**Clinical question.**

General: Does heat applied to a musculoskeletal injury improve outcome?

PICO Format: In individuals with musculoskeletal injury (P) does heat application (I) as opposed to no treatment (C) improve tissue healing? In individuals with musculoskeletal injury (P) which type of heat application (I) compared to other methods is more effective (C) and improves healing better (O)?

**Is this question addressing an intervention/therapy, prognosis or diagnosis?** Intervention/therapy

**State if this is a proposed new topic or revision of existing worksheet:** New Topic

**Conflict of interest specific to this question**

Do any of the authors listed above have conflict of interest disclosures relevant to this worksheet? Yes, Intellectual interest

**Search strategy (including electronic databases searched).**

Cochrane Reviews, DARE, and CENTRAL: “heat” OR “heat application” OR “heat pack” OR “hot pack” OR “healing” AND “muscular soreness” OR “blood flow” OR “increase temperature” OR “injury” OR “acute injury” OR “chronic injury” OR “treatment” OR “tissue extensibility” OR “stretching”

Medline, PubMed, PubMed Central, SPORTdiscus, CINAHL, and Pre CINAHL: same search terms as above

Terms:
- Continuous ultrasound
- Diathermy
- Evidence Based Medicine
- Heat pack
- Paraffin wax
- Pulsed short wave diathermy
- Sports/physiology
- Therapeutic ultrasound
- Whirl pool

**State inclusion and exclusion criteria**

Inclusion items: ankle sprains, shoulder disorders, carpal tunnel syndrome, lateral epicondylitis, myofascial trigger-points, leg ulcers, and tissue extensibility, blood flow, temperature change, and muscle soreness

Exclusion items: Special populations (i.e. cystic fibrosis, multiple sclerosis, musculoskeletal diseases), animals, diagnostic ultrasound (i.e. echocardiography, echocephalography, doppler, obstetrical), surgical ultrasound (i.e. tissue destruction), pulsed ultrasound, microwave diathermy

**Number of articles/sources meeting criteria for further review:**

43 articles were reviewed. Of these articles, 8 were LOE 1, 10 were LOE 2, 2 were LOE 3, 1 was LOE 4, and 23 were LOE 5.

**Summary of evidence**

**Evidence Supporting Clinical Question**

<table>
<thead>
<tr>
<th>Level of Evidence</th>
<th>Authors</th>
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<tbody>
<tr>
<td>Good</td>
<td>Seiger, 2006E</td>
</tr>
<tr>
<td>Fair</td>
<td>Knight, 2001E</td>
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<tr>
<td>Poor</td>
<td>Portwood, 1987A</td>
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**Level of evidence**

A = Increase in healing rate  
B = Decrease in pain  
C = Increase in blood flow  
D = Increase in tissue temperature  
E = Increase tissue extensibility  
F = Decrease soreness  
G = Was not different than placebo/control
### Evidence Neutral to Clinical question

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### Evidence Opposing Clinical Question

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</table>
Good review article/s:
Ter Haar G, Dyson M, Oakley EM. The use of ultrasound by physiotherapists in Britain, 1985. 1987
Draper DO. Guidelines to enhance therapeutic ultrasound treatment outcomes. 1998
Merrick MA. Do you diathermy?, 2001
Shields N. Short-wave diathermy and pregnancy: What is the evidence?, 2003
Mickle A. Taking a closer look at heat packs and improved flexibility, 2006

Bad review article/s:

| REVIEWER'S FINAL COMMENTS AND ASSESSMENT OF BENEFIT / RISK: (please include implementation considerations including at a minimum training, environment and availability:)
|---|
| Heat is commonly used for a variety of musculoskeletal ailments. Two methods of application include superficial and deep heat. Superficial heating is the application of a heat modality that primarily heats body tissues less than 1 cm below the skin surface layer. Examples of this include moist and dry heat packs, paraffin baths, and warm whirlpool. Deep heating is the application of a thermal modality that results in a tissue temperature increase at depths of 3 to 4 cm below the skin surface. These include continuous therapeutic ultrasound and pulsed short wave diathermy (PSWD).

A number of investigators have examined superficial and deep heat application and its effects on different orthopedic conditions,2, 4, 15-17, 20, 21, 26, 27, 32, 34, 39-41, 43 tissue extensibility,2, 7, 10, 25, 33, 36, 38, 42 muscular soreness,6, 41 blood flow,18, 30 and intramuscular temperature.1, 3, 5, 6, 8, 9, 11-14, 19, 22-24, 28, 29, 31, 35, 37 Currently, however, there is little evidence to support the use of heat or a specific heating method on improving musculoskeletal injury outcomes.

Throughout the literature no author/s concluded that heat improves healing in patients experiencing: shoulder injuries, carpal tunnel syndrome, leg ulcerations, ankle sprains, osteoarthritis, epicondylalgia, and delayed onset muscle soreness. Some however report that under randomized controlled conditions heat may increase tissue extensibility.

It is suggested that deep heat combined with concurrent prolonged static stretching increases hamstring flexibility7 and ankle dorsiflexion range of motion.35, 42 In another study, static stretching of the plantarflexor and dorsiflexor muscles 3 days a week for 2 weeks increased tissue extensibility immediately following deep heating but these results were not different than stretching alone, stretching following active exercise, or hot pack application at 4 weeks.25 As a result, tissue extensibility changes associated with deep heat are not sustained and may not be different than other heating methods. It is yet to be determined if these changes in tissue extensibility lead to increased healing.

The lack of evidence regarding the beneficial effects of heat on improving outcomes appears to be related to a lack of placebo-controlled double-blinded investigations. This is likely related to the number of variables that need to be taken into consideration prior to an investigation. These variables include: age and patient activity level, length of time from when an injury occurs and heat modality is applied, type of tissue damage (i.e. sprain vs. strain or skin ulceration vs. laceration), injury severity, size of the treatment area, amount of tissue in contact with the heat modality, length of application, and heating unit parameters (i.e. therapeutic ultrasound frequency, intensity, and treatment size area).
Citation List


