although acupuncture had no significant effects on mechanical pain threshold and muscle function, it did reduce perceived pain arising from exercise-induced muscle soreness [35].

CONCLUSION

Further studies are needed to assess the usefulness of acupuncture in sports medicine. However, there is good evidence for the current use of acupuncture in treatment of multiple pain conditions. Back pain, neck pain, shoulder pain, and knee pain related to OA tend to respond well to acupuncture treatment. There is evidence to support the use of acupuncture for the short-term treatment of plantar fasciitis, although long-term efficacy data is lacking. Acupuncture may be a useful treatment modality for epicondylitis and Achilles tendinopathy, but the current data is limited. While acupuncture may improve physical and athletic performance, there is very little evidence to substantiate this. There is also very little data that acupuncture is effective at preventing of Delayed-Onset Muscle Soreness (DOMS) symptoms, although more data is needed [36], (Table 1).

Table 1: Methodological Quality Of Key Randomized-Controlled Trials.

Study	Eligibility Criteria	Random Allocation	Concealed allocation	Similar at Baseline	Subjects Blinded	Therapies Blinded	Assessors Blinded	<15% dropouts	Intention-to-treat analysis	Between-group-comparisons	Point measures and variability data	Total
Guerra de Hoyos, 2004	1	1	1	1	1	0	0	1	0	1	1	8
Molsberger, 2010	1	1	1	1	1	0	0	0	0	1	1	7
Vas, 2008	1	1	1	0	1	0	0	1	0	1	1	7
Ju, 2015	1	1	1	1	1	0	0	1	1	1	1	9
Jensen, 1999	1	1	0	0	0	0	0	1	0	1	1	5
Kumnerddee, 2012	1	1	1	1	1	1	0	1	1	1	1	10
Huang, 1998	1	1	1	1	1	1	1	0	0	1	1	9
Zhang, 2013	1	1	1	1	1	0	0	1	1	1	1	9
Fleckenstein, 2016	1	1	1	1	1	0	0	1	1	1	1	9
Hübscher, 2008	1	1	1	1	1	0	1	0	1	1	1	9

Criteria 2-11 were used to calculate the total PeDro score [36].

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