Initial Changes in Posterior Talar Glide and Dorsiflexion of the Ankle After Mobilization With Movement in Individuals With Recurrent Ankle Sprain

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Study Design: A double-blind randomized crossover experimental study with repeated measures, including a no-treatment control condition.

Objective: To evaluate the initial effect of 2 mobilization with movement (MWM) treatment techniques performed in weight bearing and non-weight bearing on posterior talar glide and talocrural dorsiflexion in individuals with recurrent lateral ankle sprain.

Background: MWM treatment techniques are commonly used in the treatment of musculoskeletal pain, such as lateral ankle sprain. Recent evidence indicates that a lack of posterior talar glide and weight-bearing ankle dorsiflexion are common physical impairments in individuals with recurrent ankle sprains. MWM of the ankle joint involves the application of a combined posterior talar glide mobilization and active dorsiflexion movement. The recurrent ankle sprain injury and the MWM treatment techniques for the ankle seemingly provide an appropriate model to further evaluate the effects and mechanism(s) of action of the MWM treatment techniques in a way that they have not been tested to date.

Methods: Sixteen subjects (mean ± SD age, 19.8 ± 2.3 years) with a history of recurrent lateral ankle sprain and deficits in posterior talar glide (71%) and weight-bearing dorsiflexion (34%) were studied. A within-subjects study design was used to evaluate the effect of 2 independent variables: treatment conditions (weight-bearing MWM, non–weight-bearing MWM, and a no-treatment control group) and time (pretreatment and posttreatment) on the dependent variables of posterior talar glide and weight-bearing dorsiflexion.

Results: Both the weight-bearing and non–weight-bearing MWM treatment techniques significantly improved posterior talar glide by 55% and 50% of the preapplication deficit between affected and unaffected sides, respectively, which was significantly greater than that of the control group ($P<.001$). The weight-bearing and non–weight-bearing MWM treatment techniques improved weight-bearing dorsiflexion by 26% ($P<.017$), compared to 9% for the control condition. The change in posterior talar glide, expressed as a proportion of pretreatment deficit, was correlated to the change in weight-bearing dorsiflexion ($r = .88$, $P<.001$), but only after the weight-bearing MWM technique.

Conclusion: This preliminary study demonstrated an initial ameliorative effect of MWM treatment techniques on posterior talar glide and dorsiflexion range of motion in individuals with recurrent lateral ankle sprain. These results suggest that this technique should be considered in rehabilitation programs following lateral ankle sprain. This study provides justification for follow-up research of the long-term effects of MWM on lateral ankle sprain and proposes further work be conducted on the posterior talar glide test. *J Orthop Sports Phys Ther 2006;36(6):464-471.* doi:10.2519/jospt.2006.2265

Key Words: *inversion ankle sprain, positional fault, physical therapy*

Physiotherapists frequently use mobilization with movement (MWM) techniques as a physical treatment to improve range of motion, alleviate pain, and promote earlier return to function following lateral ankle sprain.[9,12] For example, the MWM treatment technique for talocrural dorsiflexion is frequently used to improve talocrural dorsiflexion deficits often seen following lateral ankle sprain.[13] The mechanism by which MWM achieves these clinical benefits has not been investigated. The present study evaluated the

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effectiveness of the MWM treatment approach for inversion plantar flexion injuries of the ankle in subjects with recurrent ankle sprains.

Lateral ankle sprains, in which the ankle undergoes excessive inversion and plantar flexion, are common among recreational and competitive athletes.[5,6,11] Approximately 44% of all sprained ankles go on to have further problems[5,6,11] and, although the factors that predispose to injury or reinjury are not conclusively evidence based, they are reported to involve proprioceptive deficits of the ankle,[1] lack of ankle dorsiflexion,[10] and reduced posterior glide of the talus in the ankle mortice.[4]

Denegar et al[4] found a reduction in posterior glide of the talus in the ankle mortise in asymptomatic fully functional subjects in the 6 months following ankle sprain. It was postulated that because the talus lacks muscular attachments, it might subluxate anteriorly following disruption to the ligaments that attach to it. The talus then remains malpositioned anteriorly until it is passively returned to its 'normal' position.[4] To an extent, the findings of reduced posterior talar glide and dorsiflexion range of motion appear congruent, as posterior talar glide is an accessory motion component of ankle dorsiflexion.[14]

Mulligan[9] developed a suite of treatment techniques on the basis of his theory of positional faults and altered joint kinematics following injuries affecting spinal and peripheral joints. The techniques, which are collectively called MWM, comprise the manual application of a passive joint glide that is sustained while the patient actively moves the joint or motion segment. The essential element of the technique is that they do not inflict any pain but, rather, alleviate pain during once-painful movements and tasks, especially during the application of the treatment technique. Several repetitions of the MWM over the course of a number of treatment sessions are frequently reported by the technique's proponents[9] to result in a lasting change in the once painful and limited movements and tasks.

Vicenzino et al[13] investigated the effects of a weight-bearing and a non–weight-bearing MWM treatment technique on ankle dorsiflexion in asymptomatic individuals and found significant improvements in dorsiflexion at the ankle, especially when measured in weight bearing. There were no significant differences in improvement between weight-bearing and non–weight-bearing MWM, suggesting that weight bearing during the application of the treatment technique is not necessary for maximizing effects on range of motion, as is usually hypothesized.[9] More importantly, a recent study of individuals with subacute ankle sprain by Collins et al,[3] which confirmed improvements in weight-bearing dorsiflexion following a weight-bearing MWM, showed that there was not a concomitant change in measures of the pain system following the application of a weight-bearing MWM, inferring that the improvement in dorsiflexion occurs through mechanisms other than that associated with the pain system. For the purpose of this study, we postulated that another possible mechanism of MWM, which in all likelihood does not involve the pain system, pertains to a change in joint mechanics, such as a change in the efficacy of an improved posterior glide of the talus within the ankle mortise.

A key component of the MWM treatment technique postulated to improve talocrural dorsiflexion is a posterior talar glide that is applied manually to the joint. This is based on the arthrokinematic principle that the talus glides posteriorly during dorsiflexion[14] and not on the proven effect of the MWM treatment technique's ability to improve posterior glide of the talus. The weight-bearing treatment techniques are often regarded by manual therapists to be superior to non–weight-bearing techniques, as they replicate aspects of functional activities.[11] The primary aim of this study was to test the assertion that both weight-bearing and non–weight-bearing MWM treatment techniques of the talocrural joint improve posterior talar glide as a means of improving dorsiflexion. A secondary aim was to explore for potential deficits in posterior talar glide and weight-bearing dorsiflexion in individuals with recurrent ankle sprains. We hypothesized that a deficit in posterior talar glide and dorsiflexion range of motion would be present in individuals with recurrent ankle sprains and that both the weight-bearing and non–weight-bearing MWM treatments would result in an improvement in posterior talar glide and dorsiflexion. Furthermore, it was hypothesized that the weight-bearing MWM would be more effective than the non–weight-bearing technique.

METHODS

The study evaluated the initial effect of the MWM treatment techniques on posterior talar glide and talocrural dorsiflexion measurements, taken before and immediately after the treatment techniques (including a no-treatment control condition) were performed. Posterior glide of the talus in the ankle mortise was measured using a posterior talar glide[4] and dorsiflexion was measured using a weight-bearing lunge.[13]

Subjects

Eight females and 8 males, with an age range from 18 to 27 years (mean ± SD, 19.8 ± 2.3 years) were recruited from the University of Queensland's student population. Volunteers were accepted into the study if they satisfied the following inclusion criteria: (1) a history of recurrent lateral ankle sprain with at

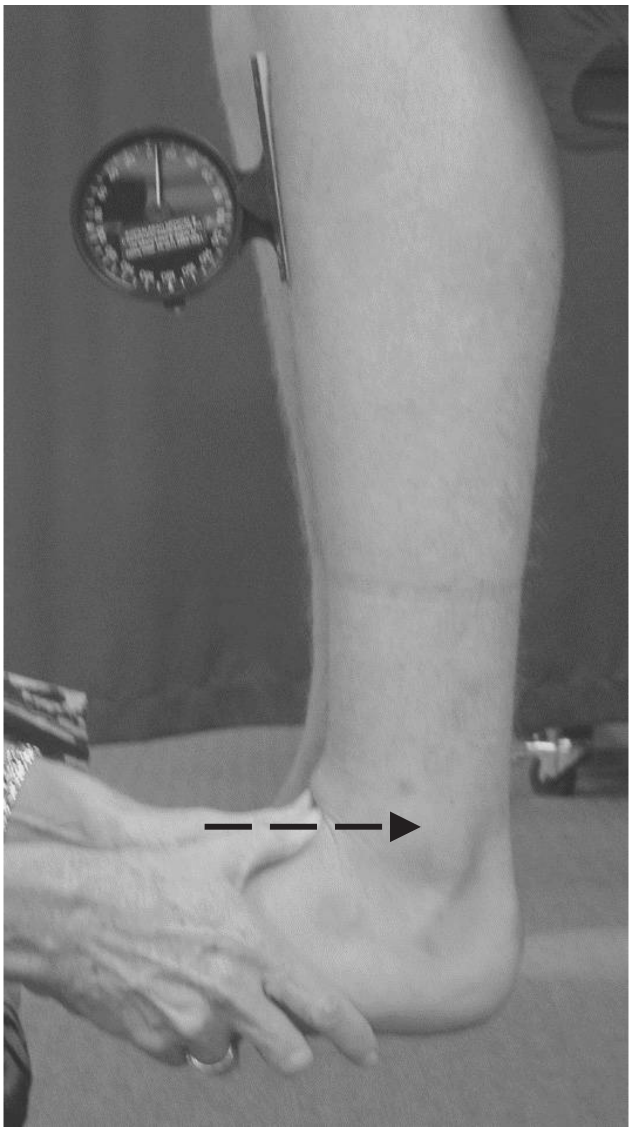

FIGURE 1. The posterior talar glide test showing the handling by the rater and the inclinometer used to quantify the test.

least 2 ankle sprains; (2) more than 20 mm asymmetry on the weight-bearing lunge test for ankle dorsiflexion; (3) no history of lateral ankle sprain on the contralateral side; and (4) not receiving any other physiotherapy treatment during the study. The main exclusion criteria were (1) acute ankle sprain within the past 6 months and (2) previous injury or surgery to the back, hip, or knee, or major injury or fracture to the ankle or distal leg. Subjects sustained between 2 and 6 injuries (mean ± SD, 3.5 ± 1.3) and, on average, the time since the last injury was 9 months (mean ± SD, 9.4 ± 3.9 months).

Volunteers were made aware of the inclusion/exclusion criteria and time commitment for the study through advertisements and direct contact with the investigators. Prior to entering the study, all volunteers were screened and, if suitable for the study, received a full explanation of the procedure and consented by signing a consent form. The study was approved by The Institutional Review Board of the University of Queensland.

Outcome Measures (Dependent Variables)

The outcome measures in this study were the posterior talar glide and weight-bearing ankle dorsiflexion.

Posterior Talar Glide A posterior talar glide, as described by Denegar et al,[4] was used to assess posterior glide of the talus in the ankle mortise (Figure 1). This measurement was performed using an assessment of tibial inclination during dorsiflexion of the ankle, with the thigh and foot in a standardized position (ie, thigh fully stabilized on a firm table, subtalar joint maintained in neutral, foot parallel to the floor). The subject was instructed to sit on the edge of the examination table. An inclinometer was held just distal to the tibial tuberosity of the subject's leg. The examiner then placed the subject's foot in subtalar neutral and, with the foot kept parallel to the floor, applied a glide to the talus posteriorly by using direct manual contact (contact point was distal palmar surface of thumb) over the anterior talus. This in effect produced a dorsiflexion of the foot and knee flexion. The end point of the test was a firm capsular end feel, as determined by the investigator performing the test. Once the examiner felt a restriction to movement, indicated by a firm end point, the movement was halted and the angle of tibial inclination recorded.

Weight-Bearing Ankle Dorsiflexion A weight-bearing lunge is frequently used as a measure of talocrural dorsiflexion range of movement.[4,12,13] As in the study by Vicenzino et al,[13] a weight-bearing lunge was performed in standing, with the foot and lower limb in a standardized position such that the second toe, center of the heel, and knee were kept in a plane perpendicular to the wall and the heel firmly in contact with the ground. While in this position, the subject lunged forward until the anterior knee contacted the wall and maximum dorsiflexion was obtained. A tape measure was used to measure the distance between the great toe and the wall. Heel contact with the floor was maintained throughout the test (Figure 2).[12]

Measurements of dorsiflexion and posterior talar glide were taken on both the affected and unaffected ankles. These measurements were repeated and recorded 3 times both pretreatment and posttreatment.

Independent Variables

The independent variable of interest in this study was treatment condition. Treatment condition consisted of a weight-bearing MWM condition (MWM_WB), a non–weight-bearing MWM condition (MWM_NWB), and a no-treatment control condition.

The MWM_WB was applied in standing, with the therapist manually stabilizing the foot on the treatment table (Figure 3). A nonelastic belt was passed around the distal leg of the subject and the waist of the therapist. To perform the technique subjects started in an easy standing position, while the therapist applied a sustained posteroanterior glide to the tibia through the belt by leaning backwards, which is effectively similar to a posterior glide of the talus in the ankle mortise. The subject was then instructed to perform a slow dorsiflexion movement until the first onset of pain or end of range. Once this end point was reached, the glide was maintained for 10 seconds. The patient then returned to the easy-standing position and the mobilization force was released. Each set of this treatment consisted of 4 glides, followed by a 20-second rest period. Four sets of the treatment technique were applied in each treatment session.[13]

The MWM_NWB was applied in supine, with the tibia resting on the treatment table and the ankle and foot unsupported off the edge of the table (Figure 4). The ankle was stabilized to the table by a nonelastic belt, while the therapist applied a sustained anteroposterior glide to the ankle. While the therapist maintained this glide, the patient was

FIGURE 2. Weight-bearing dorsiflexion being measured with a tape measure.

FIGURE 3. Weight-bearing mobilization with movement treatment. The belt applies a posteroanterior force to the distal tibia, while the talus and foot remain stationary on the table and the patient actively goes to end of pain-free range dorsiflexion.

FIGURE 4. Non–weight-bearing mobilization with movement. The therapist glides the talus anteroposteriorly against a tibia that is fixed by the treatment table, while the patient actively dorsiflexes the ankle to end of available pain-free dorsiflexion.

instructed to perform active dorsiflexion to first onset of pain or end of range. At this point, if there was no pain, the therapist applied overpressure into dorsiflexion and maintained the glide for 10 seconds. As with the weight-bearing MWM, 4 sets of 4 glides with movement were applied in the treatment session.[13]

In addition to the application of these 2 treatment techniques, a no-treatment control condition was applied. The control condition involved no manual contact or movement. The subject stood for a period of time similar to that taken to perform the treatment for the other 2 treatment conditions.

Experimental Procedure

A randomized, double-blind, repeated-measures, crossover control design was used. After qualifying for

TABLE. Summary table including means ± SD values for preapplication and postapplication of treatment conditions (weight-bearing MWM [MWM_WB], non–weight-bearing MWM [MWM_NWB], and control) for the posterior talar glide and dorsiflexion measurements. Also included is the standardized mean difference or effect size ($d \geq 0.8$ has been described as a large effect size[2]) and the maximum possible effect (MPE) ± SD from pretreatment to posttreatment.

	Before Treatment	After Treatment	Effect Size (*d*)	MPE (%)
Posterior talar glide (°)†				
Control*	2.6 ± 2.2	3.3 ± 2.6	0.3	17 ± 22
MWM_WB*	2.3 ± 2.3	4.0 ± 2.3	0.8	55 ± 40
MWM_NWB*	2.4 ± 2.0	4.1 ± 1.8	0.9	50 ± 32
Dorsiflexion (cm)†				
Control*	4.2 ± 1.6	4.4 ± 1.6	0.1	9 ± 10
MWM_WB*	4.2 ± 1.6	4.8 ± 1.5	0.4	26 ± 24
MWM_NWB*	4.3 ± 1.9	4.8 ± 1.5	0.3	26 ± 29

* Statistically significant difference between pretreatment and posttreatment measurements ($P<.017$).
† The mean ± SD posterior talar glide for the unaffected side was 6.3° ± 2.7° and dorsiflexion was 6.4 ± 1.6 cm.

the study, each subject was required to report to the laboratory on 3 separate occasions for testing. This study used a crossover design in which all subjects experienced 1 of the 3 conditions in a randomized sequence on 3 separate days at least 48 hours apart, so that on completion of the experiment, every subject had experienced each condition once. The randomization sequence was generated a priori in permuted blocks of 6 using a random-number generator.

For each of the 3 testing conditions a standard protocol was followed. On arrival the subject removed footwear and, prior to the application of the treatment condition, measurements for dorsiflexion and posterior talar glide were recorded for both the affected and unaffected ankles. An investigator, who was blinded to the treatment condition being applied at that session and the affected ankle, performed this measurement. The subject then either received MWM_WB, MWM_NWB, or the control treatment condition applied by an experienced physiotherapist. The therapist was instructed to apply these treatments as if it was a clinical situation and was blinded to the pretreatment and posttreatment outcome measurement results. The posterior talar glide and dorsiflexion measurements on both affected and unaffected sides were then remeasured, following the application of the treatment condition. The same investigator took all preapplication and postapplication measures. Subjects returned for 2 further sessions in which the only protocol change was the treatment condition received.

The therapist and the investigator responsible for taking the posterior talar glide and dorsiflexion measurements remained blinded to each other's activities throughout the data collection period. The subject was informed that the study was evaluating the influence of manual handling and positioning on a number of repeated measures.

Reliability

The intratester reliability of the testing procedure of the investigator responsible for taking the measures in this study was taken from repeated trials (reflecting that of a single session of the main experiment) of 5 asymptomatic individuals outcome measure prior to the experiment commencing. The intratester reliability for posterior talar glide and weight-bearing dorsiflexion was estimated by calculating intratester intraclass correlation coefficients (ICC) and the standard error of the measurement (SEM). Analysis of the repeated trials revealed sound levels of reliability, with an $ICC_{3,3}$ of 0.99 (95% CI, 0.96-0.99) for posterior talar glide and 0.95 (95% CI, 0.80-0.99) for dorsiflexion. The SEM was 0.4° for posterior talar glide and 0.2 cm for dorsiflexion.

Data Management and Analysis

The 3 repeated trials of posterior talar glide and dorsiflexion before and after the application of the treatment condition were averaged and used in subsequent analyses. The pretreatment differences between the affected and unaffected ankles for posterior talar glide and dorsiflexion were evaluated by paired *t* tests ($a = .05$) and expressed as the standardized mean difference or effect size (ie, mean difference/pooled standard deviation) for intrastudy comparisons.

Data were analyzed by an omnibus 3 × 2 repeated-measures analysis of variance (ANOVA), with the factors being treatment condition (MWM_WB, MWM_NWB, and control) and time (preapplication and postapplication) ($a = .05$). Significant interaction and main effects were further examined with post hoc tests of simple effects. The type I error rate for these tests of simple effects was corrected to .017 (ie, alpha level [.05]/number of comparisons) to account for multiple comparisons. Effect sizes for the treatment conditions were also calculated to allow for intrastudy comparisons. To provide an appreciation of the size of any ameliorative effect of the treatment conditions we also expressed the data as a maximum possible effect (MPE) index, which is calculated by expressing the difference between preapplication and postapplication data as a percentage of the deficit between affected and unaffected sides. That is, the reader is presented with an index of improvement expressed as a proportion of the deficit found on examination.

Basic anatomy of the talocrural joint suggests that a posterior talar glide accompanies dorsiflexion.[14] We took the opportunity to test this relationship in our small sample size, as a secondary analysis, by using a Pearson correlation coefficient (r) between the 2 measures.

All statistical analyses were performed using Microsoft Excel and SPSS 8.0 statistical software (SPSS Incorporated, Chicago, IL).

RESULTS

Before application of the treatment conditions the mean (±SD) talar glide was 2.4° ± 2.1° on the affected side, which was significantly less ($P<.001$) than 6.3° ± 2.7° on the unaffected side. The effect size was 1.3. The preapplication dorsiflexion was 4.2 ± 1.7 cm for the affected side and 6.4 ± 1.6 cm for the unaffected side, which was significantly different ($P<.001$) at an effect size of 1.3. Talar glide and dorsiflexion on the affected and unaffected sides before treatment were not correlated to each other (r = 0.14, P = .36).

The weight-bearing and non–weight-bearing MWM treatment techniques both produced significant changes in posterior talar glide (effect sizes of 0.8 and 0.9, respectively) that were not evident following the control condition (effect size of 0.3) (Table 1). MWM reduced the posterior talar glide deficit by 50% for the non–weight-bearing and 55% for the weight-bearing techniques, which was significantly greater than an MPE of 17% for the control condition (P = .003) (Table 1). The results of the ANOVA revealed a significant interaction effect (P = .009) (Figure 5). Post hoc tests of simple effects for each condition revealed significant differences from preapplication to postapplication for the weight-bearing and non–weight-bearing MWM ($P<.001$) conditions.

MWM_WB, MWM_NWB, and the control conditions induced changes in weight-bearing dorsiflexion (effect sizes of 0.4, 0.3, and 0.1, respectively) that were relatively less than those for posterior talar glide (Table 1). The MWM techniques reduced the affected-unaffected side deficit (ie, MPE) by about 26% compared to a 9% reduction in deficit following the control condition. The results from the ANOVA revealed that there was a significant main effect for time ($P<.001$) but not an interaction effect (P = .057) or main effect for the treatment condition (P = .247).

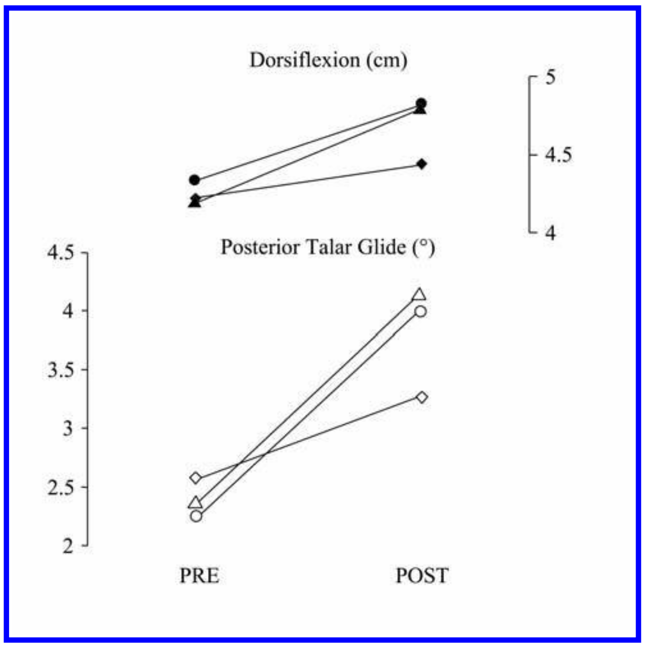

FIGURE 5. Time (pre, post) by treatment condition (weight-bearing MWM, circle; non–weight-bearing MWM, triangle; and control, diamond) interaction for the mean posterior talar glide (white), and dorsiflexion (black) data. Significant interaction effect present for posterior talar glide (P = .003), but not dorsiflexion (P = .057), for which there was a significant main effect of time ($P<.001$).

Post hoc test of simple effects revealed that there was a significant change following all conditions ($P<.01$).

A significant and substantial relationship between posterior talar glide and weight-bearing dorsiflexion was observed following the MWM_WB treatment technique, but only with indices of change, such as MPE (r = 0.88, $P<.001$) and the pretreatment-to-posttreatment difference (r = 0.53, P = .037). There was no correlation between posterior talar glide and weight-bearing dorsiflexion following the MWM_NWB (MPE: r = 0.41, P = .12; difference: r = 0.18, P = .50). There was no relationship between the 2 dependent variables (r = 0.04, P = .82) when considering raw postapplication data.

All subjects received their allocated treatment condition as randomly allocated and a poststudy questionnaire established that they remained blind to the aims of the study. There were no adverse effects resulting from the treatments and no withdrawals from the study.

DISCUSSION

The findings from this study show that the application of the MWM treatment techniques improved posterior talar glide and talocrural dorsiflexion immediately after application in subjects with chronic recurrent lateral ankle sprain. Interestingly, there appears to be little difference in treatment effect between the 2 MWM techniques, suggesting that a weight-bearing component to the MWM is not necessary for optimizing its effects on the measures used in this study (ie, posterior talar glide or dorsiflexion range of motion).

The pretreatment measurement of posterior talar glide revealed a deficit of 71% between the affected and unaffected sides, which are somewhat larger than those reported by Denegar et al[4] (ie, 52% deficit). The effect sizes for the weight-bearing and non–weight-bearing treatments were large (0.8 and 0.9, respectively) compared to the small effect size for the control (0.3).[2] This result is to be expected as a key component of the MWM treatment technique is the posterior glide that is applied manually to the joint before the patient performs an active dorsiflexion movement. Interestingly, the weight-bearing technique that is clinically favored for its replication of or similarity to functional ankle activity[11] was no more effective than the non–weight-bearing MWM for its effects on posterior talar glide. The improvements noted in the control condition, although statistically significant, were small, with an effect size of 0.3, and probably resulted from the repeated posterior talar glide and weight-bearing dorsiflexion testing that was performed in the experiment. To measure posterior talar glide the examiner pushed the talus posteriorly and the ankle into dorsiflexion until a firm capsular end-feel was encountered.[4] As the measurement technique repeatedly mobilized the talus posteriorly, it is plausible that an increase in posterior talar glide occurred as a result of testing before and after the application of the no-treatment control condition. Our findings and those of Denegar et al[4] have clinical implications for rehabilitation following lateral ankle sprain. Both studies demonstrated a deficit in posterior talar glide following lateral ankle sprain and the results of our study indicated a substantial reduction in initial deficit immediately following the MWM treatment. The clinical utility of such a change in the posterior talar glide test should be explored in future research.

This study also showed that the application of the MWM treatment resulted in positive changes in dorsiflexion range of motion. The effect sizes for the change in weight-bearing dorsiflexion was approximately half that found for the posterior talar glide and slightly larger than in our previous study[13] of the same treatment techniques in an asymptomatic population, in which we reported effect sizes in the order of 0.3. The differences in dorsiflexion improvements between the studies may be attributable to differences in baseline side-to-side deficit (15% deficit for Vicenzino et al,[13] compared to 34% deficit in the current study), inferring that treatment effects are more likely when there is a larger initial deficit. There was little difference in effectiveness between the 2 MWM treatments, suggesting that weight bearing was not necessary to improve dorsiflexion range of motion. The improvements noted for the control condition, although statistically significant, may be attributable to the repeated dorsiflexion testing performed in the experiment. A lack of dorsiflexion range of motion has been implicated as a significant risk factor for reinjury[10] and as a factor limiting normal walking gait stride and speed, and functional activities such as descending stairs and kneeling.[6] Therefore, improving dorsiflexion range of motion may have important clinical implications for the risk of reinjury and restoration of full function following lateral ankle sprain. Clinical trials of MWM following ankle sprains are required to evaluate their clinical utility and impact on injury recurrence and function.

Anatomically, the talocrural joint geometry dictates that posterior gliding of the talus is a coupled motion of talocrural dorsiflexion,[14] leading us to hypothesize that there should be an association between posterior talar glide and ankle dorsiflexion. We found reasonable associations between improvements in talar glide and weight-bearing dorsiflexion following the MWM_WB, leading us to speculate that the possible ankle function specificity of this treatment technique, beyond that of the MWM_NWB, is to improve coupling at the talocrural joint rather than provide greater improvements in posterior talar glide and weight-bearing dorsiflexion. Notwithstanding this characteristic of the posterior talar glide measure, it would appear that the poor correlation coefficients between the measures of posterior talar glide and dorsiflexion (which disproves our hypothesized relationship between posterior talar glide and dorsiflexion) may raise concerns about the ability of the posterior talar glide test used in this study to validly measure posterior talar glide. Research is required to further evaluate the utility of the posterior talar glide test to validly measure talar glide.

It is tempting to speculate as to the mechanism of action by which the MWM technique achieves the effects of improving posterior talar glide and talocrural dorsiflexion. One explanation relates to the concept of a positional fault at the talocrural joint following lateral ankle sprain. Although our methods did not allow us to measure a positional fault of the talus, we did identify a pattern of restricted posterior talar glide compared to the unaffected side pretreatment. Denegar et al[4] has suggested that this residual loss of posterior talar glide may represent a positional fault. Although the issue of positional fault was not investigated and was beyond the scope of this study, our results and those of Denegar et al[4] clearly indicate a deficit in posterior talar glide following lateral ankle sprain. The MWM technique involved the manual application of a sustained joint glide in which the talus was mobilized posteriorly in the ankle mortise and resulted in immediate improvements in posterior talar glide and dorsiflexion. It is feasible to postulate that the increase in posterior talar glide and dorsiflexion seen in this study following the MWM may be related to a reduction in positional fault at the talocrural joint. Alternatively, it is equally plausible that no positional fault exists in the presence of a reduced posterior talar glide test but, rather, there is purely a limitation of joint motion; the MWM may have produced its effects through improving (accessory) joint motion, not a change in talar position.

Interpretation of the results of this study relies to some extent on the reliability of the measures used, the manner in which the measures were made and the number of subjects studied. The assessment of posterior talar glide had high intratester reliability with a small standard error of the measurement.[4] It must be noted, however, that the validity of the assessment of posterior talar glide has not been confirmed with imaging studies and therefore the results of our study must be interpreted accordingly. To decrease the risk of potential bias the therapist performing the treatment and the investigator taking the measurements remained blind to each other's activities throughout the study data collection period and the subjects were not informed of the true purpose of the study at the time of their involvement—that is, they were blind to which treatment was intended to have an effect. As the sample size was small, the estimate of the measurement error (ie, the SEM calculated from the reliability study) was also calculated. The SEM for both the posterior talar glide and dorsiflexion measures was small, and the differences from preapplication to postapplication of the treatment techniques were substantially larger than the SEM, providing some indication that the statistically significant differences were also larger than the error of the measurement.

Furthermore, the control condition selected for this study, while allowing for a treatment effect beyond that of no treatment, did not account for the active full range dorsiflexion that the subject performed as part of both MWM techniques. Future studies should evaluate the active component of the MWM to provide insight into the role of the manual therapy component compared to active stretching alone on the effects achieved with the MWM.

CONCLUSION

This preliminary study demonstrated a positive effect of a MWM treatment technique on improving posterior talar glide and dorsiflexion range of motion in individuals with chronic recurrent lateral ankle sprain. Results of the study also demonstrated reduced posterior talar glide and a lack of dorsiflexion in the injured ankles, despite the passage of time and return to normal functional activity. Further research is needed to investigate the long long-term effect of MWM treatments in a clinical context and with regard to their mechanism(s) of action.

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