IJSPT

ORIGINAL RESEARCH

COMPARISON OF DRY NEEDLING VS. SHAM ON THE PERFORMANCE OF VERTICAL JUMP

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ABSTRACT

Introduction: Dry needling has been reported to decrease pain in subjects having myofascial trigger points, as well as pain in muscle and connective tissue.

Objective: The purpose of the study was to compare the effects on the ability to perform a two-legged vertical jump between a group who received one bout of dry needling and a group who received one bout of a sham treatment.

Methods: Thirty-five healthy students (19 males, 16 females) were recruited to participate in this study (mean age 22.7 + /- 2.4 years). The subjects were randomly divided into two groups- dry needling (n = 18) vs sham (n = 17). The dry needling group received needling to four sites on bilateral gastrocnemius muscles; two at the medial head and two at the lateral head. The sham group had the four areas of the gastrocnemius muscle pressed with the tube housing the needle, but the needle was never inserted into the skin. Two-legged vertical jump was measured with chalk marks on the wall before and after the dry needling and sham treatments.

Results: Analysis with a t-test indicated that the dry needling group significantly increased vertical jump height 1.2 inches over the sham group.

Conclusion: One bout of dry needling showed an immediate effect at significantly increasing vertical jump height in healthy, young adults. Future research is needed to determine if dry needling has any long-term effects.

Level of Evidence: 2b

Key Words: dry needling, trigger points, vertical jump

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Acknowledgements
The authors wish to thank Hannah Nelson, Halah Nelson, and Melissa Carter for their assistance with data collections.

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DOI: 10.16603/ijspt20170747

INTRODUCTION

The American Physical Therapy Association describes dry needling as a skilled intervention performed by a physical therapist that uses a thin filiform needle to penetrate the skin and stimulate underlying myofascial trigger points as well as muscle and connective tissue.[1] Dry needling is used to manage neuromuscular impairments, and treat pain associated with trigger points. Tekin et al[2] reported dry needling to be effective in relieving pain and improving quality of life of subjects suffering from myofascial pain syndrome. Llamas[3] reported dry needling to be as effective in increasing cervical range of motion and decreasing pain as manual therapy. This particular study[3] also found dry needling to be more effective in improving pressure pain thresholds or decreasing pain sensitivity in patients. A similar study determined that a single session of dry needling decreased neck pain and increased cervical range of motion.[4] Dry needling has been found to be effective for up to six weeks in reducing the symptoms in subjects suffering from fibromyalgia.[5] Dry needling combined with physical therapy has been found to reduce pain and increase range of motion and function in subjects suffering from chronic pain following a total knee arthroplasty.[6] Haser et al[7] investigated the treatment of chronic ankle sprains in soccer players and found dry needling to be an effective adjunct to proprioceptive and strengthening exercises for the management of chronic ankle sprains. In addition, Haser et al[7] reported that dry needling increased maximal force output of the quadriceps muscles and decreased injuries. Lavelle et al[8] reported that dry needling releases opioid peptides, creating an environment for tissue regeneration and reducing the concentration of nociceptive and reducing the level of nociceptive and sensitive chemical substances in the immediate environment around the trigger point.

Myofascial trigger points (MTrPs) are localized hypersensitive spots in a tight band of muscle.[9] The MTrP, often undiagnosed, are very often found in subjects suffering from myofascial pain.[10] These MTrPs can be active or latent, with active MTrPs being the most common trigger points treated in the clinic.[10] While MTrPs cause spontaneous pain and are painful upon palpation of that area, latent trigger points do not produce spontaneous pain but are only painful to palpation.[10] These latent trigger points have proven to cause accelerated muscle fatigue and overload of non-affected motor units near the trigger point.[11] Quinn et al[12] compared the use of myofascial trigger point therapy and medicine ball exercises to no intervention on hip flexor length, golf swing biomechanics, and performance in elite golfers. The authors found that backswing hip turn improved in the group receiving myofascial trigger point therapy and medicine ball exercises.[12]

The purpose of the study was to compare the effects on the ability to perform a two-legged vertical jump between a group who received one bout of dry needling and a group who received one bout of a sham treatment. Vertical Jump is often used as an indicator of an measurement of lower extremity power.[13,14] Training programs have used the vertical jump as an indicator as to whether or not the program adequately improves athletic performance.[13,14]

METHODS

Thirty-five healthy asymptomatic college students signed an informed consent form. Subjects with any lower extremity injuries within the prior year were excluded. The protocol and procedures were approved by the Institutional Review Board at the University of Central Arkansas. Subjects were randomly assigned to the sham group or to the dry needling group. The subjects were blinded to which group they were assigned.

PROCEDURES

Once each participant signed the informed consent, he or she performed a two-minute warm-up. The warm-up consisted of jogging in place. After finishing the warm-up, the subject dipped their finger in ground up chalk. The chalk was used to mark the wall during the performance of the vertical jumps. The subject first reached as high as he or she could and touched the wall leaving a chalk mark. The subject then jumped off two feet as high as he or she could and touched the wall leaving another chalk mark. The subjects were allowed to use arms for counter movement swing. The distance between the two marks were then measured and recorded as vertical jump height.

The gastrocnemius muscles of all subjects participating in the study were then palpated to determine if

Figure 1. *Procedure for intervention in dry needling group.*

trigger points were present. If no true (active) trigger points were found, areas of tightness were palpated and considered to be a latent trigger point.

The subject's calves were then wiped with alcohol to prevent possible infections. All subjects received needling with four needles in each leg. After palpation, two areas in the medial head of the gastrocnemius and two areas of the lateral head of the gastrocnemius of both legs received dry needling (Figure 1). The tube was placed on the skin and the needle was tapped and inserted; no pistoning was performed. At four points on each leg, the needles were inserted, one right after the other, resulting in almost simultaneous insertion of the needles. The participants in the sham group had four areas of the gastrocnemius muscle of both legs pressed with the tube housing the needle after palpation, but the needle was never inserted into the skin in any of the areas. The author performing the dry needling was certified and had 3.5 years of experience performing dry needling.

Once the subject finished the dry needling or sham portion of the study, he or she was asked to perform another vertical jump, in the same manner as the first attempt. The time between the first jump - and then being randomly assigned to a group and receiving the dry needling or the sham treatment – was an average of 10 minutes until the second jump. The second jump was measured and recorded using the same procedures as the initial jump. The researcher measuring vertical jump, before and after dry needling or sham, was blinded as to whether the subject received the dry needling treatment or the sham.

Data Analysis

The results of the sham group were used in an analysis of pre-test-post-test reliability by calculating an ICC. The difference in the first and second jump was calculated for each subject. The difference score was used to compare the dry needling group to the sham group using an independent t-test.

RESULTS

Mean age of the 35 participants was 22.7 (+/-2.4) and 19 males and 16 females participated. Eighteen volunteers were assigned to the dry needling group and 17 were randomly assigned to the sham group. Forty pieces of candy were placed into a bag. Twenty of the pieces were pink and twenty were yellow. The subject then chose a piece of candy from the bag. The subjects were given no indication as to what the candy represented. The subjects who chose the pink pieces of candy were placed in the dry needling group while the subjects who chose the yellow pieces of candy were places in the sham group.

Descriptive statistics are presented in Table 1. An ICC performed on the sham group first test (17.19 inches +/- 4.69) compared to second test (17.56 inches +/-4.97) resulted in a correlation of .98.

Table 1. *Descriptive Statistics.*

	N	Minimum (Inches)	Maximum (Inches)	Mean (Inches)	Standard Deviation
Sham-Pre	17	10	28.00	17.19	4.68
Sham-Post	17	10	28.00	17.56	4.97
Dry-Pre	18	10	25.50	17.00	4.15
Dry-Post	18	10	27.00	18.23	4.61

Comparing the difference scores between the dry needling group and the sham group demonstrated a significant difference ($t = 2.16$, $df = 33$, $p = .038$) of 1.2 inches.

DISCUSSION

The dry needling group had a significant increase in vertical jump height compared with the sham group. One of the purposes of this study was to determine if dry needling would inhibit athletic performance. The results of the current study indicate that not only does dry needling not inhibit athletic performance, but may actually enhance the performance (vertical jump). The findings of this current study indicate that the use of this treatment just prior to competition will not negatively affect performance. While the 1.2 inch increase in vertical jump was significant, the question may arise whether or not this difference is clinically relevant. A one inch increase may not make a significant difference in activities of non-athletes, but a one inch change in vertical jump in athletes may mean the difference between winning and losing.

Haser et al[7] found that dry needling increased maximal force in knee extensor muscles, but this current study is the first to examine the effects that dry needling has on a functional activity such as vertical jump. Vertical jump is a functional activity that can be conducted as a proxy measure of the gastrocnemius/soleus muscle complex performance.[14] The findings in this study seem to concur with the results of the study by Haser et al[7] who found an increase in maximal force of knee extensor muscles after dry needling.

The subjects in this current study were healthy college students. Because the subjects reported no pain at any of the palpable trigger points, such points would be considered latent trigger points. According to Ge et al,[15] a latent trigger point is associated with an accelerated development of muscle fatigue, while simultaneously overloading active motor units close to a myofascial trigger point. The authors[15] also stated that elimination of latent trigger points may effectively reduce accelerated muscle fatigue and prevent overload within the muscle. Theoretically by releasing the latent trigger point points that may cause muscular weakness and fatigue, the subjects increased their vertical jump significantly compared to the sham group.

In the study by Haser et al,[7] the participants received dry needling once a week for four weeks. This is the first study to show improvement in lower extremity function with only one bout of trigger point dry needling. Future research is needed to determine how long the effects of the one bout will last, and if the effects carry over to other sport specific activities. Future research should also focus on determining if similar effects will be seen in upper extremity activities.

CONCLUSION

One bout of dry needling showed an immediate effect with a significant increase in vertical jump height in healthy, young adults. Future research is needed to determine if dry needling has any long-term functional effects.

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