The Effects of Conventional Physiotherapy Versus Kinesiotaping and Conventional Physiotherapy on Delayed Onset Muscle Soreness in Calf Muscles in Amateur Trekkers.

-An Experimental Study

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Abstract: Background- Delayed Onset Muscle Soreness (DOMS)is a self-limiting condition that occurs after vigorous and unaccustomed resistance training or any other form of muscular overexertion. DOMS appeal approx. after 12 to 24 hours after the cessation of exercise and peaks at 48 to 72 hours and subsides naturally after 3 to 4 days. To study the effect of Conventional Physiotherapy and Conventional Physiotherapy Exercises on DOMS in calf muscles in Amateur Trekkers. DOMS limits the functional range of motion in muscles. DOMS is the most common a trekker gets after trekking, which also hampers some of their functional activities. So, the need for this study is to relieve the temporary termination of pain in people with trekking. To check whether the application of Kinesiotaping and Cryotherapy with Stretching is effective in reducing the effect of DOMS and regaining functional range. To check which recovery method is the best for DOMS so that trekkers won't face any pain which will hamper their functional activities.

Methodology:69 participants participated in the study. Participants were divided into 2 groups by simple random sampling i.e., Group A and Group B. Participants in Group A were treated with Conventional Physiotherapy, and participants in Group B were treated with K-taping and Conventional Physiotherapy. Pre and Post pain readings were recorded using the NPRS scale and similarly pre and post Range motion readings were recorded using Goniometer. Statistical analysis was done and results were tabulated.

Results: For Pain, after comparing the p values it proved that both the Groups showed similar results for immediate, after 24 hrs Rx and also after 48 hrs. Rx. Similarly, for Range Motion after comparing the p values it proved that both the Groups showed similar results for immediate, after 24 hrs Rx and also for after 48 hrs Rx

Conclusion: From this study, we can conclude that both groups i.e., Group A (Conventional Physiotherapy) And Group B (K-taping and Conventional Physiotherapy) are equally efficient for treating DOMS and shows the same effect on both NPRS and Ankle Range of Motion.

Keywords: Calf Muscles, Delayed Onset Muscle Soreness (DOMS), Amateur Trekkers, Conventional Physiotherapy, K-taping.

INTRODUCTION:

Trekking is one of the most adventurous activities. Amateur Trekkers are those who do trekking as a hobby or for pleasure and not for any financial benefit or professional reasons. The prevalence of DOMS in calf muscles in amateur trekkers is 77.6%

Delayed Onset Muscle Soreness(DOMS) is a self-limiting condition that can temporarily affect a person's performance.[1] DOMS occurs after vigorous and unaccustomed resistance training or any other form of muscular overexertion.[2]

DOMS are noticeable in the muscle belly or at any myotendinous junction [2]. DOMS appeals approx. after 12 to 24 hours after the cessation of exercise and peaks at 48 to 72 hours and subsides naturally after 3 to 4 days.[2] Signs and symptoms of DOMS include pain, oedema, increased passive stiffness, and reduced range of motion [1]Several pathways have been identified that lead to DOMS, including lactic acid accumulation, muscle spasm, muscle and connective tissue injury, and the release of enzymes and inflammation.[1] There are the following theories that resulted in the aetiology of DOMS:

Metabolic Waste Accumulation Theory: It is suggested that DOMS in this theory is because of lactic acid in the muscle after exercise. But multiple studies have shown that it requires only about 1 hour of recovery after exercise to exhaustion to remove almost all lactic acid from skeletal muscle and blood.

Muscle spasm theory: It is also proposed as a cause of DOMS, suggesting that a feedback cycle of pain caused by ischemic and build-up of metabolic Waste products during exercise led to muscle spasms. This theory has been discontinued because research showed no increase in EMG activities and no evidence of spasms in muscles with delayed soreness.

Micro trauma theory: DOMS is induced because of contraction-induced mechanical disruption of muscle fibres /connective tissue and around the muscle resulting in degeneration of tissue. Evidence of tissue damage such as elevated blood serum levels of creatine kinase is present for several days after exercise and is accompanied by inflammation and oedema.[2]

Therefore, different strategies for treating these issues have been proposed, including non-steroidal anti-inflammatory medications and rehabilitation as a whole. Conservative administration has shown some progress, including Cryotherapy, ultrasound, electrical

stimulation, relaxation, stretching, immobilization, and rest. For the treatment of acute soft tissue injury, rest, ice, relaxation, and elevation regimens have commonly been used.[1]

Today, Kinesiology tape has been used in various fields such as reducing pain, increasing muscle strength, preventing reinjury, improving function, and increasing range of motion. Many authors have reported positive results from the use of Kinesiology tape in the physiotherapy treatment process.

According to the present study results, the Kinesiology tape possibly reduced DOMS-induced parameters like pain, range of motion limitations, and function[1]

Cryotherapy: The application of cold for the treatment of injury is called Cryotherapy. Various methods of cryotherapy include ice towels, ice massage, ice packs, and cold-water immersion. The physiological and biological effects are due to the reduction in temperature in various tissues and the relaxation of muscles produced by the application of cold.[4]

Stretching: Stretching is a general term used to describe any therapeutic manoeuvre designed to increase the extensibility of soft tissue thereby improving the flexibility and joint range of motion by elongating (lengthening) structures that have adaptively shortened and have become hypo mobile over time.[2]

Kinesiology taping was invented by Dr Kenzo Kase. the adhesions of K-tape stimulate the mechanoreceptors in the skin and helps in reducing pain. K taping application facilitates the reduction of oedema, improves lymph and blood circulation, and contributes through proprioception to the normalization of muscle function and support of ligaments and tendons.[3]

The adhesion of the K tape to the skin and the resulting mechanical displacement caused by body movement leads to stimulation of the mechanoreceptors in the skin. These proprioceptive afferents run to the dorsal horn and inhibit the relaying of nociception, thus reducing pain. Stimulation from kinesiotaping on the skin increases blood circulation [3]

NEED OF STUDY

DOMS limits the functional range of motion in muscles. DOMS is the most common a trekker gets after trekking, which also hampers some of their functional activities. Most of the trekkers avoid trekking due to pain because of DOMS as they are unable to attend their work the next day.

So, the need for this study is to:

To relieve the temporary termination of pain in people with trekking. To check whether the application of Kinesiotaping and Cryotherapy with Stretching is effective in reducing the effect of DOMS and regaining functional range. To check which recovery method is the best for DOMS so that trekkers won't face any pain which will hamper their functional activities.

AIM:

To study the effect of Conventional Physiotherapy and Conventional Physiotherapy Exercises on DOMS in calf muscles in Amateur Trekkers.

OBJECTIVES:

1. To study the effect of Kinesiotaping and Conventional Physiotherapy on DOMS in calf muscles in amateur trekkers.
2. To study the effect of Conventional Physiotherapy on DOMS in calf muscles in amateur trekkers.
3. To compare the effects of Conventional Physiotherapy versus Kinesiotaping and Conventional Physiotherapy on DOMS in calf muscles in amateur trekkers.

MATERIAL AND METHODLOGY

1. Kinesiotape
2. Scissor
3. Goniometer
4. Recording Sheet
5. Pen

METHODOLOGY

- Study Design: Interventional
- Study Set Up**:** PMC/PCMC
- Sampling Technique: Simple Random Sampling
- Sample Size**:** For GROUP A =35 & GROUP B =34
- Study Duration**:** 6 months

OUTCOME MEASURES

1. NPRS scale for pain
2. Goniometer for Range of Motion

INCLUSION AND EXCLUSION CRITERIA

Inclusion Criteria	**Exclusion Criteria**
1. Trekkers with DOMS in calf muscle after trekking.	1. Trekkers who cannot be treated immediately after getting DOMS.
2. Age criteria: 18-35 years	2. Trekkers have a metal implants in their lower limbs.
3. Trekkers having pain intensity 5 or more than 5 on NPRS	3. Trekkers who get DOMS in muscles other than calf muscles.
4. Trekkers who do not have any other musculoskeletal disorder.	

HYPOTHESIS

Null Hypothesis:

There is no effect of Conventional Physiotherapy versus Kinesiotaping and Conventional Physiotherapy on Delayed Onset of Muscle Soreness in Trekkers.

Alternative Hypothesis:

There is an effect of Conventional Physiotherapy versus Kinesiotaping and Conventional Physiotherapy on Delayed Onset of Muscle Soreness in Trekkers.

PROCEDURE

Ethical committee clearance was obtained and permission was taken from the department. Written consent was taken from the subjects who fulfil the inclusion criteria and who volunteered to participate in the study. The subjects were divided into two groups Group A and Group B. The pain intensity was taken before the intervention by Numerical Pain Rating Scale and also the ankle ranges were taken by the Goniometer immediately after the activation of DOMS.

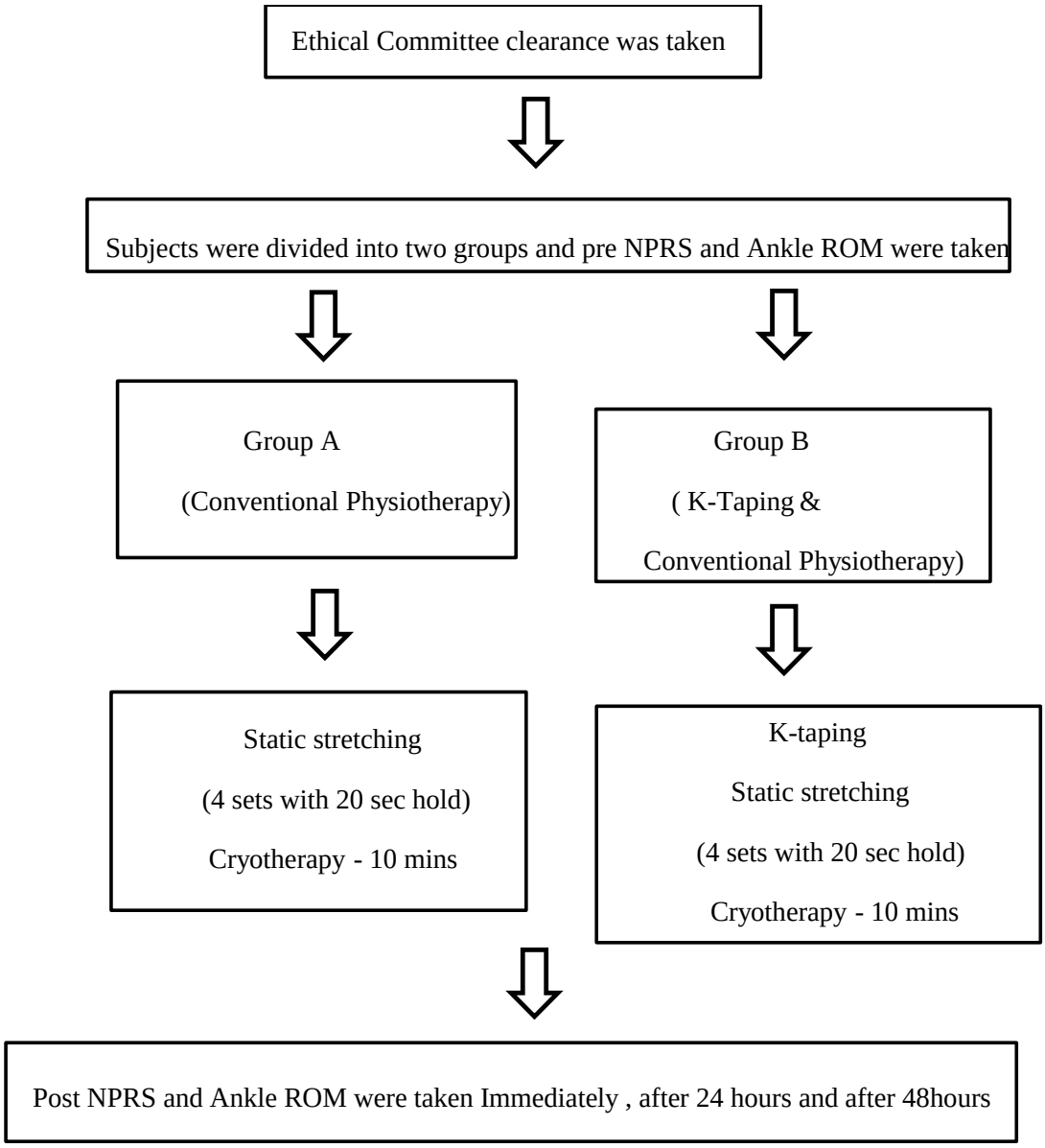
Group A was given conventional physiotherapy (i.e., Cryotherapy and Static Stretching) and Group B was given K- taping and Conventional Physiotherapy K-taping was applied in a **Y**-shaped manner on the calf muscle using ligament technique. The Inhibitory technique of K-taping was used i.e., the tape was applied from insertion to origin of the muscle. For Group A i.e., Conventional Physiotherapy which included static stretching, and cryotherapy Static stretching was given in 4 sets with 20 seconds of hold and cryotherapy for 10 minutes.

For Group B i.e., K-taping and Conventional Physiotherapy which included taping, static stretching, and cryotherapy. For applying K-tape, the subject was taken in such a position where the calf muscle was in an elongated position. The tape was stretched maximally before applying, followed by static stretching and cryotherapy.

Post readings i.e., NPRS and Ankle ROM of both Group A and Group B were taken immediately and noted. Similarly, static stretching and cryotherapy were given to both Group A and Group B After 24 hours of activation of DOMs, and also static stretching and cryotherapy were given to both Group A and Group B after 48 hours of activation. Post readings i.e., NPRS and Ankle ROM of both Group A and Group B were taken immediately after giving the treatment and noted.

FIG 1. STATIC STRETCHING

FIG 2. K-TAPING



	Group	Mean	Median	SD	SE	P value
NPRSIm-R	Group A	3.371	3.00	1.215	0.2053	0.218
	Group B	3.735	4.00	1.214	0.2082	
NPRSIm-L	Group A	3.371	3.00	1.215	0.2053	0.222
	Group B	3.735	4.00	1.238	0.2124	

DATA ANALYSIS AND RESULTS

Data was collected and analyzed by appropriate statistical tests. Within a group, Paired T test was used for pre and post-readings of NPRS and Ankle ROM. (GROUP A-Conventional physiotherapy i.e., Static Stretching and Cryotherapy) and (GROUP B – Kinesiotaping and Conventional Physiotherapy). To check the effect between two different groups, the Unpaired T-test was used. For statistical analysis, a statistician was consulted.

COMPARISON OF IMMEDIATE Rx OF GROUP A &B ON NPRS

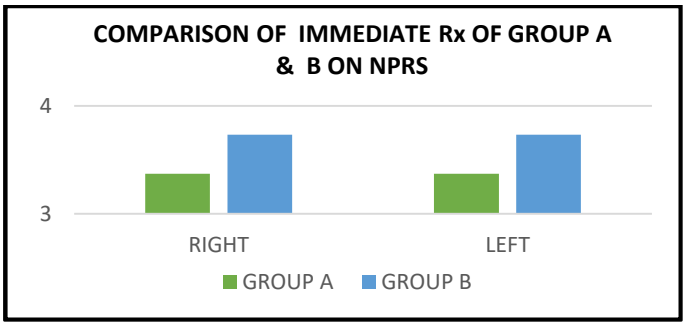


Fig [1]

FIG [1] Immediate NPRS readings of Group A i.e., Conventional Physiotherapy was (3.371) and that of Group B i.e., K-Taping and Conventional Physiotherapy was (3.735).

COMPARISON OF AFTER 24 HRS Rx OF GROUP A &B ON NPRS

	Group	Mean	Median	SD	SE	P value
NPRS 24-R	Group A	1.057	1.00	0.938	0.1585	0.321
	Group B	1.294	1.00	1.031	0.1768	
NPRS 24-L	Group A	1.057	1.00	1.027	0.1737	0.281
	Group B	1.324	1.00	1.007	0.1726	

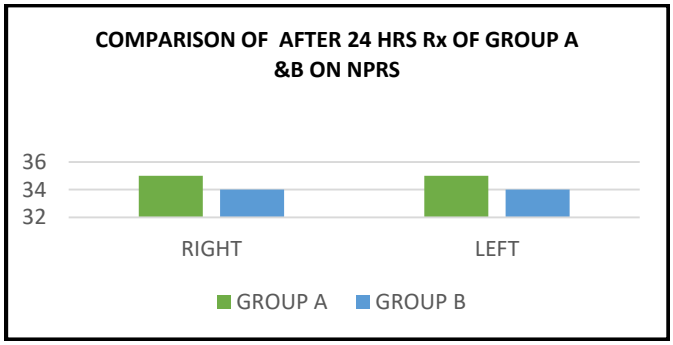


Fig [2]

FIG [2] after 24 Hours, NPRS readings of Group A i.e., Conventional Physiotherapy was (1.057) and that of Group B i.e., K-Taping and Conventional Physiotherapy was (1.294±1.324) and the p-value was 0.28±0.321

COMPARISON OF AFTER 48 HRS Rx OF GROUP A & B ON NPRS

	GROUP	MEAN	MEDIAN	SD	SE	P VALUE
NPRS 48 R	GROUP A	0.114	0.00	0.323	0.0546	0.691
	GROUP B	0.147	0.00	0.359	0.0617	
NPRS 48-L	GROUP A	0.143	0.00	0.355	0.0600	0.965
	GROUP B	0.147	0.00	0.436	0.0747	

	Group	Mean	Median	SD	SE	P value
DF 24-R	Group A	18.086	20	2.43	0.4107	0.001
	Group B	19.647	20	1.228	0.2106	
DF 24-L	Group A	18	20	2.485	0.4201	<0.01
	Group B	19.647	20	1.228	0.2106	

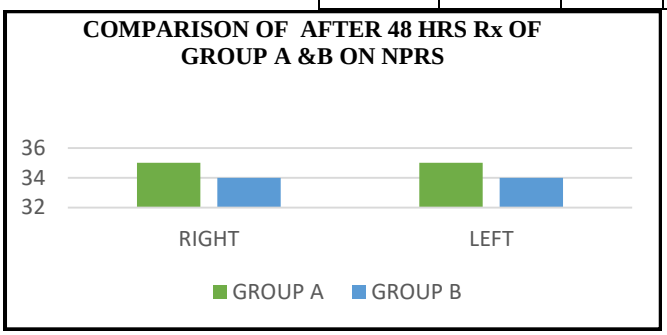


Fig [3]

FIG [3] After 48 hours, NPRS readings of Group A i.e., Conventional Physiotherapy was (0.114±0.143) and that of Group B i.e., K-Taping and Conventional Physiotherapy was (0.147).

COMPARISON OF IMMEDIATE Rx OF GROUP A & B ON ANKLE ROM

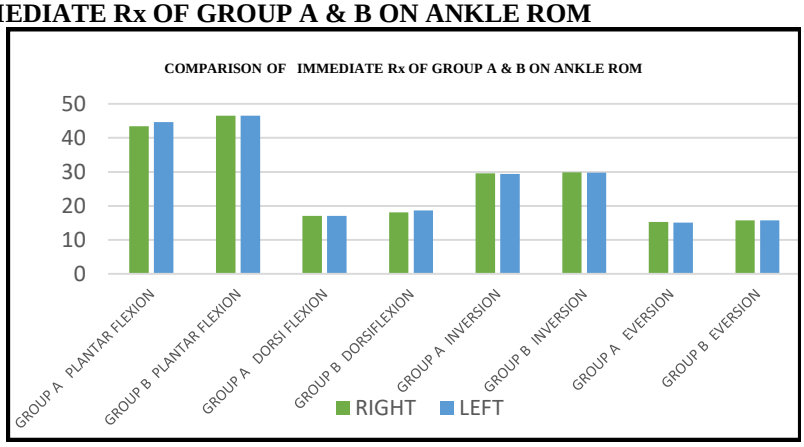


Fig [4]

FIG [4] the readings of Ankle Plantar Flexion Of Group A i.e., Conventional Physiotherapy was (43.382±44.676) and that of Group B i.e., K-Taping and Conventional Physiotherapy was (46.486±46.571). Similarly, the readings of Ankle Dorsiflexion of Group A i.e., Conventional Physiotherapy was (17.029) and that of Group B i.e., K-Taping and Conventional Physiotherapy was (18.118±18.618). The readings of Ankle Inversion of Group A i.e., Conventional Physiotherapy was (29.400±29.543) and that of Group B i.e., K-Taping and Conventional Physiotherapy was (29.735±29.835). Also, the readings of Ankle Eversion of Group A i.e., Conventional Physiotherapy was (15.114±15.257) and that of Group B i.e., K-Taping and Conventional Physiotherapy was (15.735±15.765). Therefore, it proved that there were no significant changes in both the treatment with p-value as shown in Table 4

COMPARISON OF AFTER 24 Hrs. OF GROUP A & B ON ANKLE ROM

	Group	Mean	Median	SD	SE	P value
Inv 24-R	Group A	30	30	0.845	0.1429	0.328
	Group B	30	30	0	0	
Inv 24-L	Group A	30	30	0	0	

	Group	Mean	Median	SD	SE	P value
EV 24-R	Group A	18.429	20	2.355	0.3981	0.006
	Group B	19.706	20	1.194	0.2048	
EVs 24-L	Group A	18.429	20	2.355	0.3981	0.006

	Group B	30	30	0	0			Group B	19.706	20	1.194	0.2048	

	Group	Mean	Median	SD	SE	P value
PF 24-R	Group A	48.765	50	2.764	0.474	0.536
	Group B	49.086	50	2.764	0.3827	
PF 24-L	Group A	46.086	50	1.4463	0.474	0.954
	Group B	49.118	50	0.3238	0.3238	

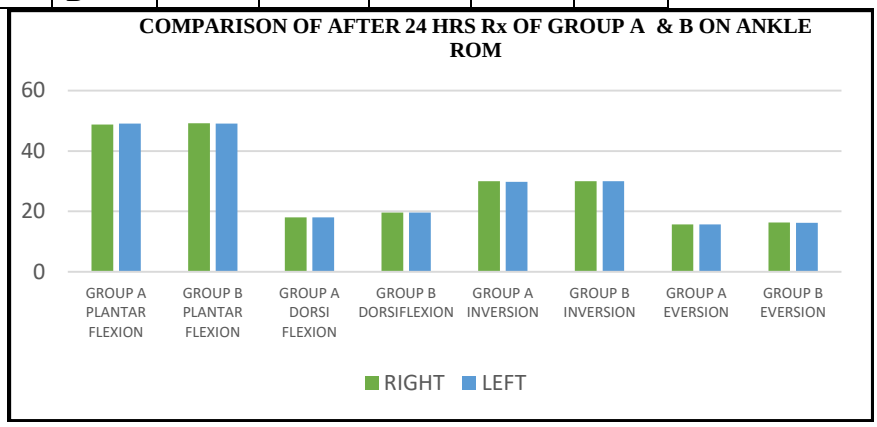


Fig [5]

FIG [5] the readings of Ankle Plantar Flexion Of Group A i.e., Conventional Physiotherapy was (48.765±49.118) and that of Group B i.e., K-Taping and Conventional Physiotherapy was (49.086±49.143). Similarly, the readings of Ankle Dorsiflexion of Group A i.e., Conventional Physiotherapy was (18.000±18.086) and that of Group B i.e., K-Taping and Conventional Physiotherapy was (19.647). The readings of Ankle Inversion of Group A i.e., Conventional Physiotherapy was (29.829±30.000) and that of Group B i.e., K-Taping and Conventional Physiotherapy was (30.000). Also, the readings of Ankle Eversion of Group A i.e., Conventional Physiotherapy was (15.735) and that of Group B i.e., K-Taping and Conventional Physiotherapy was (16.286±16.343). Therefore, it proved that there were no significant changes in both the treatment with p-value as shown in Table 5

COMPARISON OF AFTER 48 Hrs. OF GROUP A & B ON ANKLE ROM

	Group	Mean	Median	SD	SE	P value
PF 48-R	Group A	49.174	50	2.08	0.3516	0.539
	Group B	50	50	1.714	0.2985	
PF 48-L	Group A	49.714	50	2.08	2.08	0.539
	Group B	50	50	1.714	1.714	

	Group	Mean	Median	SD	SE	P value
DF 48-R	Group A	18.429	20	2.355	0.3981	0.006
	Group B	19.706	20	1.194	0.2048	
DF48-L	Group A	18.429	20	2.355	0.3981	0.006
	Group B	19.706	20	1.194	0.2048	

	Group	Mean	Median	SD	SE	P value
Inv 48-R	Group A	30	30	0.845	0	0.328
	Group B	30	30	0	0	
Inv 48-L	Group A	30	30	0	0	
	Group B	30	30	0	0	

	Group	Mean	Median	SD	SE	P value
EV 48-R	Group A	15.543	15	1.884	0.3185	0.666
	Group B	15.735	15	1.797	0.3083	
EV 48-L	Group A	15.543	15	1.884	0.3185	0.666
	Group B	15.735	15	1.797	0.3083	

TABLE [6]

Fig [6]

FIG [6] the readings of Ankle Plantar Flexion Of Group A i.e., Conventional Physiotherapy was (49.714) and that of Group B i.e., K-Taping and Conventional Physiotherapy was (50.000). Similarly, the readings of Ankle Dorsiflexion Of Group A i.e., Conventional Physiotherapy was (18.429) and that of Group B i.e., K-Taping and Conventional Physiotherapy was (19.706). The readings of Ankle Inversion of Group A i.e., Conventional Physiotherapy was (30.000) and that of Group B i.e., K-Taping and Conventional Physiotherapy was (30.000). Also, the readings of Ankle Eversion of Group A i.e., Conventional Physiotherapy was (15.543) and that of Group B i.e., K-Taping and Conventional Physiotherapy was (15.735). Therefore, it proved that there were no significant changes in both the treatment with p-value as shown in Table 6

DISCUSSION

Delayed Onset Muscle Soreness (DOMS) is a self-limiting condition that can temporarily affect a person's performance. DOMS occurs after vigorous and unaccustomed resistance training or any other form of muscular overexertion. DOMS appeal approx. after 12 to 24 hours after the cessation of exercise and peaks at 48 to 72 hours and subsides naturally after 3 to 4 days. Signs and symptoms of DOMS include pain, oedema, increased passive stiffness, and reduced range of motion.

Several pathways have been identified that lead to DOMS, including lactic acid accumulation, muscle spasm, muscle and connective tissue injury, and the release of enzymes and inflammation.

The present study was designed to compare the effects of Conventional physiotherapy versus K-taping and Conventional physiotherapy. In this study both the groups have shown similar results.

Stretching is a form of physical exercise in which a specific muscle or tendon is deliberately flexed or stretched to improve the muscles felt elasticity and achieve comfortable muscle tone. There are various types of stretching: Ballistic stretching, dynamic stretching, Active stretching, passive stretching, Isometric stretching, and PNF stretching.

The adhesion of the K tape to the skin and the resulting mechanical displacement caused by body movement leads to stimulation of the mechanoreceptors in the skin. These proprioceptive afferents run to the dorsal horn and inhibit the relaying of nociception, thus reducing pain.

The purpose of this study was to examine the effects of Conventional physiotherapy versus K-taping and Conventional physiotherapy on DOMS in calf muscle in amateur trekkers. According to this study, there were no significant changes between the groups. However, within-group analysis significant changes were seen in both groups. Clinically, it was found that Group B (i.e., K-Taping and Conventional Physiotherapy) was more effective in the Ankle Range of Motion. Participants found more ease in doing the movement.

One of the studies done in Spain proposed by Rafael Merino-Marban1 et al(2013) Effect of Kinesio Tape Application on Calf Pain and Ankle Range of Motion in Duathletes. This study concluded that there were no differences found immediately after the application of the Kinesio tape and after the competition in the ankle range of motion and calf pain.

Another study proposed by Majid Farhadian et al(2019), Effect of Kinesio Taping on Pain, Range of Motion, Hand Strength, and Functional Abilities in Patients with Hand Osteoarthritis. This study concluded that there were no significant changes seen immediately with K-taping and Exercise, but after 2 months of follow-up, K-taping was more effective than exercise alone.

One of the studies on Effects of Different Kinesio-Taping Applications for Delayed Onset Muscle Soreness after High-Intensity Interval Training Exercise by Bao-Lien Hung et al (2021) was where Y-shaped and crisscross methods were used. This study

concluded that there were no changes seen in pain with y shape K-taping up to 72 hours but in the crisscross method there were changes seen in pain not immediately but after 24 hours of application of tape.

One study done in Pune proposed by Farheen Patel et al (2020) the effect of kinesiotaping and pelvic tilts on menstrual symptom questionnaire and Visual Analogue Scale in primary dysmenorrhea in females aged 18-30yrs. The study concluded that taping in conjunction with pelvic tilts was beneficial both immediately and in the next consecutive menstrual cycle. But in this study, taping was done on the 1st day of menstruation and was kept until their last day of menstruation.

In this study, we found that both the groups i.e., Group A and Group B have shown a similar effect. Clinically, it was found that Group B (i.e., K-Taping and Conventional Physiotherapy) was more effective in the Ankle Range of Motion. Participants found more ease in doing the movement. Hence, clinically we can use K-tape as an adjunct treatment for treating DOMS

CONCLUSION

From this study, we can conclude that both groups i.e., Group A (Conventional Physiotherapy) And Group B (K-taping and Conventional Physiotherapy) are equally efficient for treating DOMS and shows the same effect on both NPRS and Ankle Range of Motion.

LIMITATIONS OF STUDY

1. A Few subjects complained of itching and irritation after the removal of tape.

RECOMMENDATIONS AND FURTHER SCOPE OF STUDY

1. The Study can also be done in a population other than the age group of 18-35 yrs.
2. The Study can also be done in any other recreational population.

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