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# Graston Soft Tissue Mobilization And Dynamic Balance Training Effects On Pain And Dynamic Postural Control Of Young Athletes With Chronic Ankle Instability

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## Scientific Inquiry II

Fall 2011

### Intervention CAT

**Title:** Graston soft tissue mobilization and dynamic balance training effects on pain and dynamic postural control of young athletes with chronic ankle instability

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**Date CAT Completed:** 10/26/14

**Clinical Scenario:** The clinical scenario that encouraged me to do this intervention CAT is a patient that presents as a 17-year-old male high school athlete that has a history of chronic ankle sprains and most recently suffered an inversion sprain that was so severe his medial ankle ligaments were also involved. My clinical instructor (CI) has been trained in the Graston Technique of utilizing stainless steel instruments to assist with soft tissue mobilization. I had not been exposed to this technique prior to beginning my clinical. My CI's current plan of care for this patient includes the use of Graston for instrument assisted soft tissue mobilization, in addition to an exercise program that incorporates various strengthening exercises for the lower extremities and neuromuscular re-education activities including varying degrees of challenging single leg stance exercises. I was curious what the effects of Graston would be on a chronically unstable ankle, and if an exercise program that was geared toward balance training would be effective without the use of Graston.

**Clinical Question:** Does Graston soft tissue mobilization and dynamic balance training improve dynamic postural control, as measured by the star excursion balance test, of the ankle in 17-year-old male athletes with chronic ankle instability more so than dynamic balance training alone?

**P** – 17-year-old male athlete with chronic ankle instability

**I** – Graston soft tissue mobilization and dynamic balance training

**C** – Dynamic balance training

**O** – Improved dynamic postural control as measured by the star excursion balance test

**Clinical Bottom Line:** This article neither supports nor refutes my current plan of care for this particular patient. The study shows improvements in all outcome measures for all intervention groups, thus it is impossible to say anything more than dynamic balance training is effective at improving pain ratings and dynamic postural control. However, Graston had the greatest effect size in all outcome measures, so it can be hypothesized that Graston does have a positive effect on dynamic postural control and decreasing pain. I will continue to utilize Graston in addition to dynamic balance training on my patient to further decrease his pain and increase his dynamic postural control. I think this is the best course of action due to the vast limitations the

study possesses. It would be in the patient's best interest to continue a treatment that could only have potential benefits, rather than discontinue the treatment for lack of statistically significant results in favor of the Graston technique of soft tissue mobilization.

**Search History:**

Databases/Sites Searched	Search Terms	Limits Used
CINAHL Cochrane Medline - EBSCO Medline - PubMed SPORTDiscus	Graston technique Instrument assisted soft tissue massage Instrument assisted soft tissue mobilization Chronic ankle instability Dynamic balance training Pain High school athletes	English Humans Published in last 5 years Adolescent Adult

**Citations:**

1. Schaefer J, Sandrey M. Effects of a 4-week dynamic-balance-training program supplemented with Graston instrument-assisted soft-tissue mobilization for chronic ankle instability. *Journal Of Sport Rehabilitation* [serial online]. November 2012;21(4):313-326. Available from: MEDLINE, Ipswich, MA. Accessed October 26, 2014.

**Summary of Study:**

*Study Design:* This study was designed as a randomized single-blind controlled trial with random assignment of participants to one of three intervention groups. <sup>1</sup>

*Setting:* This study took place at the University of Missouri located in Columbia, Missouri and at West Virginia University in Morgantown, West Virginia.

*Participants:* Participants were high school or college students that were generally healthy and physically active. They were acquired from a north-central American high school and a mid-Atlantic Division I university. Forty-five subjects were present at the beginning of the study, however, only 36 subjects completed the study. The study consisted of 5 females and 31 males with chronic ankle instability (CAI) and ankle laxity of a grade I or II. Inclusion criteria consisted of the following: a minimum of 1 unilateral inversion sprain of the ankle that resulted in loss of function, pain and swelling within the last year, more than one repeated injury to the same ankle, perception of ankle instability, no ankle sprain within the previous 6 weeks, and between the ages of 16 to 30 years-old. <sup>1</sup> Exclusion criteria included the following: no history of ankle sprains, no perception of instability, grade III ankle laxity without an end feel, history of surgery to lower extremities, and conditions known to affect balance. <sup>1</sup> If a subject had bilateral ankle instability, the worse ankle was chosen. If a patient didn't complete at least 75% of the treatment sessions, they were excluded from the study.

*Interventions:* Three intervention groups were utilized in this study. The first group interventions consisted of dynamic balance training and Graston instrument-assisted soft-tissue mobilization (DBT/GISTM). The second group interventions consisted of dynamic balance training and Graston instrument-assisted soft-tissue mobilization sham (DBT/GISTM-S). The third group intervention was dynamic balance training as a control (DBT/C) group. All groups participated in a stretching program which consisted of a dynamic warm-up utilizing dynamic flex-band for 10 minutes on both lower extremities.<sup>1</sup> This protocol started on the left leg and then the right stretching the ankle into inversion and eversion, the gastrocnemius, and Achilles.<sup>1</sup> Then the hamstrings, groin, iliotibial band, quadriceps and hip flexors were stretched.<sup>1</sup> The dynamic balance training consisted of a program developed by McKeon et al. The program begins with 4 exercises for single-limb hops to stabilization, hop to stabilization and reach was performed 5 times, an unanticipated hop to stabilization was performed, and the participant had the potential to move through 7 levels of difficulty in single limb stance activities.<sup>1</sup> The DBT/GISTM group utilized Graston instruments 2-5 to treat first the ankle and posterior lower leg and then the anterior and lateral leg.<sup>1</sup> The treatment time was 8 minutes and consisted of treating restrictions in ligaments, fascia, tendons and muscle as the practitioner deemed necessary for each subject.<sup>1</sup> The DBT/GISTM-S group was hypothetically treated with the same Graston instruments, however, the instruments were glided over the surface of the skin without making an indentation or changing the shape of the skin.<sup>1</sup> The DBT/C group only performed the dynamic balance training program.

*Outcome Measures:* Outcome measures were tested pre and post-intervention. The outcome measures consisted of the following: the Foot and Ankle Ability Measure (FAAM), activities of daily living (ADLs), FAAM Sport, visual analog scale (VAS), ankle range of motion (ROM) – plantar flexion, dorsiflexion, inversion and eversion – and the Star Excursion Balance Test (SEBT) – anterior, posteromedial, and posterolateral.<sup>1</sup> The FAAM ADL and FAAM Sport were utilized for self-reported physical function and to detect CAI deficits. The VAS was utilized for self-reported perception of pain intensity measured by the hash mark on a 10 cm line. Ankle ROM was done following standard procedure; however, active ankle motion was utilized. Each direction was measured 3 times and an average was taken for the recorded value. The SEBT was utilized to determine dynamic postural control. Each subject was given 3 practice trials in each direction prior to testing. Participants performed 3 trials in each of the 3 directions. Leg length was normalized for these values and distances were reported as a percentage of leg length.

*Data Analysis:* SPSS software was utilized to analyze the data. The FAAM ADL, FAAM Sport and VAS scores were analyzed with a 2X3 repeated-measures ANOVA.<sup>1</sup> The SEBT distances were analyzed independently using 2X3 repeated-measures ANOVA.<sup>1</sup> The 4 ROM measures were analyzed separately with a 2X3 repeated-measures ANOVA.<sup>1</sup> When ANOVA results were significant, post hoc pairwise comparisons were completed. All analyses were done with alpha level of  $P = 0.05$ . Hedges  $g$  was utilized to

correct for the small sample size and to report post-intervention to pre-intervention comparisons. Hedges g was interpreted as large = 0.80, moderate = 0.50 and small = 0.20.<sup>1</sup>

**Summary of Evidence:** The FAAM ADL and FAAM Sport scores were significantly different from pre and post-testing ( $P < 0.001$ ) with improved disability scores at post-test.<sup>1</sup> The FAAM ADL and FAAM Sport scores surpassed the minimally clinical important difference (MCID) for all 3 intervention groups, which was determined to be an improvement of 8 and 9 points respectively.<sup>1</sup> The VAS also had a significant difference from pre to post-test scores ( $P < 0.001$ ), with lower pain levels indicated post-test. No groups achieved a MCID for the VAS scores, which was determined to be an improvement of 2.<sup>1</sup> ROM was significantly different from pre to post test for all directions with ( $P < 0.0001$ ), with all directions showing an increase in motion. All three intervention groups met the minimal detectable change (MDC) for dorsiflexion and eversion, however, only the DBT/GISTM intervention group met the MDC for plantar flexion and inversion as well. MDC scores for ankles motions were as follows: dorsiflexion 2.0°, plantar flexion 5.6°, inversion 2.3°, and eversion 1.0°.<sup>1</sup> All intervention groups had a significant difference between pre and post-test scores for the SEBT in anterior, posteromedial and posterolateral ( $P < 0.001$ ). With the exception of the DBT/GISTM-S intervention group in the posteromedial direction only, the MDC was met. The MDC scores for SEBT are as follows: anterior = 4.9, posteromedial = 5.2, and posterolateral = 5.4.<sup>1</sup>

**Additional Comments:** Overall, this study was of moderate quality. The study by Schaefer et al is of level II evidence. The DBT and GISTM as interventions seem to have very different purposes, with DBT improving factors related to ankle stability and GISTM improving factors relating to ankle ROM. There were several limitations to this study that could have affected the results. One example of this is the fact that the VAS pain ratings were low to begin the study, which caused a floor effect since the end results didn't show that much of a decrease in scores. Additional limiting factors of the study include the lack of long term follow-up data to see if any intervention had a more lasting effect than the others. Furthermore, since the literature is lacking in research of this nature, the length of the treatment was established for 4 weeks in this study, but there is no rationale for this that precludes a shorter or longer duration of treatment being any more or less beneficial for improved outcome measures. The external validity of this study is fair due to the sample size being one of convenience, which makes the results of this study less generalizable to other populations, that aren't high school or college athletes with CBI located in a specific geographical location. The internal validity of this study is also fair due to the lack of blinding of the researcher, whom took the pre/post-test values, to which subjects were in which intervention groups. The study seems to be statistically valid with respect to the statistical analyses done on all the outcome measures, for each intervention group, showing statistically significant changes from pre to post-testing. Overall, the fact that all intervention groups showed improvement to the level of exceeding the MDC/MCID for all of the outcome measures, with the exception of pain, shows that there is a true clinically important improvement.

This CAT was completed as part of Scientific Inquiry II (Fall 2014) under the instruction of Sally McCormack Tutt PT, DPT, MPH