Therapeutic Massage to Improve Balance in those with Chronic Ankle Instability

Purpose/Rationale

The main purpose behind this thesis is to investigate and compare the effects of three types of plantar massage on postural control on those with chronic ankle instability. The three types of plantar massage are by a sensory brush, massage ball, and traditional clinician administered plantar massage. The outcomes of this study and the benefits of these different plantar massage techniques could demonstrate which receptors in the foot are the most important to treat in those with chronic ankle instability.

Studies have shown that a lateral ankle sprain is the one of the most common musculoskeletal injuries in athletics. These injuries are commonly mistreated and often lead to chronic ankle instability. Chronic ankle instability is defined as recurring bouts of ankle “giving way”, perceived instability, or functional instability for a substantial period of time.

Common symptoms are instability, joint stiffness, ligament laxity, muscle weakness, articular degeneration, synovial changes, sensorimotor dysfunction, and impaired postural control.

Some common traditional treatments of chronic ankle instability are strengthening programs, bracing and taping, and balance programs. Several studies showed significant success in balance treatments which got researchers thinking about how this treatment may be different than the others. Balance treatments tended to have more of an effect on postural control which is one of the main detriments associated with chronic ankle instability. There has now been a substantial amount of evidence to suggest that treatments that target the sensory inputs, part of the sensorimotor system could be effective in treating this condition. Some common sensory treatments are stochastic resonance, joint mobilizations, and plantar massage. LeClaire & Wikstrom found significant improvements in the balance of chronic ankle instability subjects who underwent a simple five minute clinician delivered plantar massage. The purposes of this
Therapeutic Massage to Improve Balance in those with Chronic Ankle Instability

study are: 1) to determine if a self-delivered massage (e.g. massage ball) is as effective as a traditional clinician delivered massage, and 2) determine if the postural control improvements previously observed were due to stimulating the cutaneous receptors or the underlying muscular receptors.

Methods

A cross-over design will be in this study, with the order of the treatments being randomized by the Latin Square Design. Inclusion criteria of the study will include male or females between the ages of 18 and 45 with self-reported CAI. This is defined by episodes of recurrent ankle sprains and/or feeling of instability or “giving way” after an initial ankle sprain. The subject must report at least two episodes of “giving way” within the previous 6 months; answering “YES” to 5 or more questions on the Ankle Instability instrument (AI); a score of <90% on the self-reported Foot and Ankle Ability Measure (FAAM); a score of <80% on the FAAM Sport. The exclusion criteria will include failing to meet the inclusion criteria, balance and vision problems, acute lower extremity and head injuries (<6 weeks), chronic musculoskeletal conditions known to affect balance, history of musculoskeletal surgeries on either limb, and a history of fracture on either limb that required realignment. Eligibility will be determined on the exclusion and inclusion criteria.

Selected subjects will participate in three total sessions over at least a three week period of time. Each session will consist of a pre-test, a treatment, and a post-test. Pre and post-testing across all sessions will be identical. The first session will consist of gathering general information about the patient such as: height, weight, age, leg length, and foot size. These will be measured by a tape measure and a scale. Further questions regarding injury history will be
Therapeutic Massage to Improve Balance in those with Chronic Ankle Instability

collected and a basic assessment of ligament laxity will be performed using standard assessment
techniques performed by health care professionals. Pre-test will be performed before the
treatment is administered and will include measuring, static balance, dynamic balance, and
cutaneous sensation. Static balance will be tested using a force plate. The participant will
balance on one leg with their hands on their hips for ten seconds with their eyes open while
standing on the force plate. Three trials will be recorded on each limb, but if there are any
faults such as putting the foot down or using hands to regain balance, the trial will be stopped
and repeated. Dynamic balance will be measured by using a star excursion balance test. The
directions tested will be anterior, posteriormedial, and posteriolar lateral. Participants will stand
on one leg and reach in all three of these directions with the other leg but will not put weight on
the reaching leg. The last assessment will be the participant’s cutaneous sensation on the
plantar surface of the foot. Semmes-Weinstein monofilaments will be the tool used. These
monofilaments will be placed on three points of the foot (the head of the first metatarsal, the base
of the 5th metatarsal, and the heel. Participants will be asked to close their eyes during testing.
The monofilament tip will be applied to the skin until the monofilament bends, forming a C
shape. The participants will then be asked whether they detect the touch of the
monofilament. This process will start with the smallest monofilament and continue until touch
is sensed in each point.

The treatments that will be administered after the pre-test are traditional plantar
massage, ball massage, and a sensory brush. Each of these treatments will be given once for a
time of five minutes. The traditional plantar massage will be administered by the primary data
collector (me), and the techniques light pettrisage and effleurage will be used. To do this, I will
place my hands on the subject’s foot with my thumbs on the plantar surface and his fingers of
Therapeutic Massage to Improve Balance in those with Chronic Ankle Instability

both hands on the dorsal (top) side of the foot. This is a typical manual therapy treatment used in athletic training settings. The ball massage is a self-administered treatment in which the subject roles the plantar surface of their foot on a spiked rubber ball to somewhat mimic the technique used for traditional massage. This will also be a five minute massage administered once while the participant is in a seated position. The last intervention will be the handheld sensory brush massage. This will again be a onetime massage for duration of five minutes. This technique will be completed by gently stroking the brush (looks like a corn brush) over the bottom of the foot (imagine brushing hair). The patient will be lying on their back for this treatment. Sensory brushes are used for working with children or adults with sensory processing issues. Subjects will be assigned to one of three treatment orders (1: traditional, ball, sensory; 2: sensory, traditional, ball; 3: ball sensory, traditional) that will be completed over the sessions that they attend. Following the treatments, each participant will complete post-testing which will be identical to the pre-testing methods.

Data Analysis

All of the data will be entered in SPSS for statistical analysis. Two separate repeated measures multivariate ANOVAs (static balance and dynamic balance) will be used for each of the study questions. Additionally, a repeated measures ANOVA will be used to analyze the cutaneous sensation data for each research question. Differences will be determined with a statistical significance level of 0.05 as well as effect sizes and 95% Confidence Intervals.

Implications

Question 1 (Is a massage ball as effective as a traditional massage): equal improvements or greater improvements from the massage ball would suggest that those with chronic ankle
Therapeutic Massage to Improve Balance in those with Chronic Ankle Instability

instability can improve their postural control by treating themselves. This result would also help improve the efficiency of clinical practice by allowing clinicians to help other patients instead of dedicating time to perform the massage treatments. Larger improvements from the traditional massage may indicate that the selected massage ball or massage ball parameters may not stimulate the foot in the same way and suggest that further research is needed to explore this question.

Question 2 (Stimulation of which receptors cause postural control improvements in those with chronic ankle instability): equal improvements or greater improvements from the sensory brush would suggest that stimulating the cutaneous receptors are responsible for improving postural control. Larger improvements from the traditional massage would indicate that stimulation of the muscular receptors are responsible for the postural control improvements. This is because the cutaneous receptors are stimulated during both the traditional and sensory brush treatments but only the muscular receptors are stimulated during the traditional massage.
Therapeutic Massage to Improve Balance in those with Chronic Ankle Instability

References