The Effectiveness of Mobilization With Movement at Improving Dorsiflexion After Ankle Sprain

Matthew C. Hoch and Patrick O. McKeon

Clinical Scenario

Ankle sprains are the most frequently occurring orthopedic injury among the physically active. The number 1 risk factor for suffering an ankle sprain is a history of a previous sprain. Those with a history of ankle sprain often report recurrent bouts of ankle instability and decreased functional capacity. Several mechanical and functional deficits have been identified that may contribute to residual symptoms, sequelae, and functional loss. One is decreased dorsiflexion range of motion. This deficit could predispose the patient to alterations in the ankle axis of rotation, changes in alignment and tracking of bony surfaces, and disrupted proprioceptive input to the sensorimotor system resulting in future ankle sprains or ankle osteoarthritis. Therefore, improving accessory and physiological motion at the talocrural joint is a clinical consideration. Joint mobilizations could be an effective intervention for addressing these alterations during rehabilitation. A joint-mobilization technique known as mobilization with movement (MWM) is of particular interest because this method is the concurrent application of an accessory mobilization with active or passive physiological movement.

Focused Clinical Question

Does talocrural MWM improve dorsiflexion in those with a history of ankle sprain?

Summary of Search, “Best Evidence” Appraised, and Key Findings

- The literature was searched for studies of level 2 evidence or higher that investigated the effect of talocrural MWM on improving dorsiflexion in those with a history of ankle sprain.
- The literature search returned 6 possible studies for inclusion; 3 studies met the inclusion criteria and were included.

The authors are with the Div of Athletic Training, University of Kentucky, Lexington, KY.
• All 3 studies used a randomized, crossover-trial design and demonstrated improvements in dorsiflexion after a single posterior talocrural MWM treatment compared with no intervention, sham treatment, or control.

**Clinical Bottom Line**

There is moderate evidence supporting the use of talocrural MWM for improving dorsiflexion in those with a history of ankle sprain.

*Strength of Recommendation:* There is level B evidence that a single talocrural MWM treatment improves dorsiflexion in those with a history of ankle sprain. Although the effect sizes displayed a trend in favor of MWM, caution should be used in interpreting these findings because the effect-size confidence intervals cross zero for all 3 investigations, suggesting that further investigation is warranted.

**Search Strategy**

**Terms Used to Guide Search Strategy**

• Patient/Client group: ankle and sprain
• Intervention (or assessment): mobilization with movement or Mulligan's
• Comparison: no intervention or control
• Outcomes: dorsiflexion or range of motion

**Sources of Evidence Searched**

• MEDLINE
• CINAHL
• SPORTDiscus
• Cochrane Library
• PEDro
• Additional resources obtained via review of reference lists and hand search

**Inclusion and Exclusion Criteria**

**Inclusion Criteria**

• Studies investigating the effect of talocrural MWM on dorsiflexion range of motion in subjects with a history of ankle sprain
• Level 2 evidence or higher
• Limited to English language
• Limited to humans
• Limited to the last 10 years (2000–2009)
Exclusion Criteria

- Studies using multicomponent intervention programs (mobilization with movement + other manipulation techniques, strengthening, etc)
- Studies applying MWM treatments to joints other than the talocrural joint or to patients with injuries other than ankle sprain

Results of Search

Three relevant studies were identified and categorized (based on Levels of Evidence, Centre for Evidence Based Medicine, 1998):

- Level of evidence: 2b
- Study design: Crossover trial
- Authors: Collins et al,1 Vicenzino et al,2 and Reid et al3

Best Evidence

The 3 studies that were identified as the best evidence and selected for inclusion in the CAT are described in Table 1. Reasons for selecting these studies were that they were graded with a level of evidence of 2 or higher, included an MWM treatment on subjects with a history of ankle sprain, and measured the effect of talocrural MWM treatment on dorsiflexion range of motion.

Implications for Practice, Education, and Future Research

All 3 studies appraised here demonstrated improvements in dorsiflexion range of motion after a single MWM treatment. These findings indicate that talocrural MWM significantly increased dorsiflexion in those with a history of ankle sprain based on a single treatment. All 3 investigations applied similar weight-bearing MWM techniques resulting in dorsiflexion improvements ranging from 16% to 26% after a single treatment. In addition, Vicenzino et al1 used a non-weight-bearing MWM treatment, which resulted in outcomes similar to those of the weight-bearing treatment. Despite the improvement in dorsiflexion, MWM treatments created small to moderate effect sizes (.16–.38) with 95% confidence intervals that encompassed zero. Because the treatment effect-size confidence intervals consistently crossed zero, caution should be exercised when interpreting the results of these investigations.

It was not unexpected that a single MWM treatment resulted in small effect sizes, because the full effects of this intervention are typically accomplished over several treatment sessions. The single treatment combined with a relatively low number of subjects limits the treatment effects. Despite the small to moderate effect, the improvements in dorsiflexion exhibited in these studies may be clinically relevant. To determine the clinical relevance of dorsiflexion improvements, future research should explore the influence of this treatment on patient functioning during gait, postural control, and other movement tasks. We concluded that a
Table 1  Characteristics of Included Studies

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Collins et al(^1)</th>
<th>Vicenzino et al(^2)</th>
<th>Reid et al(^3)</th>
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<tr>
<td>Participants</td>
<td>Eight males and 8 females (28.25 ± 9.33 years) who sustained a grade II lateral ankle sprain 40 ± 24 d before testing. Subjects were required to have a minimum pain-free dorsiflexion asymmetry of 1 cm, anterolateral ankle tenderness, and full pain-free weight-bearing capacity. They were randomized in crossover-trial design in which each subject served as his or her own control. Subjects were randomly assigned to 1 of 3 treatments (MWM, placebo, control) by a roll of dice by the therapist.</td>
<td>Eight males and 8 females (19.8 ± 2.3 y) with a history of at least 2 lateral ankle sprains, at least 2 cm asymmetry in dorsiflexion, no history of bilateral ankle sprain, and not receiving concurrent treatment. Subjects were randomized in a crossover trial with repeated measures. They were randomly assigned to non-weight-bearing MWM, weight-bearing MWM, or control treatments. Every subject experienced each treatment once; the order was decided using a random-number generator.</td>
<td>Eight males and 15 females (25 ± 9 y, 170 ± 9 cm, 69 ± 11 kg) with a history of unilateral ankle sprain, a minimum of 2 cm less weight-bearing dorsiflexion in their affected ankle, and no injury in the 8 wk before testing. Subjects were randomized in a crossover trial in which each subject served as his or her own control. They were randomly assigned to 1 of 2 treatment sequences (sham, MWM) using a random-numbers table. Subjects reported to the laboratory on 2 separate occasions to experience each treatment once.</td>
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### Table 1 (continued)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Study</th>
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<td>Intervention investigated</td>
<td>All subjects received a weight-bearing MWM treatment to the talocrural joint for dorsiflexion. The investigator who performed outcome-measure assessments was blinded to the treatment. Participants were blinded to the aims of the study and which intervention was under investigation. They were placed in a relaxed stance. A nonelastic belt was placed around the distal tibia and fibula and around the therapist’s waist. The therapist leaned backward while manually securing the talus and forefoot to the table, creating a posteroanterior tibial glide. The glide was sustained while the participant performed slow, active dorsiflexion. Three sets of 10 repetitions were applied with 1 min between sets. Twenty-four h between sessions allowed for a wash-out period.</td>
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<td>All subjects received a single treatment of weight-bearing and non-weight-bearing MWM to the talocrural joint for dorsiflexion. The investigator who performed outcome-measure assessments was blinded to the treatment. The weight-bearing MWM was applied in a relaxed stance. A nonelastic belt was placed around the therapist’s waist and the distal tibia and fibula of the participant. The therapist manually stabilized the foot and leaned backward, creating a posteroanterior tibial glide. The participant then performed a slow dorsiflexion. The non-weight-bearing MWM was performed in a supine position with the ankle stabilized to the table with a nonelastic belt. The therapist applied an anteroposterior talar glide while the patient actively dorsiflexed. Each glide was maintained for 10 s. Four sets of 4 glides were performed for each treatment. Subjects reported to the laboratory on 3 separate days at least 48 hr apart to allow for a wash-out period between treatments.</td>
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<td>All subjects received a single treatment of weight-bearing MWM of the talocrural joint for dorsiflexion. Only the primary investigator had knowledge of treatment sequence, leaving the dorsiflexion examiners blinded to group assignment. The participant was placed in a high kneeling position with the affected ankle in weight-bearing neutral. A padded belt including a pressure biofeedback unit was placed over the inferior margin of the medial malleolus and around the pelvis of the therapist. The therapist manually stabilized the talus and calcaneus and leaned backward, creating a posteroanterior draw of the tibia until the pressure biofeedback unit read 200 ± 20 mm Hg. Two sets of 10 repetitions were performed and separated by a 2-min rest period. Treatments were at least 7 d apart to allow for a wash-out period for any treatment effects.</td>
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<tr>
<td>Outcome measure</td>
<td>Weight-bearing dorsiflexion using the knee-to-wall principle</td>
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<td><strong>Results</strong></td>
<td>A significant interaction for time by condition was detected. Post hoc analysis revealed a significant effect for the MWM treatment ($P = .013$) and no differences for placebo or control. MWM preapplication 57.27 ± 41.00 mm; postapplication 68.93 ± 45.44 mm. The MWM intervention did create a significant improvement in weight-bearing dorsiflexion, but the effect size for this intervention was 0.28 ± 21.48, suggesting these results should be viewed with caution.</td>
<td>A significant interaction for time by condition was detected. Post hoc analysis revealed a significant treatment effect for both MWM techniques ($P &lt; .001$). The weight-bearing and non-weight-bearing MWM improved dorsiflexion 26%. Both techniques significantly improved dorsiflexion, but the effect size for the weight-bearing technique was 0.38 ± 0.78 and for the non-weight-bearing technique was 0.26 ± 0.93. Because the effect-size 95% CI crossed zero these results should be viewed with caution.</td>
<td>A significantly greater change in dorsiflexion was reported after the MWM treatment ($P = .019$). The average change after MWM was 0.45 cm. The change in weight-bearing dorsiflexion after MWM was significantly greater than in the sham mobilization treatment. The effect sizes and 95% CI for pretreatment and posttreatment revealed that the MWM (0.16 ± 0.81) and the sham treatment (0.05 ± 1.58) crossed zero, suggesting that these results be viewed with caution (95% CI = .08–.82).</td>
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<td><strong>Level of evidence</strong></td>
<td>2</td>
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<tr>
<td><strong>Validity score</strong></td>
<td>PEDro 5/10</td>
<td>PEDro 7/10</td>
<td>PEDro 6/10</td>
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<td><strong>Conclusion</strong></td>
<td>This study indicates that MWM could be an effective treatment for improving dorsiflexion in those with subacute ankle sprains.</td>
<td>Both weight-bearing and non-weight-bearing MWM could effectively improve dorsiflexion in those with recurrent ankle sprains.</td>
<td>Dorsiflexion range of motion improved immediately after a weight-bearing MWM treatment in those with decreased dorsiflexion after lateral ankle sprain.</td>
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Abbreviations: MWM, mobilization with movement.
level B recommendation could be made in favor of an MWM intervention because the 3 studies included were categorized as level 2 evidence, and improvements were consistently identified after a single MWM intervention, but effect size was limited and confidence intervals crossed zero.

This review suggests that no studies have examined the effects of multiple MWM treatments. In addition, these studies viewed decreased range of motion at the impairment level. The relationship between improvements in range of motion and patient progress needs to be systematically evaluated. Future studies should incorporate longer treatment durations and use patient self-reported outcome measures in addition to traditional clinical measures to view treatment effectiveness using a patient-oriented approach. Finally, all included studies were of level 2 evidence according to the Oxford Centre of Evidence-Based Medicine. To capture the true effect of this treatment, future research should include well-designed randomized control trials with longer treatment durations, longer patient follow-up periods, larger sample sizes, and self-reported measures of function.

The ability to include higher levels of evidence with the considerations posed in the previous paragraph may allow for a stronger and clearer recommendation on incorporating this intervention into rehabilitation for those with a history of ankle sprains. Furthermore, MWM should be studied as a plausible intervention for those with chronic ankle instability because this group has demonstrated arthrokinematic restrictions, degenerative joint changes, impaired postural control, altered proprioception, and decreases in functional capacity. This critically appraised topic should be reviewed when additional best evidence becomes available that may change the clinical bottom line for the research question posed in this review.

References