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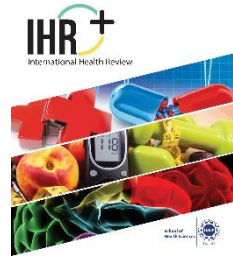
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Title: Effectiveness Of Kinesio Taping Versus Mulligans Mobilization with Movement in Sub-Acute Lateral Ankle Sprain in Footballers: A Randomized Controlled Trial

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Effectiveness of Kinesio Taping versus Mulligan's Mobilization with Movement in Sub-acute Lateral Ankle Sprain in Footballers: A Randomized Controlled Trial

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ABSTRACT

The current study aimed to compare the effectiveness of Kinesio Taping (KT) and Mulligan Mobilization with Movement (MWM) in conjunction with conventional physical therapy for sub-acute lateral ankle sprain in football players. For this purpose, a total number of 30 participants were randomly assigned to either the KT group or the MWM group. Furthermore, pain, disability, and functional capabilities were assessed using the Numeric Pain Rating Scale (NPRS) and the Foot and Ankle Ability Measure (FAAM) before and after a 4-week intervention. The results showed that MWM with conventional physical therapy was more effective in relieving pain and improving mobility, strength, and functional status as compared to KT with conventional physical therapy. The study also suggested that MWM is a more beneficial treatment for footballers with a sub-acute lateral ankle sprain.

Keywords: ankle sprain, Kinesio Taping (KT), Mobilization with movement (MWM), physical therapy, ultrasound therapy

1. INTRODUCTION

Ankle sprains are a frequent sports ailment, which is often dismissed as being unimportant by athletes and coaches [1]. Lateral ankle sprains (LAS) are a common sports injury that occurs quite often. The recurrence rate of ankle sprain is still high despite the substantial clinical and fundamental science studies [2]. Lateral ankle sprains have a high likelihood of

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recurrence and have substantial financial consequences because of preventive measures, healthcare interventions, and the potential for recurring limitations [3] The lateral side ligaments of the ankle were among the first structures that Garrick identified as being the most frequent injuries in athletes, which was prevalent in their ankle [4].

In this idea, it is often believed that untreated ligament injury is the primary cause of post-sprained ankle symptoms, including pain, a sense of crepitus, stiffness, instability, and weakness. Furthermore, functional instability, joint stiffness brought on by a lack of joint mobility, and a lack of insufficient recovery process are the main reasons for these persistent symptoms [5].

Ankle sprains are typically categorized into three groups, indicating the severity of the injury. First of all, in Grade 1 ankle sprain, there is mild discomfort, edema, and stiffness associated with a stretched or slightly torn ligament. Walking usually feels manageable with little discomfort since the ankle feels solid. However, in Grade 2 ankle sprain, there is an incomplete tear with significant discomfort, edema, and bruising, with a more severe sprain. It appears to be a fairly stable condition; however, pain during the walk and tenderness upon the touch are the usual symptoms. Whereas in Grade 3 ankle sprain, the damaged ligament(s) had been injured entirely and a sizable swelling and bruising can also be observed as endemic symptoms. As a result, the ankle gives out and there is severe pain, which makes walking an impossible task during this condition [6].

It was Brian R. Mulligan who initially coined the terms "Mobilizations with Movement" (MWM) for the extremities and "SNAGS" (Sustained Natural Apophyseal Glides) for the spine [7].

Mobilization with movement (MWM) is the simultaneous use of persistent accessory mobilization by a therapist and an active physiological movement by the patient to the limit of their range of motion. After that passive end-of-range stretching without discomfort as a barrier is applied [8].

KT is a quick-drying, latex-free product that is commonly kept on the skin for periods of 3-5 days. It may; therefore, be more cost-effective and better tolerated than taping with nonelastic athletic tape when used to prevent ankle sprains. The potential of KT to improve the functional stability of the ankle rests on its alleged effects on muscle activation and

proprioception as opposed to mechanical support because of its elastic qualities [9].

There is a scarcity of research examining the impact of a sub-acute lateral ankle sprain (LAS) on self-reported function, self-reported pain, self-reported global function, dorsiflexion range of motion, ankle joint effusion, and dynamic balance, as well as the progression of these symptoms over a two-week timeframe. It is likely that misunderstanding the progress of patient outcomes leads to accelerated return-to-play protocols for ankle sprains, which may contribute to the development of ankle sprain recurrence.

The prime purpose of this study was to evaluate and compare the efficacy of Kinesio Taping and Mulligan's Mobilizations with Movement for treating sub-acute lateral ankle sprains in football players. There were a limited number of studies investigating the efficacy of Kinesio Taping and Mulligan's Mobilization with Movement in treating both acute and chronic lateral ankle sprains (LAS). Moreover, the effects of Kinesio Taping versus Mulligan's Mobilization with Movement on sub-acute lateral ankle pain and disability among football players with such sprains have not been widely explored in the literature. Since not many studies have been conducted concerning this direction, it was very helpful to know, which technique is effective for a sub-acute lateral ankle sprain in footballers. This study also helped in raising awareness and lessening the rate of disability resulting from ankle sprain.

2. METHOD

The Randomized Controlled Trial (RCT) was conducted at the Family Hospital and Maternity Home, Multan, Pakistan, from September 2022 to February 2023. This study was registered in the Iranian Registry of Clinical Trials on 19-06-2023 with reference ID IRCT20210205050256N3. The approval was obtained from the ethics review committee of Family Hospital and Maternity Home, Multan, Pakistan with reference ID (PT/2022/REC/IRB/023). In accordance with previous research, the sample size was measured through epitool by taking 95% CI, and 5% margin of error [10], after obtaining authorization from the hospital administration, patients were screened using a non-probability convenience sampling technique. Male athletes, aged 13-17, who had participated in football for more than two years were included in the study. These individuals had a

history of recurrent ankle sprains, with an average of six (\pm five) months since their last sprain, and reported sensations of ankle instability during training. Athletes who met any of the following criteria were excluded from the study: those requiring assistance for walking, individuals with a acute ankle trauma within 7 days of the injury incident, those with medial ankle instability, participants with grade III ankle sprains, individuals who had experienced an ankle sprain within the past 12 months, individuals with connective tissue disorders, those unable to bear weight on the affected extremity immediately after the injury, and patients with a chronic ankle injury on the opposite side.

Following informed consent, the patients were randomly assigned to one of two groups using the lottery method and single blinding. Group 1 received Kinesio Taping (KT) and Group 2 received Mulligan's Mobilization with Movement, both paired with conventional physical therapy. The treatment plan for sub-acute lateral ankle sprains (LAS) for Group 1 involves a multi-faceted approach. In the initial session, a lymphatic correction using a Kinesio Fan strip was employed to address swelling, followed by an Achilles tendon correction using a Kinesio Y strip in the second step. Subsequent sessions target specific muscles—tibialis anterior and peroneus longus/brevis—with Kinesio Y strips and light tension. Additionally, these specialized interventions, conventional treatments, including 10 minute-hot pack, ankle isometrics, and therapeutic ultrasound therapy, were administered across three sessions. The ultrasound therapy parameters were specified as follows: Frequency: 1 MHz, Intensity: 1.5 W/cm², Duration: 10 minutes, and Mode: Continuous. A treatment method for Group 2 involves the use of Mulligan's mobilization belt, positioned over the patient's pelvis, distal tibia, and fibula, with the Achilles tendon padded. The patient assumed a relaxed stance on a bench. Hand placement involves stabilizing the talus and forefoot with one hand and guiding the knee with the other hand to align over the second and third toes. The technique includes slow active dorsiflexion by the patient, while the therapist moves backward, creating tension on the seatbelt, and inducing a posteroanterior tibial glide. The seatbelt is kept perpendicular to the tibia and tension is released right after completing the movement. The treatment protocol consists of 10 repetitions per set, with 3 sets per session and a 1-minute rest between sets. Conventional treatments, including a 10-minute hot pack, ankle isometrics, and therapeutic ultrasound therapy, were also administered in three sessions. Ultrasound parameters are specified as

Frequency: 1 MHz, Intensity: 1.5 W/cm², Duration: 10 minutes, and Mode: Continuous. The combined approach aims to address the condition, promote circulation, and enhance muscle strength [11]. A self-structured performa was used to gather data from different clubs of Multan, which included demographics and outcome measures, such as the numeric pain rating scale (NPRS) [12] and foot and ankle ability measure (FAAM) with two subscales, activities of daily living (ADL), and sports (S) [13]. Measurements were obtained at the beginning of the study after the first session to see which group experienced faster symptom relief, and again at the end of the 12 sessions were observed over the course of 4 weeks to observe and record the changes in measurements from the initial assessment. Each session lasted between 10 and 15 minutes. All of the individuals were treated by one therapist, while the other therapist documented the results. The data was analyzed by using the SPSS-21. In the beginning, the normality of the data was tested using Shapiro-Wilk, which revealed a significant value of <0.05 and a skewed histogram. For the before-and-after comparisons, parametric methods were employed since the data exhibited a normal distribution. Moreover, significant group comparisons were conducted using an independent sample t-test, whereas within-group analyses they were performed using a paired sample t-test.

3. RESULT

The study was successfully completed by a total number of 30 patients, with an equal distribution of 15 individuals (50%) in each of the two groups to evaluate the symptoms in each. The baseline socio-demographic information was comparable between both groups (Table 1). All participants in the MWM with CPT group were presented with a mean age of 16.67 ± 1.34 years and in KT with CPT group with 14.87 ± 1.35 years. Participants in the MWM with CPT group were presented with a mean height of 166.34 ± 6.76 centimeters and in KT with CPT group with 166.64 ± 6.64 centimeters. Additionally, participants in MWM with CPT group were presented with a mean weight of 53.88 ± 6.54 kg and in KT with CPT group category with 54.90 ± 6.63 kg. The baseline values of NPRS, FAAM (ADL), and FAAM (S) showed resemblance, demonstrating that information is similar between the two groups with p-value >0.05 (Table 2). The results revealed that in both groups, a statistically significant difference was observed with a p-value of less than 0.05. MWM with CPT

showed a difference that is statistically significant in NPRS, FAAM (ADL), and FAAM (S) as compared to KT with CPT ($p < 0.05$) (Table 3,4).

Table 1. Comparison of Socio-Demographic Variables of Two Groups

	Study Group	<i>N</i>	Mean \pm <i>SD</i>
Kinesio Taping with Conventional Physical Therapy	Age of Participants	15	14.87 \pm 1.35
	Gender of Participants	15	1.00 \pm 0.00
	Height in centimeters	15	166.64 \pm 6.64
	Weight in kg	15	54.90 \pm 6.63
	Valid <i>N</i> (listwise)	15	
Mulligan's Mobilization with Movement with Conventional Physical Therapy	Age of Participants	15	16.67 \pm 1.34
	Gender of Participants	15	1.00 \pm 0.00
	Height in centimeters	15	166.34 \pm 6.76
	Weight in kg	15	53.88 \pm 6.54
	Valid <i>N</i> (listwise)	15	

Table 2. Base line measurements for Age, Weight, Height, NPRS and FAAM

	Kinesio Taping with Conventional Physical Therapy (<i>n</i> =15)	Mulligan's Mobilization with Movement with Conventional Physical Therapy (<i>n</i> =15)	<i>p</i> value
	Mean \pm <i>SD</i>	Mean \pm <i>SD</i>	
Age	14.87 \pm 1.35	16.67 \pm 1.34	0.68
Height	166.64 \pm 6.64	166.34 \pm 6.76	0.90
Weight	54.90 \pm 6.63	53.88 \pm 6.54	0.67
NPRS	8.47 \pm 1.30	8.93 \pm 0.88	0.26
FAAM (Activities of Daily Living Subscale)	25.70 \pm 3.01	25.79 \pm 2.80	0.94
FAAM (Sports Subscale)	26.66 \pm 6.66	26.87 \pm 4.84	0.92

Table 3. Independent sample t-test was used to compare the values of NPRS, FAAM (ADL), and FAAM (S) between each treatment group

		Treatment group		<i>p</i> value
		Kinesio Taping with Conventional Physical Therapy (<i>n</i> =15)	Mulligan's Mobilization with Movement with Conventional Physical Therapy (<i>n</i> =15)	
NPRS	Pre-treatment (Mean±SD)	8.47±1.30	8.93±0.88	0.260
	Post-treatment (Mean±SD)	6.60±1.05	3.20±0.86	<.001
FAAM (Activities of Daily Living Subscale)	Pre-treatment (Mean±SD)	25.70±3.01	25.79±2.80	0.947
	Post-treatment (Mean±SD)	33.72±3.35	68.48±1.90	<.001
FAAM (Sports Subscale)	Pre-treatment (Mean±SD)	26.66±6.66	26.87±4.84	0.923
	Post-treatment (Mean±SD)	34.58±7.03	59.37±5.00	<.001

Table 4. Paired sample t-test was used to compare the values of NPRS, FAAM (ADL), and FAAM (S) within each treatment group

Study group	Kinesio Taping with Conventional Physical Therapy	Mulligan's Mobilization with Movement with Conventional Physical Therapy
NPRS	1.86	5.73

Study group		Kinesio Taping with Conventional Physical Therapy	Mulligan's Mobilization with Movement with Conventional Physical Therapy
Paired Mean Difference	FAAM (ADL)	-8.01	-42.69
	FAAM (S)	-7.91	-32.50

4. DISCUSSION

The study aimed to compare the efficacy of non-invasive treatment methods, namely Kinesio Taping and Mulligan's Mobilization with Movement (MWM), for individuals with sub-acute lateral ankle sprains. Significantly, Group B showed a statistically significant difference as compared to Group A in terms of pain and function while analyzing different variables. The two groups had statistically significant differences in NPRS, FAAM (ADL), and FAAM (S) scores. Therefore, these results revealed that the MWM in the conventional physical therapy group was more effective than KT; in the conventional physical therapy group in terms of pain and its function.

Several studies have revealed the benefit of immediate substantial changes in pain and function in patients with lateral ankle sprains (LAS) at the moment [14]. The patients benefited from both a joint mobilization and a focus on pain-free early motion using MWM. This research provided support to past research that used joint mobilizations and early intervention to treat ankle sprains [15]. After three treatments, patients were able to resume their previous levels of exercise with superior clinical outcomes for both fibula MWM treatments. The current guidelines for recovering from acute Grade I lateral ankle sprains (LAS) recommended a range of 11.86 to 20 days from the injury's occurrence before patients can return to their regular activities. However, it's important to note that certain individuals may still encounter lingering symptoms, such as pain and instability even after resuming their normal activities [16, 17]. The enhancement in dorsiflexion range of motion achieved through the MWM and taping technique is believed to be linked to the increased posterior talus gliding in relation to the tibia. The enhancement in the dorsiflexion range of motion achieved through the MWM and taping technique is believed to be linked to the increased posterior talus gliding in relation to the tibia. A study,

conducted in 2009 discussed the effectiveness of MWM therapy on the strength, discomfort, and function of peripheral joints [18]. Notably, a number of publications showed that dorsiflexion ROM could be enhanced by a single MWM session. After just one session of talocrural MWM, Collins et al. found a + 1.2 cm improvement [19].

Kinesiology tape effectively reduces pain, as indicated by previous research. Kinesiology tape application activates cutaneous mechanoreceptors [20]. The stimulation of mechanoreceptive afferents causes the release of enkephalin, which inhibits the transmission of nociceptive signals, in accordance with the counterirritant idea. The neurotransmitter (substance P) involved in the integration of pain is inhibited by enkephalin [21]. Kinesiology taping is said to boost proprioceptive sensation and sensory input, as indicated by previous research. In stroke patients, the application of kinesiology tape to the ankle and foot of the afflicted side increased somatosensory information [22]. Kinesiology tape, which provides tactile stimulation, enhances muscular activation in the damaged patients [23].

The outcomes of the study indicated a statistically significant difference in FAAM scores between the two groups following additional treatment. The score was further increased and the function was also improved during MWM with the conventional physical therapy group as compared to KT with the conventional physical therapy group.

The findings of this study demonstrated that both statistically and clinically significant outcomes in relation to NPRS, FAAM (Activities of Daily Living), and FAAM (Sports) scores were significant. Both treatments are -accepted and recognized treatments and methods for footballers with a sub-acute lateral ankle sprain. The current study indicated that MWM with conventional physical therapy was more helpful in relieving pain and improving mobility, along with increased strength and functional status in footballers with a sub-acute lateral ankle sprain than KT with conventional physical therapy.

4.1. Conclusion

The latest study showcased noteworthy statistical and clinical outcomes in NPRS, FAAM (ADL), and FAAM (S) scores. Both interventions garnered widespread acknowledgment for their efficacy in addressing sub-acute lateral ankle sprains among footballers. The results imply that the

combination of MWM and conventional physical therapy proves more effective than incorporating KT with conventional physical therapy. This combination demonstrates superior outcomes in terms of pain relief, enhanced mobility, and improved strength and functional status, especially in footballers with sub-acute lateral ankle sprains.

4.2. Limitations

The current study included exclusively male footballers and excluded female footballers due to their adherence to religious and cultural norms, limiting the generalizability of the outcomes to the entire population. Furthermore, no extended follow-up was conducted. To address these limitations, it is advisable to organize a well-randomized clinical trial with a diverse random sample, encompassing a control group for more comprehensive results.

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