

Efficacy of specific needling techniques in the treatment of myofascial pain syndrome

Candice Brunham
Kelly McNabney
Jody Wiebe
Jeff Norwood

Research Supervisors:
Dr. Darlene Reid
Dr. Babak Shadgan



An anteroposterior (AP) X-ray of the human spine, showing the vertebrae and intervertebral discs. The image is in a blue-tinted, negative-like style. The spine is centered vertically, with the pelvis visible at the bottom and the upper thoracic region at the top.

Objectives

- To evaluate the efficacy of available invasive dry needling techniques for treatment of persons diagnosed with myofascial pain syndrome (MPS) and/or myofascial trigger points (MTrPs)
- Identify gaps in current research and provide guidance for future studies
- Relate findings to best practice



What is Myofascial Pain Syndrome?

- Myofascial pain syndrome (MPS) is a condition characterized by the presence of myofascial trigger points (MTrP's)¹
- MTrP's are hyper-irritable areas located on a taut band of skeletal muscle that illicit pain when stretched or compressed¹



Myofascial Trigger Points

- Exhibit sensory, motor and autonomic phenomenon^{1,2}
 - **Sensory:** local tenderness and referral of pain which can lead to peripheral and/or central sensitization
 - **Motor:** disturbed function in muscle of origin and related muscles, muscle weakness, stiffness, restricted ROM, poor coordination, & muscle imbalance
 - **Autonomic:** localized sweating, vasoconstriction/vasodilation, & pilomotor activation



Common Treatment Methods

- Step 1 = deactivate MTrP^{3,4}
 - Invasive Techniques:
 - Dry needling, acupuncture, wet needling
 - Non-invasive Techniques:
 - Ischemic compression, spray and stretch, laser, myofascial release
- Step 2 = correcting or removing the precipitating/predisposing stimuli⁵



Dry Needling Techniques


- Dry Needling (DN)
 - Simple insertion and removal of an acupuncture type needle following anatomical and biological principles^{3,4}
- Acupuncture
 - Needling at acupoints along meridians and extrameridians to relieve the associated pain^{3,4}
- Intramuscular Stimulation (IMS)
 - Manipulation of the inserted needle until a local twitch response is attained^{3,4}



Who is affected by MPS and how?

(American Pain Foundation, 2007)

- Very common source of musculoskeletal complaints⁶
- Increasing in prevalence⁸
- The estimated cost of chronic pain in America is \$100 billion per annum⁹
- Increased morbidity and decreased quality of life in those suffering

An anteroposterior (AP) X-ray of a human spine, showing the vertebrae and intervertebral discs. The image is in grayscale, with the spine appearing as a series of white, segmented blocks against a darker background. The vertebrae are clearly visible, and the intervertebral discs are the darker spaces between them. The overall image has a slightly grainy texture, typical of medical X-rays.

Why is this Systematic Review (SR) needed?

- Needling therapies are growing in popularity amongst clinicians, resulting in a need for scientific support¹⁰
- If strong evidence can support a positive effect of needling therapies, they may become accepted as standard form of treatment



Existing Systematic Reviews

- Evidence Based Practice:
 - Cummings and White (2001)¹¹
 - Wet needling therapy not therapeutically superior to dry needling in reduction of pain
 - Inconclusive evidence to support effect of needling therapies beyond placebo
 - Rickards (2006)¹²
 - Non-invasive treatment of MPS
 - Unable to provide strong evidence for any treatment interventions
 - Furlan et al (2005)¹³
 - Acupuncture or dry needling in treatment of non-specific low back pain
 - No firm conclusions as most studies were of low methodological quality

Database Search

- EMBASE
- MEDLINE
- PubMed
- CINAHL
- PEDro
- Cochrane Library Database of Systematic Reviews
- Hand Searching



Embase Search Strategy

- 1. myofascial pain syndrome.mp. or Myofascial Pain/
- 2. trigger points.mp. or Trigger Point/
- 3. Acupuncture/ or needling therapies.mp.
- 4. acupuncture.mp.
- 5. needle therapy.mp.
- 6. dry needling.mp.
- 7. intramuscular stimulation.mp.
- 8. IMS.mp.
- 9. invasive.mp.
- 10. needling.mp.
- 11. 1 or 2
- 12. 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10
- 13. 11 and 12
- 14. from 13 keep 3
- 15. from 13 keep 10, 14, 21, 23, 35, 54...
- 16. 14 or 15





Inclusion Criteria

- Adults over 16 years
- Diagnosis of MPS and/or myofascial pain with associated TrP's
- Clear definition of myofascial pain and/or MTrP
- RCTs, CCTs, or quasi-experimental trials
- Assessment of outcome measures blinded if feasible
- Invasive dry needling technique
- At least one standardized measure of pain, including pre-and post-test values



Exclusion Criteria

- Patients with diagnosed temporomandibular joint dysfunction and/or fibromyalgia
- Patients diagnosed with myofascial pain as a direct result of a surgical procedure
- Wet needling therapies that involve the injection of substance into subject without dry needling comparison group (ie. injection of analgesic/saline/Botox)
- Patients with coexisting cognitive impairment (ie. acute stroke)
- Studies with a PEDro score of < 4



Quality Assessment & Data Extraction

- PEDro
 - 11 item quality assessment tool
 - Studies graded by two assessors independently
 - Assigned a grade of excellent, good, fair, poor
- Data extraction tool
 - Tool selected due to comprehensiveness and ease of use
 - Includes written description of trial and quantitative results (change in mean and SD)
 - Data extracted by two assessors independently



Results - Selected Studies

- 45 articles selected for full-text review
- 13 trials met the inclusion criteria¹⁴⁻²⁶
 - Needling interventions included: Dry Needling, Intramuscular Stimulation (IMS), Acupuncture (Traditional Chinese and Japanese, superficial and deep), and other variations
 - Subject characteristics:
 - Average age range = 32-79 yrs
 - 9 trials in neck/upper trapezius region, 2 trials in lumbar region, 1 trial in gluteal region, and 1 trial did not specify
 - PEDro quality assessment scores:
 - 8 high quality, 4 moderate quality, and 1 fair quality



Data Synthesis - Effect Sizes

- Effect Size:
 - Measure of the strength of relationship between two variables
 - Small effect size: $d = 0.2-0.5$
 - Moderate effect size: $d = 0.5-0.8$
 - Large effect size: $d = 0.8+$
- Calculated using REVMAN v.5.0
 - 95% confidence interval
 - Standardized mean difference as effect measure
 - Hedges adjusted g
- Calculated at two time periods:
 - Baseline to end of treatment
 - Baseline to follow-up



Groupings for Data Synthesis

- Needling Intervention vs Control
- Needling Intervention vs Other Intervention
- Needling Intervention + Adjunct Therapy vs Adjunct Therapy vs Control
- Needling Intervention - no comparison group

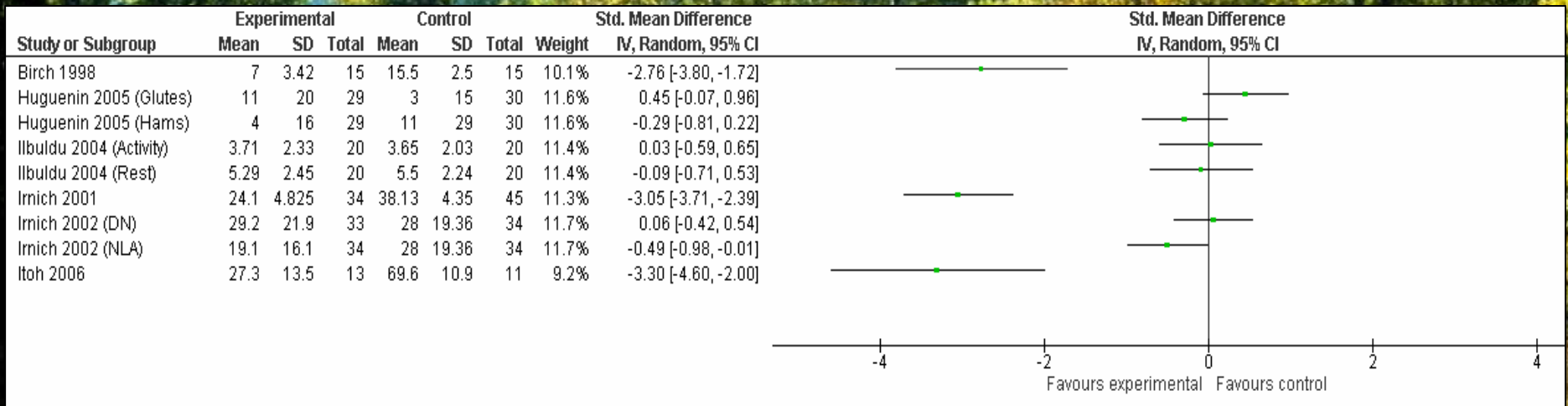


Needling Intervention vs Control Group

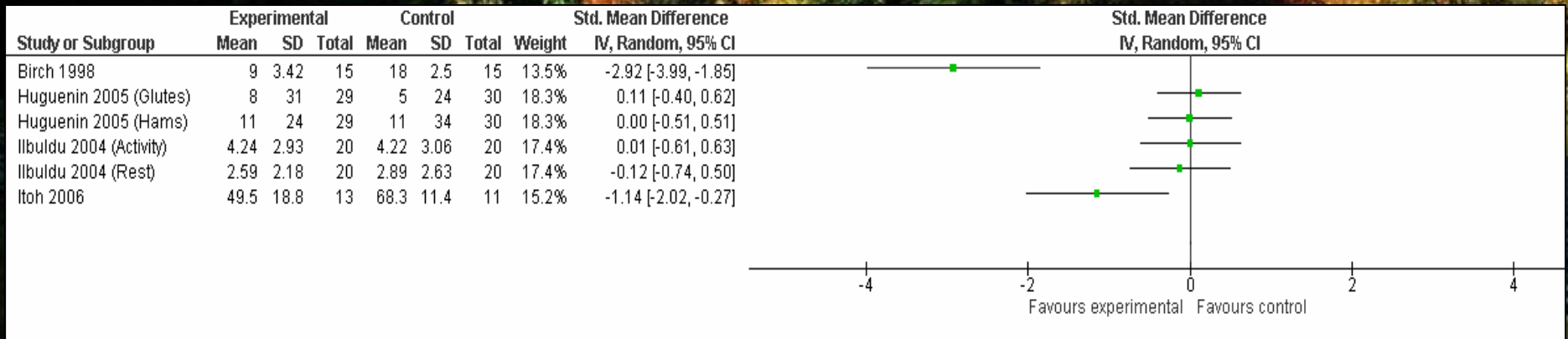
- Studies comparing DN vs placebo control showed no significant difference at post treatment and follow up^{21, 20}
 - Ilbuldu et al (2004) & Huguenin et al (2005)
- Three of four studies comparing acupuncture with placebo control had results favouring acupuncture at both end of treatment and follow up^{22-24,14}
 - Irnich et al (2001 & 2002), Itoh et al (2006), Birch & Jamison (1998)

Forest Plots

End of Treatment – Pain Scales



Follow up – Pain Scales





Needling Intervention vs Other Intervention

- Comparison of two DN techniques:
 - Study by Fu (2007)¹⁷ showed no significant difference between treatment groups (no follow up measure)
- Comparison of two acupuncture techniques:
 - Study by Birch & Jamison (1998)¹⁴ favoured relevant Japanese acupuncture over irrelevant acupuncture at both post treatment and follow up
 - Study by Ceccherelli et al (2002)¹⁵ compared superficial and deep acupuncture
 - No significant difference between groups post treatment but favoured deep acupuncture at follow up
- Comparison of DN technique and acupuncture technique:
 - Study by Irnich et al (2002)²² favoured acupuncture over DN for reduction of motion related pain at end of treatment



Needling Intervention vs Other Intervention

- Comparison of DN and Wet Needling techniques:
 - Results of studies by Kamanli et al (2005)²⁵ and Hong (1994)¹⁹ favoured lidocaine injection over DN at post treatment (for reduction of pain scores and increase in PPT)
 - Study by Hong (1994)¹⁹ retained significant treatment effect at follow up (for reduction of pain scores)
 - Ga et al (2007)¹⁸ favoured IMS over lidocaine injection for increase in PPT at follow up

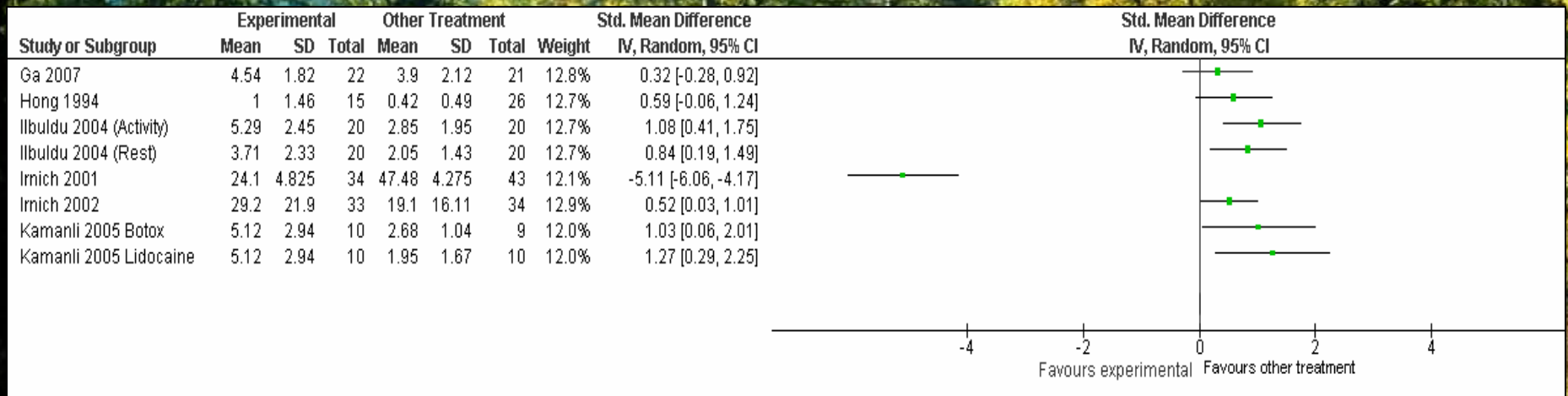


Needling Intervention vs Other Intervention

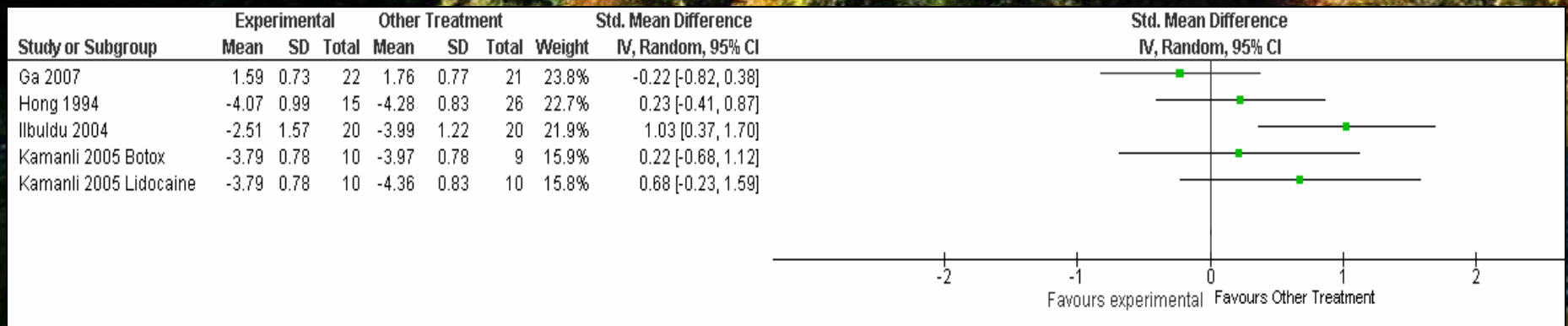
- Comparison of acupuncture and conventional massage:
 - Study by Irnich et al (2001)²³ showed significant difference in favour of acupuncture for reduction in motion related pain post treatment (no follow up)
- Comparison of DN and laser therapy:
 - Study by Ilbuldu et al (2004)²¹ showed significant difference in favour of laser therapy post treatment, but was not retained at follow up (VAS at rest, VAS with activity, PPT)

Forest Plots - End of Treatment

Pain Scales

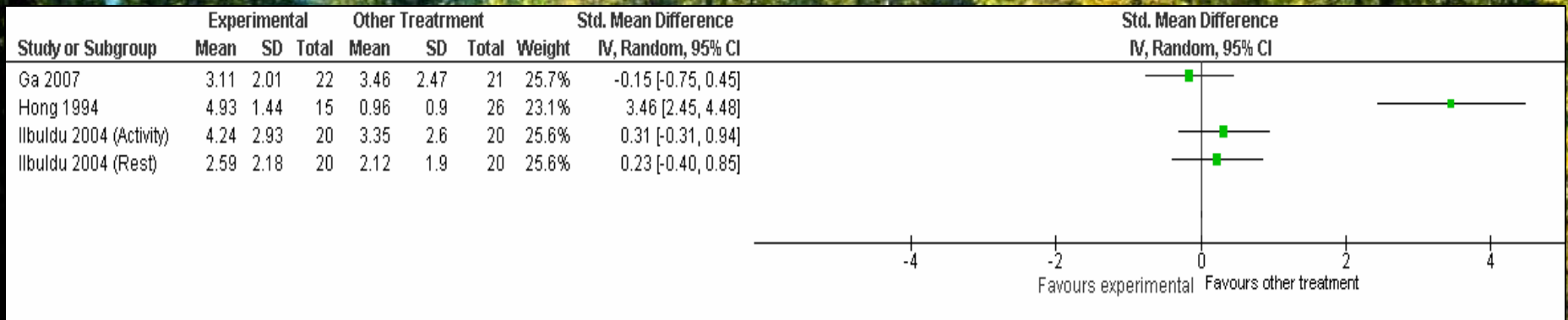


PPT

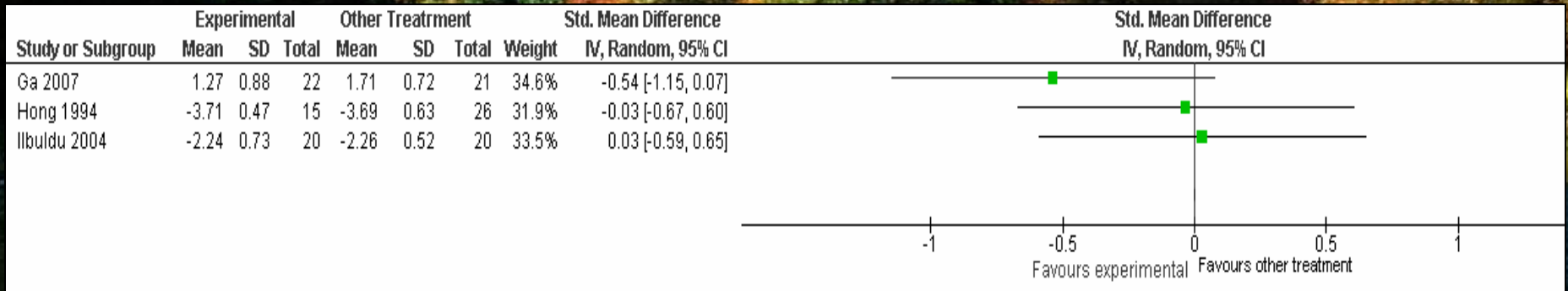


Forest Plots - Follow up

Pain Scales



PPT





Needling Intervention + Adjunct Therapy vs Adjunct Therapy vs Control

- Comparison of superficial DN + stretching vs stretching vs control (Edwards & Knowles, 2003):¹⁶
 - No significant difference between groups immediately post treatment
 - Superficial DN + stretch favoured at follow up for increase in PPT



Needling Intervention without Control Group

- Effects of traditional Chinese acupuncture over 3 week course of treatment (Kung et al, 2001):²⁶
 - Paired t-test analysis showed significant reduction in VAS pain scale at end of treatment



Discussion - Needling Intervention vs Control

- Studies that had a large effect size in favour of needling interventions shared a common trait of multiple needling treatments (at least 1x/week for 3 weeks)
- Birch & Jamison (1998)¹⁴ identified a high correlation between previous acupuncture treatments and reduction in VAS scores
- Many studies had design flaws which introduced confounding variables (ie attrition bias, additional non-controlled treatments, variable diagnoses)



Discussion - Needling vs Needling Intervention

- No trends seen due to heterogeneity of studies
 - Study by Irnich et al (2002)²² found acupuncture to be significantly more effective than DN
 - Ceccherelli et al (2002)¹⁵ found deep acupuncture to be more effective than superficial acupuncture
 - Birch & Jamison (1998)¹⁴ found relevant acupuncture to be more effective than irrelevant acupuncture
- Future studies comparing needling techniques are needed to determine the most effective technique



Discussion - Needling vs Other Intervention

- Studies which favoured lidocaine injection over DN techniques involved only one treatment session
- Study by Ga et al (2007)¹⁸ which favoured IMS over lidocaine injection had 3 treatments over 3 weeks
- The form of dry needling may play a role in treatment efficacy
- Study by Ilbuldu et al (2004)²¹ favoured laser over DN, but subjects received a greater number of laser treatments



Limitations of this Review

- Publication bias
 - Translation of foreign studies not feasible, timing of literature search
- Quality assessment tool
 - High quality studies had serious design flaws
- Heterogeneity of studies
 - Difficult to perform meaningful meta-analysis
- Manipulation of data
 - Interpretation of some data by reviewers led to increased risk of translation error
- Diagnostic criteria of MPS
 - Not all studies based on Travell & Simon's criteria¹



Implications for Research

- Need for additional high quality studies
- Standardization of research and treatment methods
- Real-life treatment plans incorporated into study designs (ie. 2 treatments per week for 4 weeks)
- Consistent timing of outcome measures (including end of treatment and long-term follow up measures)



Implications for Practice

- Best practice involves a structured interdisciplinary approach including physical and cognitive behavioral strategies
- The national institute of health (USA) consensus statement on acupuncture (1997) concluded that it may be useful as an adjunct treatment²⁷
- This review indicates a need for future investigation of dry needling therapies as part of a comprehensive program

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Conclusions

- No clear evidence that Dry Needling techniques are more efficacious than placebo, sham, or alternative treatment techniques
- No clear recommendations can be made regarding the most effective needling technique or optimal length and frequency of treatment
- Results suggest that multiple treatment sessions are more effective on pain outcomes than single treatment sessions
- Level of evidence does not exceed moderate



Thank you! 😊

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