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Immediate effect of integrated neuromuscular inhibitory technique on calf pain and ankle rom in Bharatayanatyam dancers-experimental study

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Abstract
Background: Dance related injuries are usually a result from inherent biomechanical factors environmental and training issues as well as technical competence. Calf pain and restricted ankle ROM in Bharatnatyam dancers is common due to overuse of the soleus and gastrocnemius because they are the chief muscles in the lower limb one of the main cause of the calf pain is trigger point. Nature of many dance positions the knee experiences torque from a tenderness and swelling. Integrated neuromuscular inhibitory technique is suitable for Bharatnatyam dancers who have calf pain.
Aim and Objective: To study the immediate effect of integrated neuromuscular inhibitory technique on calf pain and ankle ROM in Bharatnatyam dancers.
Methods and Materials: Various Bharatnatyam dance classes in and around pune. Participants (Total n=58) were selected according to the inclusion exclusion criteria; informed consent was taken. Participants with calf pain were assisted using visual analogues scale (VAS) preintervention data was noted. Integrated neuromuscular inhibitory technique was performed on dancers and immediate take post intervention-based assessment was done.
Result: Total 58 female were evaluated with age between 16 to 30 year. Data analysis was done using paired t-test. Post intervention pain ($p>0.0001$) was statistically significant.
Conclusion: This study was concluded that immediate effect of neuromuscular inhibitory technique is effective on pain and ankle ROM in Bharatnatyam dancers.

Keywords: calf pain, ankle ROM, INIT, chief muscle

Introduction
Dance is form that is generally referred to movement of the body usually rhythmic and to music used as form of expression, social interaction presented in a spiritual or performance setting [1]. It not only involves flexibility and body movement but also physics of the body [1]. If proper physics is not taken into consideration injuries may occur [1]. Dance related injuries are usually a result from inherent biomechanical factors, environmental and training issues as well as technical competence [1]. The most common locations for injuries are ankles, lower leg /calves, usually caused by overuse, muscle strains and sprain [1]. Because of the nature of many of the dance positions the knee experiences torque from a tenderness and swelling [4]. The aramandi position: position actually lead to impingement of the anterior lip of the tibia on the talor neck [4].
The kutunuam position: position leads to extreme plantar flexion causing posterior impingement [4].
Due to overuse of gastrocnemius and soleus musculoskeletal (calf muscle), in dancers they are the chief muscle in the lower limb, the prevalence of injury, pain, cramps etc. are very common [1].
One of the main cause of the calf pain and cramps is myofascial trigger points [1].
Myofascial trigger points are hyperirritable spot which is usually a taut band of skeletal muscle, which is painful on compression and give rise to musculoskeletal dysfunction [3].
Gastrocnemius muscle being the main muscle of mobility and stability in bharatanatyam dancers [1].
Due to constant use of this muscle, it may cause trigger points [1].
Trigger points are common in gastrocnemius due to physical overload and miss position of

the foot [1]. The prevalence of trigger point of calf in Bharatnatyam dancers is 207 [1].

Materials:

- Study design: Experimental
- Sample size: 58
- Study population: Bharatnatyam dancers with calf pain
- Study setting: Bharatanatyam dance class in and around pune
- Study duration: 6 months

Material: pen, paper, scale, consent form.
Outcome measures: Visual analogues scale (VAS) for pain and goniometry for ankle ROM.

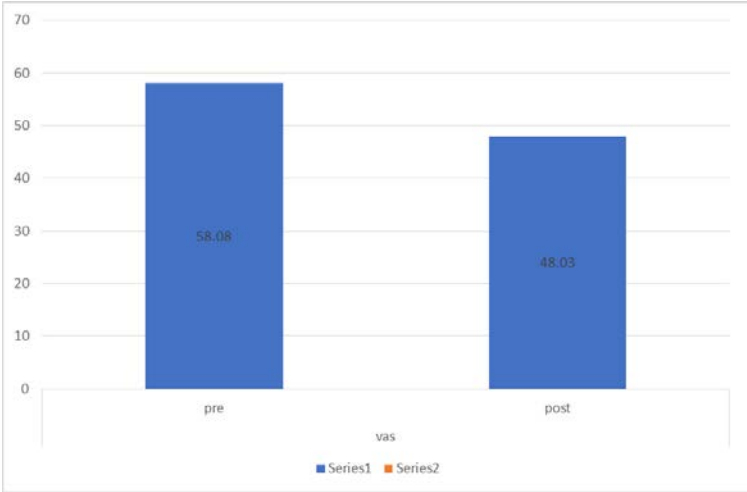
Method

58 subjects were selected who had calf pain. Detailed instruction was given to the subjects regarding the study and consent was taken from the subjects who were willing to participate. Subjects were selected according to the inclusion and exclusion criteria. Pre intervention assessment was done using VAS and ankle ROM and data was recorded. Intervention was explained to the subjects. Post intervention assessment was done using VAS and ankle ROM. Data was collected and analysed using graph pad prism 9.11 version. Results were recorded.

Data Analysis

Table 1: Visual Analogue Scale (Graph No. 1)

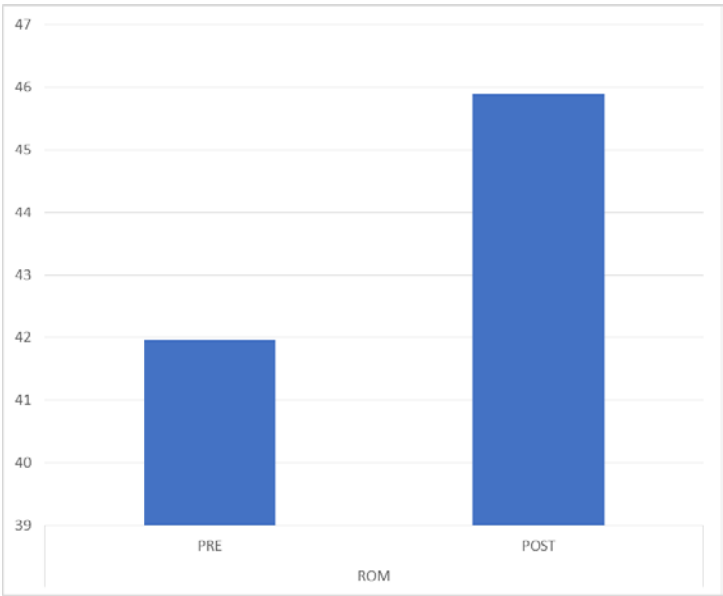
	Mean	Standard deviation	P value
Pre-Intervention	58.08	6.85	0.0001
Post Intervention	48.03	8.38	



Graph 1: Vas score mean graph

Table 2: Active ROM Dorsiflexion (Graph No. 2)

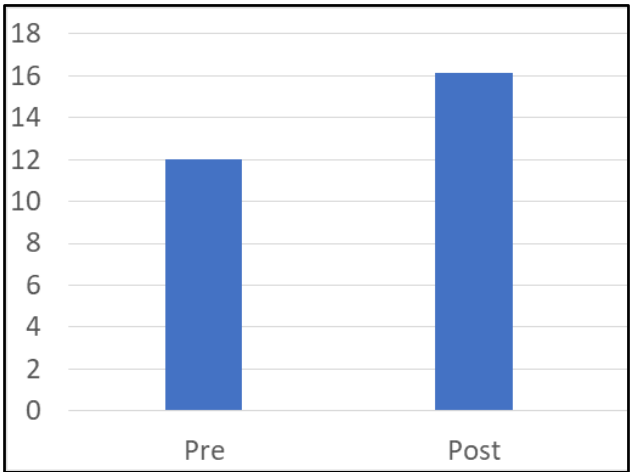
	Mean	Standard deviation	P value
Pre-Intervention	41.96	2.33	0.0001
Post Intervention	45.89	5.27	



Graph 2: Dorsiflexion Mean Value Graph

Table 3: Active ROM Plantarflexion (Graph No. 3)

	Mean	Standard deviation	P value
Pre-Intervention	12.01	16.13	0.0001
Post Intervention	2.22	2.04	



Graph 3: Plantarflexion Mean Value Graph

Results

- This study evaluated 58(n) in the age group 16 to 30 year.
- Paired t-test was done to camper pre and post VAS values of calf pain which showed p value <0.0001 which is highly consider.
- Also, when compared the pre and post ankle ROM using t-test, it gave p value <0.0001 which highly significant.

Discussion

Current study was conducted to study the immediate effect of Integrated Neuromuscular Inhibitory Technique on calf pain and Ankle ROM in Bharatanatyam dancers. The total no. of 58 female individual were participated in study. The result of the current study showed that Integrated Neuromuscular Inhibitory Technique is effective in improving Ankle ROM and reducing pain in Bharatanatyam dancers (p-0.0001).

Rob Griveve (2009) In their study titled "the immediate effect of soleus trigger point pressure release on restricted ankle joint dorsiflexion". Demonstrates that statistically a single treatment of trigger point pressure release to the soleus has an immediate effect on restricted active ankle dorsiflexion ROM [3]. The clinical implication of increased ankle ROM after only one treatment would include cost effectiveness and patient satisfaction. The calf pain in dancers is often results from overuse injury. There is evidence that for dancers at all skill levels, musculoskeletal injury is major health issue [1]. There is high prevalence and incidence of lower extremity, where soft tissue and overuse injuries are most common [1]. Studies have shown that trigger point is developed when the muscle has been in continues shortened state, with the knee bent and foot plantarflexed [1]. In Bharatanatyam dance form, it is seen that the above-mentioned position of the leg is hold for long durations [1]. Nisha Yadav (2016) in their study titled "immediate effect of soleus trigger point pressure release and post isometric relaxation (MET) on restricted active ankle joint dorsiflexion among college females" the findings of present study confirm the positive effects of trigger point pressure release and post isometric relaxation (MET) on restricted active ankle joint dorsiflexion and significantly improved the range of motion in ankle joint, results showing improvement occurs more in post isometric relaxation group as compared to trigger point pressure release group [2]. Mehdikhani *et al.* 2012, Change Zern Hong, 2006 concluded that MET changes in pressure sensitivity in latent trigger point in upper trapezius muscle [2]. Cleofas Rodriguez Blanco, 2006 evaluated the effectiveness of post-isometric relaxation in active mouth opening following a single treatment of latent trigger point in masseter muscle [2]. Simons *et al.* (1999) claimed that stretching of muscle with trigger point might be useful since the stretching can reduce the contraction knot as well as increasing circulation to the area this theory explains the mechanism of post isometric relaxation [2]. The clinical implication of increased ankle ROM after the treatment protocol would include cost effectiveness and patient satisfaction [3]. Superiority Of trigger point could possibly due to involvement of the whole muscle for the lengthening of contracted sarcomere as compared to pressure release which works directly on trigger point only [2]. Here the pressure release technique used is Integrated Neuromuscular Inhibitory Technique which is combination of three techniques namely: - "Ischemic compression, Strain-counterstain, Muscle energy technique." Coxford *et al.* (1998), suggested that clinicians using goniometry should only assume that areal clinical change in ankle dorsiflexion has occurred when there has been a ROM change of more than 5°[3]. The results should be interpreted in relation to the findings accordingly. Hanten *et al.*, 2000; Chatchawan *et al.*, 2005; Buttagat et el., 2010; Hou *et al.*, 2002; Fernandes de las Penas *et al.*, 2004; Blanco *et al.*, 2006; Gemmell *et al.*, 2008; have utilized ROM as an outcome major in the management of myofascial trigger points [3]. Although none of these studies have focused on the lower limb.

Conclusion

This study conclude that Immediate Effect of Neuromuscular Inhibitory Technique Is effective on pain and Ankle ROM in Bharatanatyam dancers.

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