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Use of kinesio strips in the rehabilitation of runners with partial muscle tears in the anterior and posterior quadriceps muscles

Zahraa Jaafar Hussein

Faculty of Physical Education and Sport Sciences, Dhi Qar University

zahraa.jaffar@utq.edu.iq

Abstract

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Sports injuries are one of the most important obstacles suffered by athletes at all levels, and a tear injury in the anterior and posterior thigh muscles is one of the most common injuries as runners perform fast running, which makes them susceptible to injury, the current study aimed to identify the effect of using kinesio adhesive tapes in the rehabilitation of players with muscle tears, the researcher used the experimental method by designing the two experimental groups, the first experimental group underwent a rehabilitation program that includes treatment The research sample was represented by the (12) runners in the clubs of Dhi Qar Governorate from five clubs in the province, the results showed that the qualifying exercises using Kenizio tapes had a positive effect on the rehabilitation of the injured anterior and posterior thigh muscles, and the differences between the two groups were statistically significant. Therefore, the researcher recommends the use of kinesio adhesive tapes in the rehabilitation of muscle injuries.

1.1 Introduction and importance of the research:

Despite all the measures used by players and coaching staff in the sports field to prevent and reduce sports injuries, whether during training or matches, the rate of these injuries is constantly rising as a result of the intensity of competitions and excessive enthusiasm to try to reach the best levels to achieve sporting achievement, and these things have made the players in a state of continuous competition, whether with themselves or with others.

Rehabilitation exercises are often considered the best way to return injured athletes to activity, and rehabilitation exercises are the best way to restore athletes to their normal state before the injury and with the same level of physical and functional efficiency. Physical rehabilitation combines physical exercises with other means of treatment such as manual, electric, and water surveyors, saunas, and others to restore the high level of performance, so rehabilitation is an important aspect of treatment that athletes may often prefer, and that choosing the inappropriate approach for the type and severity of the injury can affect the speed of recovery and thus return to the stadiums in the fastest time and with less effort.

The importance of the research lies in the fact that it is one of the scientific attempts in the field of sports injuries to develop an integrated rehabilitation program, with the aim of reducing muscle injuries, and it may contribute to highlighting and directing the attention of coaches and researchers to address the injury of the anterior and posterior thigh muscles.

1-2 Research Problem:

Muscle injury is one of the most common injuries among athletes, and this is due to the fact that muscles are the main tool implementing the requirements of athletic performance, as they are one of the main factors in human movement, if the injury occurs and is not diagnosed in time, it may cause a chronic injury that is difficult to treat. Injury to the anterior and posterior thigh muscles occurs in athletes, especially those who participate in sports that require strength, speed, agility, jumping, sudden stops, and changes of direction. Therefore, the researcher decided to delve into this important and fateful aspect of the players' career.

1-3 Research Objectives:

The aim of the present study is to prepare exercises to rehabilitate the anterior and posterior quadriceps muscles of track and field players with partial tears, as well as to identify the effect of these exercises using kinesio tapes on the research sample members.

1-4 Research Hypotheses:

The researcher hypothesizes that the proposed rehabilitation exercises using kinesio tapes have a positive effect on the rehabilitation of the injured anterior and posterior quadriceps muscles of runners.

1-5 Research Areas:

1.5.1 Human Field: Runners in the clubs of Dhi Qar Governorate.

1.5.2 Spatial Field: Department of Physiotherapy and Rehabilitation at Nasiriyah General Hospital.

1-5-3 Time Domain: The period from 21/1/2024 to 15/8/2024.

2- Research Methodology and Field Procedures:

2-1 Research Methodology:

The researcher used the experimental method using two experimental groups and applying measurement (pre-intermediate, and post-test) to suit the nature of the research, where the rehabilitation method was applied to the first experimental group with kinesio strips, rehabilitation exercises, and thermal physical therapy. The second experimental group was given rehabilitation exercises and physical therapy with thermal devices only without the use of kinesio strips.

2-2 Research Population and Sample:

The research sample consisting of (12) players with a deliberate injury was selected from athletes with minor partial tears in the anterior and posterior thigh muscles who are active in (5) clubs in Dhi Qar, represented by Al-Nasiriyah Club, Souk Al-Shuyoukh, Al-Euphrates, Akad and Tishreen, the first experimental group consisted of (6) players, the rehabilitation curriculum was applied using kinesio tapes, rehabilitation exercises and physical therapy with thermal devices, and the second experimental group consisted of (6) players, the rehabilitation method was applied using rehabilitation exercises and treatment Only natural without the use of kinesio strips, and the research sample was selected according to the following conditions:

1- The sample members must be patients with a partial tear of the anterior or posterior thigh muscles, based on a medical report.

2- The sample members must have a serious desire to participate in the rehabilitation curriculum.

3- The applicant must not be subject to any other treatment program (rehabilitative and medical) during the study period.

4. Regular attendance at the proposed rehabilitation curriculum throughout the course of the study.

5- Exclusion of injured players who suffer from other injuries or who have undergone surgical intervention.

2-3 Homogeneity and Equivalence of the Research Sample:

Table (1)

shows the statistical characterization of the research sample data in the basic variables before applying the qualifying method n=12

Statistical significance of characterization				Basic Variables
Torsion coefficient	Standard Deviation	Broker	Arithmetic average	
0.55	2.68	22	22.21	Age (year)
0.24	4.40	173.5	174.3	Length (cm)
-0.13	4.88	69	68.6	Weight (kg)

It is clear from Table (1) of the homogeneity of the research sample data in the basic primary measurements that the torsion coefficients range between (-0.13 to 0.55), which indicates that the extracted measurements are close to the moderate as the values of the moderate torsion coefficient range between ±3. It is very close to zero, which confirms the homogeneity of the research group members in the initial variables before the study.

Table (2)

Statistical Characterization of the Research Sample Data on Muscle Strength and Pain Degree of the Legs Before Applying the Rehabilitation Method n = 12

Statistical significance of characterization	Variables

Torsion coefficient	Standard Deviation	Broker	Arithmetic average			
−0.16	0.49	4.65	4.61	Anterior quadriceps	The injured man	Muscle Strength (kg)
0.21	1.22	24.05	24.11	Posterior quadriceps		
0.12	1.31	14.80	14.74	Anterior quadriceps	Healthy Leg	
0.19	1.45	39.95	40.5	Posterior quadriceps		
0.28	0.48	6.50	6.57	Degree of pain sensation		

It is clear from Table (2) of the homogeneity of the research sample data in muscle strength (kg) and the degree of pain sensation of the two legs that the torsion coefficients range between (−0.16 to 0.28), which indicates that the extracted measurements are close to the moderate as the values of the moderate torsion coefficient range between ±3. It is very close to zero, confirming the homogeneity of the research group in muscle strength (kg) and the degree of pain sensation of the affected leg before the study.

Table (3)

Statistical Characterization of the Research Sample Data on the Range of Motion of the Legs Before the Application of the Rehabilitation Method

Statistical significance of characterization				Variables		
Torsion coefficient	Standard Deviation	Broker	Arithmetic average			
0.58	2.06	16.75	16.83	Hip joint		

-0.28	1.73	42.5	42.21	Knee joint	The injured man	Range of motion (degree)
-0.20	1.76	31	31.39	Hip joint	Healthy Leg	
-0.15	2.67	55.75	55.71	Knee joint		

It is clear from Table (3) of the homogeneity of the research sample data in the kinetic range (degree) that the torsion coefficients range between (-0.28 to 0.58), which indicates that the extracted measurements are close to the moderate, as the values of the moderate torsion coefficient range between ±3. It is very close to zero, which confirms the homogeneity of the research group members in the range of motion before the study.

Table (4)

Shows the parity in the research variables in the pre-experiment of the first and second experimental groups

Significance	(Sig)	Calculated	Follicular Group II		The first experimental group		Variables	
			±	Going to	±	Going to		
Insignificant	.565	.583	.419	4.50	.485	4.60	Anterior quadriceps	Muscular strength of the injured man
Insignificant	.688	.406	1.434	24.12	1.259	24.33	Posterior quadriceps	

Insignificant	.56	.578	1.377	14.62	1.368	14.92	Anterior quadriceps	Healthy Leg Muscular Strength
Insignificant	.11	1.64-	.977	41.01	1.534	40.21	Posterior quadriceps	
Insignificant	.82	.222-	3.410	27.64	3.387	27.35	Hip joint	Range of motion of the affected leg
Insignificant	.61	.506-	2.991	82.21	3.694	81.57	Knee joint	
Insignificant	.67	.431	4.410	118.92	5.209	119.71	Hip joint	Healthy leg range of motion
Insignificant	.305	1.046	2.21880	50.0000	3.12470	51.0714	Knee joint	

Significant < (0.05) at the degree of freedom (26).

It is clear from Table (4) that there are no significant differences between the first experimental group and the second experimental group in all measurements, and there are no differences in the calculated value of (T) in all measurements, and this is an indication of the existence of parity in the members of the first experimental research sample and the second experimental research sample.

2.4 Tribal Measurements:

The pre-measurement was performed on the experimental research sample group consisting of (12) injured players in different time periods over (7) months of the 2023-2024 season,

according to the availability of the sample of players with partial tears in the anterior or posterior thigh muscles in the physiotherapy center at the General Hospital.

2-5 Rehabilitation Curriculum:

The researcher prepared the rehabilitation curriculum that includes rehabilitation exercises and physical therapy with thermal devices with the use of kinesio strips on the injured muscles, as follows:

1- **Applying medical labels:**

The researcher applied Kenizio adhesive tapes to the affected area of the thigh according to the medically approved conditions from the first day of the injury until the pain disappeared completely, and the tape continued for three days, and the adhesive tape was removed on the fourth day, and the operation was repeated periodically until complete recovery.

2- **Qualifying exercises:**

Rehabilitation exercises were prepared to be applied to the sample members individually distributed in three stages, the first stage took two weeks, the second and third stages took three weeks, and the total time period required to implement the program practically took eight weeks, and the rehabilitation stages contain different exercises to suit the stage that the player with a tear of the anterior or posterior thigh muscles is going through, and the training was carried out at a rate of (6) training units per week, and the number of training units for the injured over eight weeks reached (48) training units, and it was The training unit time is (45) minutes in the first week and (60) minutes in the second week, while the training unit time in the second phase has become (75) minutes, and in the third phase it has become (90) minutes.

3- **Physiotherapy:**

Physical therapy with thermal devices started after the first week after the end of the inflammation and tumor stage, and the program prepared using physical therapy devices lasted from seven weeks and at the rate of three treatment units per week, as the total number of units reached (21) treatment units during the entire program, during which three devices were used, namely (Infrared), (Muscle stimulate), and (Ultra Sound) based on the opinion of experts.

2.6 Intermediate and dimensional measurements:

Intermediate measurements were performed on the research sample to identify the extent to which the goals set for the research were achieved, the extent of improvement and progress in the injury, and the physical, psychological and moral condition of the injured players, and they were conducted four weeks after the start of the experiment in the same order as the previous measurements and under the same conditions and for each injured person separately.

2.7 Dimensional measurements:

Eight weeks after the start of the experiment, the telemetry was performed on the research sample in the same order as the pre-measurements and under the same conditions and for each patient separately.

2.8 Statistical Treatments:

1- Arithmetic mean

2- The mediator

3- Standard deviation

4- Torsion coefficient

5- Repeated F-test

3- Presentation, analysis and discussion of the results:

3-1 Presentation of the results of the pre-measurements of the research sample:

Table (5) shows the differences between the pre-measurements in the research variables for the first and second groups.

Significance	Morality (SIG)	Calculated	Second Experiment		First Experimental		Variables	
			±	Going to	±	Going to		
Moral	0.000	15.513	0.40	7.10	0.50	9.80	Hip joint	Muscular stren of the affecte limb
Moral	0.000	17.769	0.77	27.22	3.12	29.14	Knee joint	
Insignificant	0.647	-.464-	1.31	15.04	0. 89	13.08	Hip joint	

Insignificant	0.062	-1.946-	0.89	40.71	0.71	40.22	Knee joint	Muscular stren of the health limb
Moral	0.000	7.876	4.75	70.09	4.73	78.27	Lying hip joint	Range of moti of the affecte limb
Moral	0.000	-8.635-	2.19	70.81	2.89	65.28	Knee joint	
Moral	0.000	9.840	2.23	37.62	2.90	41.87	Hip prolapse	
Insignificant	1.000	.000	3.13	120.10	2.01	120.31	Lying hip joint	Range of moti of the health limb
Insignificant	0.822	.227	2. 79	49.91	2.76	48.98	knee	
Insignificant	1.000	.000	2.32	53.66	2.85	52.04	Hip prolapse	
Moral	0.000	-14.943-	0.32	2.02	0.44	0.43		Pain

Significant < (0.05) at the degree of freedom (26).

It is clear from Table (5) of the differences in intermeasurement between the first experimental group and the second experimental group that there is a difference between the two measurements at the level of 0.05 in all research variables (muscle strength, range of motion, degree of pain) in favor of the first experimental group, where the value of t was between (5.883 to 17.796) and these values are greater than the value of the tabular t at the level of (0.05).

3-2 Presentation of the results of the intermeasurements of the research sample:

Table (6)

Shows the arithmetic mean, standard deviation, and calculated value of (t) for the first and second experimental groups in the research variables in the intertest

Significance	Morality (SIG)	Calculated	Second Experiment		First Experimental		Variables	
			±	Going to	±	Going to		
Moral	0.000	11.53	0.40	8.11	0.50	8.39	Hip joint	

Moral	0.000	15.76	0.77	28.11	3.12	30.22	Knee joint	Muscular stren of the affecte limb
Moral	0.647	4.44	1.31	17.04	0. 89	15.08	Hip joint	Muscular stren of the health limb
Moral	0.062	4.46	0.89	44.88	0.71	40.19	Knee joint	
Moral	0.000	7.87	4.75	72.18	4.73	80.27	Lying hip joint	Range of moti of the affecte limb
Moral	0.000	8.635	2.19	72.72	2.89	66.09	Knee joint	
Moral	0.000	9.840	2.23	38.62	2.90	42.12	Hip prolapse	
Insignificant	1.000	0.000	3.13	123.10	2.01	122.31	Lying hip joint	Range of moti of the health limb
Insignificant	0.822	0.227	2. 79	53.91	2.76	50.98	knee	
Insignificant	1.000	0.000	2.32	53.66	2.85	56.23	Hip prolapse	
Moral	0.000	11.943	0.32	1.02	0.44	0.33		Pain

Significant < (0.05) at the degree of freedom (26).

It is clear from Table (6) of the differences in intermeasurement between the first experimental group and the second experimental group that there is a difference between the two measurements at the level of 0.05 in all research variables (muscle strength, range of motion, degree of pain) in favor of the first experimental group, where the value of t was between $(4.44$ to $15.76)$ and these values are greater than the value of the tabular t at the level of (0.05).

3-3 Presentation of the results of the dimensional measurements of the research sample:

Table (7)

The arithmetic mean, standard deviation, and calculated value of (T) for the first and second experimental groups in the research variables in the post-test

Significance	Morality (SIG)	Calculated	Second Experiment		First Experimental		Variables	
			±	Going to	±	Going to		
Moral	0.000	16.34	0.40	11.11	0.50	10.39	Hip joint	Muscular strength o the affecte limb
Moral	0.000	16.11	0.77	32.11	3.12	37.22	Knee joint	
Moral	0.647	3.12	1.31	19.04	0. 89	19.08	Hip joint	Muscular strength o the health limb
Moral	0.062	2.46	0.89	49.88	0.71	48.19	Knee joint	
Moral	0.000	7.22	4.75	76.18	4.73	82.27	Lying hip joint	Range of motion of t affected lim
Moral	0.000	8.22	2.19	75.72	2.89	71.09	Knee joint	
Moral	0.000	9.13	2.23	42.62	2.90	44.12	Hip prolapse	
Insignificant	1.000	0.87	3.13	145.10	2.01	142.31	Lying hip joint	Range of motion of t healthy lim
Insignificant	0.822	0.88	2. 79	80.91	2.76	78.98	knee	
Insignificant	1.000	0.00	2.32	73.66	2.85	71.23	Hip prolapse	
Moral	0.000	9.33	0.32	0.04	0.44	0.02		Pain

Significant < (0.05) at the degree of freedom (26).

It is clear from Table (7) of the differences in intermeasurement between the first experimental group and the second experimental group that there are differences between the two measurements at the level of 0.05 in all research variables (muscle strength, range of motion, degree of pain) in favor of the first experimental group, where the value of t was between $(2.46$ to $16.34)$ and these values are greater than the value of the tabular t at the level of (0.05).

3.4 Discussion of the results:

Based on the results of the statistical analysis of the study data, which were reached using different measurement methods, guided by scientific references and previous studies, the researcher found that there are statistically significant differences between the pre-measurement, intermediate, and post-measurement in the study variables (muscular strength, range of motion, degree of pain), where it is clear from the results of the study that there are statistically significant differences between the pre-, intermediate, and post-measurements of the first experimental group in the variable of muscle strength of the posterior thigh muscles, which indicates that The researcher attributes this improvement in the experimental group in the muscular strength variable to the rich diversity that the researcher used when preparing her proposed rehabilitation method, where the researcher relied on a selection of rehabilitation exercises and the use of a muscular stimulation device because of their important role in the development of muscular strength, in addition to the researcher's placement of kinesio strips on the injured muscles, which had a great role in giving sufficient support and stability to the injured muscles when performing exercises It also reduced the degree of pain in the injured limb, which helped the injured to work without fear or hesitation.

This is consistent with Heather 's study, which stated that those who used kinizo tapes had a higher ability to contract muscles than the other group that did not use tape.[1]

This is also consistent with the findings of Waleed Hussein's study[2] The inclusion of muscle strength exercises and their regular and gradual practice leads to various changes in the muscles such as increasing the cross-section of the muscle, increasing the size of fast fibers, increasing the size and strength of tendons and ligaments, and the density of capillaries.

1- Heather M.Murray : (2000). Kinesio Taping®, Muscle Strength and ROM after ACL Repair. Journal of Orthopedic and Sports Physical Therapy, 30, 1.

2 - Waleed Hussein Hassan: The Effect of a Proposed Exercise Program for the Prevention of Some Ankle Joint Injuries in Short-Distance Runners, Unpublished Master's Thesis, Faculty of Physical Education for Boys, Minia University, 2002, p. 41.

The results of thet The researcher with the results of Ahmed Abdel Gawad's study [3] It is that rehabilitation programs generally improve the elements of the overall physical fitness of the various muscles of the body. As Aboul-Ela Abdel Fattah points out[4] Strength training using muscular stimulation gives better results than traditional willpower training.

The results of this study by Hasnan and others [5] confirmed [6] that muscle stimulation is a form of training as it leads to involuntary muscle contraction that increases muscle tone, removes tension, stimulates blood circulation, relaxes and relieves pain. Samia Khalil reminds that [7] muscle stimulation is one of the means that work to recruit all muscle fibers to contract at once, and helps to grow muscle strength without affecting motor performance compatibility.

The researcher took into account the principle of gradualism in muscular strength training, in agreement with what Mattacola said [8] that we should gradually progress with strength training from static strength to the use of weights, rubber ropes, and different resistances, while Yasser Shafei explained[9] that the gradual use of appropriate resistances in terms of intensity and size helps to improve muscle strength.

B. Range of motion of the hip joint and knee joint:

The results showed that there are statistically significant differences between the pre-, intermediate and post-measurements of the first experimental group in the variable of range of motion of the hip and knee joints, which indicates the positive effect of the rehabilitation method used, and the researcher attributes this improvement in the first experimental group in the averages of the pre-, intermediate and post-measurement of the range of motion variable, which may be close to 100% in the telemetry to the paragraphs of the proposed rehabilitation

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[3] Ahmed Mohamed Abdel Gawad Talaba: A Proposed Rehabilitation Program for the Sprained Hand Wrist for Tennis Players, Ph.D. Thesis, Unpublished, Helwan University, 2011, p. 34.

[4] - Abu Al-Ula Abdel Fattah: A source mentioned above, p. 123.

[5] Hasnan N, Ektas N, Tanhoffer AI, Tanhoffer R, Fornusek C, Middleton JW, Husain R, Davis GM : 2013 : Exercise responses during functional electrical stimulation cycling in individuals with spinal cord injury: Clinical Exercise and Rehabilitation Unit, Faculty of Health Sciences, University of Sydney, Sydney, Australia .

[6] Saad Fathallah Mohamed Al-Alam: The Effect of Developing Strength Characterized by Speed of Legs Using Plyometric Training and Electrical Stimulation on Digital Achievement in the Triple Jump Competition, Master's Thesis, Unpublished, Alexandria University, 2008, p. 26.

[7] - Samia Khalil Mohammed: Physical Therapy, Methods and Techniques, University of Baghdad, 2010, p. 92.

[8] - Mattacola CG, Dwyer MR : Rehabilitation of the ankle after acute sprain or chronic instability , Journal of athletic training ; 37(4):dec2002.

[9] Yasser Saeed Shafei: Rehabilitation of the Knee Joint after Surgical Repair of Anterior Cruciate Ligament Injury, Unpublished Ph.D. Thesis, Faculty of Physical Education for Boys, Helwan University, 1993, p. 104.

curriculum using kinesio adhesive tapes and rehabilitation exercises in its three stages, where its first and second stages included while the third stage contained exercises of higher intensity, longer time, and more exercises than the first and second stages, which had a positive effect on increasing and developing the range of motion of the joint and in all directions in a way that is almost like a healthy foot and maybe even better than it

This is in line with what Talha Hossam El-Din, Wafa Salah El-Din, Saeed Abdel Rashid[10] , Nariman Al-Khatib and Abdulaziz Al-Nimr[11] have stated that flexibility exercises work to develop the element of muscle stretching and increase the elasticity of the muscles and ligaments together, which leads to an increase in the range of motion of the joint.

This is consistent with what laku et al. have said. ayako et al The use of medical patches (kt) has a positive effect on the range of motion (rom) and in improving the flexion and extension of the trunk and lateral curvature of the spine. [12]

He also agrees with what Ashraf Shaalan said that the rehabilitation [13] curriculum contains stretching and flexibility exercises for the joints, in addition to their positive effect on the development of muscular strength, leads to an increase in the range of motion of the joint, as there is a direct relationship between increasing the range of motion of the joint and increasing the muscular strength leading to the movements of the range of motion.

C. Degree of pain:

It is also clear from the results that there are statistically significant differences between the pre-, intermediate, and post-measurements of the first experimental group in the variable of pain degree, which indicates the positive effect of the rehabilitation method used, and the researcher attributes this improvement by changing the degree of pain in the averages of the pre-, intermediate, and post-measurement to the researcher's use of kinesio adhesive tapes and other physical therapy methods such as infrared radiation, ultrasound, and muscle stimulation, which had a very large role in reducing the degree of pain. The use of Kenizio adhesive strips

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[10] Talha Hossam El-Din, Wafa Salah El-Din, Saeed Abdel Rashid: The Scientific Encyclopedia of Training (Strength, Endurance, Flexibility), Part One, Al-Kitab Center for Publishing, Cairo, 1997, p. 246.

[11] Nariman Muhammad Al-Khatib and Abdulaziz Al-Nimr: Sport Training - Muscle Stretching, Dar Al-Fikr Al-Arabi, Cairo, 1997, p. 72.

6- Ayako, kahanov, and Leamor: The Effect of kinesio taping on lower trunk range of motion, research in sport medicine, 2007; 15(2)103-112.

[13] Ashraf El-Desouki Shaalan: The Effect of a Proposed Exercise Program on the Rehabilitation of the Knee Joint and the Muscles Working on it after Anterior Cruciate Ligament Reconstruction, Unpublished Ph.D. Thesis, Faculty of Physical Education for Boys, Minia University, 1992, p. 77.

has contributed effectively to reducing the degree of pain in the affected posterior thigh muscles, and this was confirmed by the study of Gonzalez et al.[14], which concluded that the use of Kenizio adhesive strips reduces the degree of pain by 23% immediately after application, which allowed the injured athlete to perform his exercises with clear comfort and without pain, which helped to raise the muscular abilities of the injured person to perform strength and flexibility exercises, thanks to the use of Kenizio adhesive strips, which are characterized by their weight. The same thickness and the same specifications of the skin, as they work to lift the skin upwards, which reduces pain, in addition to the fact that kinesio adhesive tapes stimulate blood circulation, which positively affects muscle physiology, and this is in line with the words of Oliveria[15] and Heather[16].

This is also consistent with the findings of the [17] Erkan Kaya and other studies, which showed that kinesio adhesive tapes had a greater effect on reducing the level of pain and inflammation of the injury sample than the second group treated with physical therapy, especially in the first week. The study proved that the use of kinesio adhesive tapes is an alternative option in the treatment of shoulder pain when an immediate effect is needed.

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