e-ISSN: 2320-4230, p-ISSN: 2961-6085

Journal of Drug Discovery and Therapeutics

Available Online at www.jddt.in

CODEN: - JDDTBP (Source: - American Chemical Society)

Volume 11, Issue 05, September-October: 2023, 106-116

Ankle Sprain in Football Players: A Comparison of the Efficacy of Mobilization with Movement Vs. Ultrasound

M. Rajasrinivas [*1], Kranthi kumar Macharla [2]

[1]Research Scholar, Sunrise University, Alwar

[2]Professor, Sunrise University, Alwar

Received: 14-07-2023 / Revised: 13-08-2023 / Accepted: 11-09-2023

Corresponding author M. Rajasrinivas

Conflict of interest: No conflict of interest.

Abstract:

Every athlete aspires to win a medal, but only a small number of them really do. Sports allow for the articulation of extraordinary actions, such as sprinting 100 meters in 9.58 seconds or 800 meters in 40 seconds, jumping higher and further, putting the ball in the basket, and so forth. The main aim of the study is Ankle Sprain in Football Players: A Comparison of The Efficacy of Mobilization with Movement Vs. Ultrasound. A comparative study is done among the football players to determine the effect of Mulligans mobilization with movement and ultrasound therapy in acute lateral ligament sprain of ankle reducing pain and improving range of motion & function. The ankle is a frequently affected anatomical region in sports-related incidents, with around 85% of all ankle injuries being attributed to sprains.

Keywords: **Athlete, Efficacy, Ultrasound, Mulligans, Ankle, Sprain, Ligament**

1. INTRODUCTION

Every athlete aspires to win a medal, but only a small number of them really do. Sports allow for the articulation of extraordinary actions, such as sprinting 100 meters in 9.58 seconds or 800 meters in 40 seconds, jumping higher and further, putting the ball in the basket, and so forth. The so-called components that govern sports performance include physical preparedness, skill improvement, advanced technical and tactical training, and physiological and psychological adaptations. As a result, excelling in sports requires a lot of work. There are also several difficulties to overcome, such as the need for tenacity and sacrifice, as well as the obvious dangers of harm associated with sports participation. A mix of improper play during the game and overuse of the muscles, ligaments, and joints may be to fault. The purpose of this study is to investigate alternative methods for healing and treating ankle injuries. Injury is a possibility while participating in sports. Alexandra Stevenson and Rafael Nadal are two athletes who have suffered from muscle pulls; Monica Seles has suffered from shin splints; Andre Agassi has suffered from lower back pain; Roger Federer has suffered from shoulder impingement; Serena Williams has suffered from runner's knee; Sachin Tendulkar has suffered from tennis

elbow; as a result, injuries have become commonplace for athletes.

1.2 ANKLE SPRAIN

An ankle sprain is a frequently seen injury within the realm of musculoskeletal conditions, characterized by the elongation or rupture, either partially or entirely, of the ligaments around the ankle joint. Ankle injuries manifest when the ankle joint surpasses the typical range of motion, mostly seen among those engaged in physical activity and sports.

Epidemiology

The ankle joint is often susceptible to damage in athletic activities, with ankle sprains being the prevailing kind of injury in this joint.

The predominant kind of ankle sprains seen is lateral ligament injuries, including roughly 85% of all ankle sprains. Conversely, acute medical and syndesmotic ankle sprains are less often encountered. Notably, females exhibit a higher incidence rate of ankle sprains compared to males, particularly among youngsters.

2. LITERATURE REVIEW

Vilar, Pia & Kovačič, Tine & Gerževič, Mitja (2023) The objective of this research was to examine the prevailing, efficacious, and contemporary injury prevention and rehabilitation techniques used in the context of ankle injuries among ballet dancers. A systematic evaluation of the literature was conducted, using a qualitative analytic approach. The databases used for this research were PubMed, SAGE, ScienceDirect, PlosOne, and Cochrane Library. The study's inclusion criteria included individuals of both genders who were over the age of 18. Additionally, the selected studies were required to have a journal impact factor greater than zero and focus on subjects within the age range of 10 years or younger. The search was conducted using specific keywords like "ankle," "injury," "ballet," "dancers," "physiotherapy," "physical therapy," and "prevention." A comprehensive search yielded a total of 520 publications, from which six were deemed suitable based on the predefined inclusion and exclusion criteria. The study focused on addressing the prevention and rehabilitation of ankle sprains (N=2), Achilles tendon tendinopathy (N=2), tendinitis of the m. hallucis longus (N=4), Achilles tendon rupture (N=2), as well as anterior (N=3) and posterior (N=4) impingement syndrome. The study revealed that the primary strategies used for injury prevention in ballet include strengthening and stretching exercises. Conversely, injury treatment mostly involves the utilization of rest, ice therapy, muscle strengthening exercises, foot braces, and the optimization of dancing technique. The injury prevention and physiotherapy treatments seem to be the most current. However, the lack of relevant research hindered the ability to quantitatively compare the efficiency of the most optimal procedures. The existing body of clinical data supports the use of physiotherapy/kinesiotherapy as a viable approach for preventing and managing ankle injuries in ballet dancers. However, it is important to note that more research with improved methodological rigor is needed to strengthen these findings.

Ammendolia, Antonio & de Sire, Alessandro (2023) Acute lateral ankle sprains are often encountered injuries in the athletic population, although the most effective treatment approaches for top athletes remain a subject of ongoing discussion and analysis. The objective of this proof-of-concept research was to evaluate the effects of cryo-ultrasound treatment on the immediate healing of football players who have had acute lateral

ankle sprains. The study included the random assignment of semi-professional football players who had grade I or II lateral ankle sprains into two groups: the experimental group, which received cryo-ultrasound treatment in addition to conventional physical therapy, and the control group, which received sham cryo-ultrasound therapy alongside conventional physical therapy. The assessment of pain intensity and physical functionality was conducted using the Numeric Rating Scale (NRS) and Foot and Ankle Disability Index (FADI) at four time points: baseline (T0), end of therapy (T1), one month after treatment (T2), and two months after treatment (T3). Following the implementation of the research intervention, significant disparities were seen between the groups in relation to pain alleviation (NRS: 4.08 ± 1.29 vs. 5.87 ± 1.19; p = 0.003) and physical function (FADI: 50.9 ± 10.3 vs. 38.3 ± 11.5; p = 0.021). Nevertheless, there were no notable changes seen between the groups at T2 and T3. There were no recorded instances of harmful consequences. The integration of cryo-ultrasound treatment with traditional physical therapy has been shown to expedite the healing process and facilitate a prompt return to athletic activity in top football players who have sustained acute lateral ankle sprains. This work provides significant contributions to the understanding of the potential advantages of cryo-ultrasound therapy. However, more research with an extended duration of follow-up is necessary to authenticate and enhance the use of physical agent modalities for the treatment of ankle injuries.

Wagemans, Jente & Bleakley, Chris (2023) We conducted a comprehensive search across many databases, including CINAHL, Web of Science, SPORT Discus, Cochrane Register of Controlled Trials, PEDro, and Google Scholar. Our search aimed to identify randomized controlled trials (RCTs) that specifically focused on patients with acute ankle sprains and their management via exercise-based rehabilitation. The assessment of bias was conducted using the Risk of Bias 2 instrument. The analysis of exercises was conducted by considering many factors, including the major impairment(s) being targeted, the direction of movement, the base of support, the weightbearing condition, and the flight phase. The study with registration number CRD42020210858, conducted by Prospero, is being discussed. We included a total of fourteen randomized controlled trials (RCTs) that had a sample size of 177 workouts. The study examined the inclusion of neuromuscular function in 44% of the workouts, followed by performance tasks at 23% and muscle building at 20%. The exercises were mostly restricted to movements occurring in the sagittal plane, accounting for 48% of the total exercises. Additionally, 31% of the exercises involved movements that occurred across several planes. The distribution of weight bearing activities was almost identical for single-limb stance exercises (59 out of 122) and double leg stance exercises (61 out of 122). A flying phase was seen in 18% of the exercises. The rehabilitation process after LAS often involves the implementation of uncomplicated exercises within the sagittal plane, which may not adequately address the underlying processes that might potentially lead to re-injury. It is recommended that forthcoming therapies include a greater emphasis on open chain joint position sensing training, multiplanar single limb tasks, as well as leaping and landing activities.

Ma, Mingze (2023) Basketball, being widely recognized as a prominent global sport, has given rise to a multitude of injuries among professional athletes. The prevalent injuries seen in basketball games include tooth damage, knee meniscus injury,

collateral ligament damage, lumbar disc herniation, triangular cartilage disc of the wrist damage, knuckle contusion, active and passive strain, and ankle injuries. The susceptibility of ankle ligaments to injury is notable, with the severity of such injuries being contingent upon the angle at which an ankle sprain occurs, as well as the degree of ligamentous impairment. Various factors such as insufficient preparation, previous injuries, advanced age, and other related variables may all contribute to increased risk. When an individual sustains an ankle sprain, it is essential to administer appropriate treatment methods, including the use of ice, utilization of well-established protective measures, optimum loading, compression, and elevation therapy, among others. Ankle rehabilitation training has been shown to be an effective intervention for the treatment of ankle sprains in the short term. When there is an increased incidence of ankle sprains, coaches and players are more inclined to use preventive measures in order to mitigate the risk of damage.

Song, Jae Hwang & Moon, Jeong (2023) Ultrasound is often used by physicians for the purpose of diagnosing acute lateral ankle sprain. Specifically, their attention is often directed towards the lateral ligament complex, since it represents the predominant location of lesions associated with ankle sprains. Nevertheless, this methodology has the potential drawback of overlooking further foot and ankle abnormalities. The primary objective of this research was to present and evaluate the outcomes of a novel ultrasonic diagnostic technique for acute lateral ankle sprains, with the capability to comprehensively assess the extent of injuries in the foot and ankle region. The present study employed various methodologies to investigate the research question. A retrospective cross-sectional cohort research was conducted, including a total of 123 patients who had undergone diagnostic ultrasonography within one week after experiencing an acute lateral ankle injury. The analysis focused on the etiology of ankle sprains, the frequency and severity of ligament injuries, the specific site of anterior talofibular ligament (ATFL) injuries, the presence of concomitant ligament injuries, and the occurrence of concealed fractures. The findings of the study indicate Out of the total sample size of 102 patients with anterior talofibular ligament (ATFL) injuries, 60 cases (58.5%) presented with just ATFL damage, 28 cases (27.5%) exhibited concomitant calcaneofibular ligament (CFL) injury, and 14 instances (13.7%) displayed accompanying midtarsal or syndesmosis injury. The occurrence of ATFL injuries was seen in 48 instances (47.1%) at the fibula attachment, in 24 cases (23.5%) at the ligament mid-substance, and in 30 cases (29.4%) at the talus attachment. In the sample of 123 cases, a total of 165 lesions were seen. The occurrence of injuries in the fourth or fifth dorsal tarsometatarsal ligaments was found in 12 instances (7.3%), while injuries in the bifurcate and anterior tibiofibular ligaments were observed in 11 cases each (6.7% each). These findings indicate that the occurrence of such ligament injuries is not infrequent. In conclusion, it can be inferred that the points collectively support the notion that. The results of this study indicate that doing an ultrasonic assessment that includes an evaluation of the midtarsal joint, syndesmotic ligament, as well as the ATFL and CFL, may be helpful in providing a full and systematic diagnosis of acute lateral ankle sprain.

3. METHODOLOGY

A comparative study is done among the football players to determine the effect of Mulligans mobilization with movement and ultrasound therapy in acute lateral ligament sprain of ankle reducing pain and improving range of motion & function. 48 subjects from 7 different colleges participated in the

study who were between the ages of 17-30 yrs and were football players. The subjective history was taken from each subject and then objective examination is done. The objective examination involved ankle joint range of motion testing. After the completion of the general assessment 32 subjects fit into the inclusion criteria. An informed consent was received and signed by the subjects.

The subjects are given the FAAM questionnaire and the numerical pain rating scale for indicating their pain intensity & Ankle ROM is measured. These scores were recorded as pretest values. The subjects were randomly allocated in each group. The subjects were explained about Mulligans Mobilization with movement technique & ultrasound its effects and the possible outcomes of the study.

4. RESULTS

To evaluate the individual efficacy of each therapy, the Pre-test and Post-test scores for each standard measure were analyzed. Subsequently, a Paired t-test was conducted using the Pre and Post-test values for each treatment independently.

Table 4.1 Descriptive Statistics by Treatment Groups for All Measures

Descriptive Statistics						
Treatment		N	Minimum	Maximum	Mean	Std. Deviation
MWM	DF1	15	8.00	16.00	12.0667	2.54858
	PF1	15	10.00	34.00	22.8000	6.36059
	NPRS1	15	3.00	8.00	6.0000	1.36277
	FAAM1	15	24.13	65.51	41.2020	11.12735
	DF2	15	14.00	20.00	18.2667	1.66762
	PF2	15	40.00	44.00	42.5333	1.24595
	NPRS2	15	.00	2.00	.6667	.61721
	FAAM2	15	91.37	98.27	96.2593	1.86377
	Valid N (listwise)	15				
UST	DF1	15	6.00	14.00	11.0000	2.00000
	PF1	15	13.00	33.00	22.5333	4.98378
	NPRS1	15	4.00	7.00	5.8667	1.06010
	FAAM1	15	18.10	65.51	39.2580	15.91591
	DF2	15	12.00	17.00	13.9333	1.66762
	PF2	15	20.00	40.00	31.6000	4.38830
	NPRS2	15	2.00	5.00	3.4000	.91026
	FAAM2	15	51.72	79.31	63.7900	8.14832
	Valid N (list wise)	15				

The frequency distribution table reveals that a significant proportion of the participants in this research are male (57%), while the remaining 43% are female. A sample consisting of 30 patients was randomly assigned to two treatment groups in a 1:1 ratio. Specifically, 50% of the subjects were allocated to undergo Mulligan Mobilization with Movement (MWM), while the other 50% got Ultrasound therapy (UT). Furthermore, the descriptive statistics for each treatment group have been individually computed for both the pre-treatment and post-treatment measurements.

4.2 Statistical Test

4.2.1 Mulligan Mobilization with Movement (MWM) and individual ultrasound treatment effectiveness tests

Table 4.2: Testing the Effect of Group A Mulligan Mobilization with Movement (MWM) and Group B Ultrasound Therapy on Reduction in NPRS (NPRS2 - NPRS1)

Paired Samples Statistics

Treatment			Mean	N	Std. Deviation
MWM	Pair 1	NPRS2	.6667	15	.61721
		NPRS1	6.0000	15	1.36277
UT	Pair 1	NPRS2	3.4000	15	.91026
		NPRS1	5.8667	15	1.06010

Paired Samples Test

Treatment			Paired Differences	
			Mean	Std. Deviation
MWM	Pair 1	NPRS2 - NPRS1	-5.33333	1.63299
UT	Pair 1	NPRS2 - NPRS1	-2.46667	.91548

The aforementioned results indicate a substantial decrease in mean NPRS scores as a result of implementing Mulligan Mobilization with Movement (MWM) ($t(14) = -12.649$, $p = 0.000 < 0.05$). The average decrease in NPRS (Numeric Pain Rating Scale) score resulting from the use of MWM (Mulligan's Mobilization with Movement) is 5.33, with a standard deviation of 1.63. Likewise, a significant decrease in mean NPRS scores is seen as a result of Ultrasound treatment (UT) ($t(14) = -10.435$, $p = 0.000 < 0.05$). The average decrease in Numeric Pain Rating Scale (NPRS) score resulting from the use of an unidentified treatment (UT) is 2.47, with a standard deviation of 0.915.

4.2.2 Testing the Effects of Group A Mulligan Mobilization with Movement (MWM) and Group B Ultrasound Therapy on Dorsi Flexion (DF2 - DF1)

Table 4.3 Paired Samples Statistics

Treatment			Mean	N	Std. Deviation
MWM	Pair 1	DF2	18.2667	15	1.66762
		DF1	12.0667	15	2.54858
UT	Pair 1	DF2	13.9333	15	1.66762
		DF1	11.0000	15	2.00000

Paired Samples Test

Treatment			Paired Differences	
			Mean	Std. Deviation
MWM	Pair 1	DF2 - DF1	6.20000	2.07709
UT	Pair 1	DF2 - DF1	2.93333	1.62422

The aforementioned results indicate a substantial average improvement in DF scores resulting from the use of Mulligan Mobilization with Movement (MWM) ($t(14) = 11.561$, $p = 0.000 < 0.05$). The average increase in NPRS score resulting from the use of MWM is 6.20, with a standard deviation of 2.08. Likewise, it is seen that Ultrasound treatment (UT) leads to a substantial average rise in DF scores ($t(14) = 6.995$, $p = 0.000 < 0.05$). The average increase in DF score resulting from the use of (UT) is 2.93, with a standard deviation of 1.62.

Table 4.4: Comparing the effects of Group A Mulligan Mobilization with Movement (MWM) and Group B ultrasound treatment on plantar flexion (PF2 - PF1)

Paired Samples Statistics

Treatment			Mean	N	Std. Deviation
MWM	Pair 1	PF2	42.5333	15	1.24595
		PF1	22.8000	15	6.36059
UT	Pair 1	PF2	31.6000	15	4.38830
		PF1	22.5333	15	4.98378

Paired Samples Test

Treatment			Paired Differences	
			Mean	Std. Deviation
MWM	Pair 1	PF2 - PF1	19.73333	6.31853
UT	Pair 1	PF2 - PF1	9.06667	4.43149

The results shown above indicate a substantial average improvement in PF scores as a result of using Mulligan Mobilization with Movement (MWM) ($t(14) = 12.096$, $p = 0.000 < 0.05$). The average increase in PF score resulting from the use of MWM is 19.73, with a standard deviation of 6.32. Likewise, Ultrasound treatment (UT) resulted in a notable average rise in PF ratings, as seen by the statistically significant mean difference ($t(14) = 7.924$, $p = 0.000 < 0.05$). The average increase in PF score resulting from the intervention of (UT) is 9.07, with a standard deviation of 4.43.

Table 4.5 Comparing the effects of Group A Mulligan Mobilization with Movement (MWM) and Group B Ultrasound treatment on FAAM (FAAM2 - FAAM1)

Paired Samples Statistics

Treatment			Mean	N	Std. Deviation
MWM	Pair 1	FAAM2	96.2593	15	1.86377
		FAAM1	41.2020	15	11.12735
UT	Pair 1	FAAM2	63.7900	15	8.14832
		FAAM1	39.2580	15	15.91591

Paired Samples Test				
Treatment			Paired Differences	
			Mean	Std. Deviation
MWM	Pair 1	FAAM2 - FAAM1	55.05733	10.91845
UT	Pair 1	FAAM2 - FAAM1	24.53200	14.90087

The results presented above indicate a statistically significant increase in mean FAAM scores as a result of Mulligan Mobilization with Movement (MWM) ($t(14) = 19.530$, $p = 0.000 < 0.05$). The average increase in FAAM score resulting from the use of the Modified Weighted Mean (MWM) method is 55.06, with a standard deviation of 10.92. Likewise, the results indicate a substantial increase in FAAM scores as a result of Ultrasound treatment (UT) ($t(14) = 6.376$, $p = 0.000 < 0.05$). The average increase in FAAM score resulting from the use of (UT) is 24.53, with a standard deviation of 14.90.

4.3 Contrasting the efficiency of ultrasound treatment with Mulligan Mobilization with Movement (MWM) in terms of Standard Measures

Table 4.6 Testing the difference between Group A Mulligan Mobilization with Movement (MWM) and Group B Ultrasound treatment in terms of Reduction in NPRS (NPRS2 - NPRS1)

Group Statistics				
	Treatment	N	Mean	Std. Deviation
NPRS_diff	MWM	15	-5.3333	1.63299
	UT	15	-2.4667	.91548

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
NPRS_diff	Equal variances assumed	3.424	.075	**-5.931**	**28**	**.000**	-2.86667	.48337	-3.85681	-1.87652
	Equal variances not assumed			-5.931	22.009	.000	-2.86667	.48337	-3.86910	-1.86423

The aforementioned results indicate that there is a statistically significant difference in the average decrease of NPRS scores between Mulligan Mobilization with Movement (MWM) and Ultrasound treatment (UT) at a significance level of 5% ($t(28) = –5.931$, $p = 0.000 < 0.05$). The available information supports the conclusion that there exists a statistically significant disparity in the mean decrease of NPRS scores between the MWM and UT interventions. Based on the average results provided, it can be inferred that the average decrease in NPRS scores resulting from Mulligan Mobilization with Movement (MWM) (Mean = 5.33 & SD = 1.63) is considerably higher compared to Ultrasound treatment (UT) (Mean = 2.47 & SD = 0.915).

Table 4.7: Comparing the effects of Group A Mulligan Mobilization with Movement (MWM) and Group B ultrasound treatment on the improvement of Dorsi Flexion (DF2 - DF1)

Group Statistics

	Treatment	N	Mean	Std. Deviation
DF_diff	MWM	15	6.2000	2.07709
	UT	15	2.9333	1.62422

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
DF_diff	Equal variances assumed	2.645	.115	**4.798**	**28**	**.000**	3.26667	.68080	1.87211	4.66123
	Equal variances not assumed			4.798	26.462	.000	3.26667	.68080	1.86844	4.66489

The results shown above indicate that there is a statistically significant difference in the average increase in Dorsi Flexion scores between the Mulligan Mobilization with Movement (MWM) and Ultrasound therapy (UT) treatments. This difference was found to be significant at the 5% level, as seen by the t-test statistic ($t(28) = 4.798$) and the p-value ($p = 0.000 < 0.05$). The available information supports the conclusion that there exists a statistically significant difference in the mean increase of Dorsi Flexion scores between the Mobilization with Movement (MWM) technique and the usual treatment (UT). Based on the average data provided, it can be inferred that the increase in DF scores resulting from Mulligan Mobilization with Movement (MWM) (Mean = 6.20 & SD = 2.08) is substantially higher compared to Ultrasound treatment (UT) (Mean = 2.93 & SD = 1.62).

5. CONCLUSION

The ankle is a frequently affected anatomical region in sports-related incidents, with around 85% of all ankle injuries being attributed to sprains. According to estimates, around 67.3% of football players and 70% of basketball players exhibit the characteristics. The prevalence of ankle sprains and subsequent reinjuries has posed a significant issue for healthcare professionals, prompting the need for improved rehabilitative and preventive approaches to mitigate the occurrence rate. Ankle sprain is characterized by the presence of pain, edema, and restricted range of motion. The therapeutic approach for ankle sprains primarily focuses on pain management and enhancing both the range of motion and functional abilities. This research aims to examine the efficacy of Mulligan's Mobilization with Movement (MWM) and Ultrasound interventions in the

treatment of ankle sprains among football players, specifically focusing on the outcomes of Numeric Pain Rating Scale (NPRS), Range of Motion (ROM), and Foot and Ankle Ability Measure (FAAM) for the ankle joint.Based on the outcome measure, this study demonstrates that both Mulligan Mobilization with Movement and Ultrasound therapy exhibit significant improvement when comparing the post-test results of these two groups. However, it is found that Mulligan Mobilization with Movement is more effective in reducing pain, improving range of motion (ROM), and enhancing functional activity in cases of lateral ligament sprain of the ankle joint. This research proposes that the use of Mulligan Mobilization with Movement demonstrates efficacy as a therapy modality for lateral ligament ankle sprains in football athletes.

REFERENCES

1. Vilar, Pia & Kovačič, Tine & Gerževič, Mitja. (2023). Injury prevention and physiotherapy procedures for ankle injuries in ballet dancers: A literature review. Annales Kinesiologiae. 13. 93-113. 10.35469/ak.2022.349.
2. Ammendolia, Antonio & de Sire, Alessandro & Lippi, Lorenzo & Ammendolia, Valerio & Spanò, Riccardo & Reggiani, Andrea & Invernizzi, Marco & Marotta, Nicola. (2023). Cryo plus Ultrasound Therapy, a Novel Rehabilitative Approach for Football Players with Acute Lateral Ankle Injury Sprain: A Proof-of-Concept Study. Sports. 11. 180. 10.3390/sports11090180.
3. Wagemans, Jente & Bleakley, Chris & Taeymans, Jan & Kuppens, Kevin & Schurz, Alexander & Baur, Heiner & Vissers, Dirk. (2023). Rehabilitation strategies for lateral ankle sprain do not reflect established mechanisms of re-injury: A systematic review. Physical Therapy in Sport. 60. 10.1016/j.ptsp.2023.01.008.
4. Ma, Mingze. (2023). Injury Incidence, Risk Factors, Prevalence and Rehabilitation of Injuries of Ankles in Professional Basketball Players. Highlights in Science, Engineering and Technology. 30. 54-60. 10.54097/hset.v30i.4950.
5. Song, Jae Hwang & Moon, Jeong & Shin, Woo & Ko, Kwang. (2023). Use of a comprehensive systemic ultrasound evaluation in the diagnosis and analysis of acute lateral region ankle sprain. BMC Musculoskeletal Disorders. 24. 10.1186/s12891-023-06642-0.
6. Ruvo, Rocco & Russo, Giuseppe & Lena, Francesco & Giovannico, Giuseppe & Neville, Christoper & Turolla, Andrea & Torre, Monica & Pellicciari, Leonardo. (2022). The Effect of Manual Therapy Plus Exercise in Patients with Lateral Ankle Sprains: A Critically Appraised Topic with a Meta-Analysis. Journal of Clinical Medicine. 11. 4925. 10.3390/jcm11164925.
7. Jokela, Aleksi & Valle, Xavier & Kosola, Jussi & Rodas, Gil & Til Perez, Lluis & Burova, Maria & Pleshkov, Pavel & Andersson, Håkan & Pasta, Giulio & Manetti, Paolo & Lupón, Gabriel & Pruna, Ricard & García-Romero-Pérez, Alvaro & Lempainen, Lasse. (2022). Mechanisms of Hamstring Injury in Professional Soccer Players: Video Analysis and Magnetic Resonance Imaging Findings. Clinical journal of sport medicine: official journal of the Canadian Academy of Sport Medicine. Publish Ahead of Print. 10.1097/JSM.0000000000001109.
8. Davari, Ahmadreza & Sohani, Soheil & Sarrafzadeh, Javad & Nikjooy, Afsaneh. (2021). Evaluation of the Effects of Tecar Therapy on Acute Symptoms of Athletes Following Lateral Ankle

Ligament Sprain Conflict of interest. Function and Disability Journal. 4. 1-11. 10.32598/fdj.4.31.

9. Dr, Ramamurthy & Paul, Jibi & Hepsibah, Sharmil & Sathya, P. (2021). Effect of Ultrasound Therapy and Cryotherapy over Taping Technique in Patients with Acute Lateral Ankle Sprain. International Journal of pharma and Bio Sciences. 11. 10.22376/ijpbs/lpr.2021.11.4.L9-15.
10. Vuurberg, Gwendolyn & Spennacchio, P. & Laver, Lior & Pereira, J. & Diniz, Pedro & Kerkhoffs, Gino. (2021). Current Concepts in Ankle Sprain Treatment. 10.1007/978-3-662-62763-1_10.