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A REHABILITATION PROGRAM FOR SOFT TISSUE INJURIES OF THE KNEE JOINT IN WRESTLERS

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Abstract
The research's objective was to create a suggested rehabilitation regimen to address specific soft tissue injuries (ligaments, capsule, and muscles) in wrestlers' knee joints. In favor of any measurement, the research sought to determine how different shoulder joint injury types were treated and rehabilitated in the tests under investigation between the three measurements (before, mid, and post). Given the nature of the investigation, the experimental approach utilizing the similar single station design was used.
The research population and sample comprised 77 wrestlers who were all teenage athletes from Baghdad who were taking part in the 2022 sports season. Fourteen wrestlers from the Al-Adhamiya Sports Club's freestyle wrestling team were chosen by the researchers to be the research sample. The players, coach, and club administration all agreed to allow this research to be conducted, thus the sample was specifically picked. They were split into two groups: the experimental group, which included seven wrestlers who used the suggested preventive training regimen, and the control group, which included seven wrestlers who used the conventional regimen established by the coaches. The researchers conducted homogeneity on the sample to start the experiment, ensuring uniformity and equality among the sample members in terms of height, weight, age, and chronological age.
The six-week rehabilitation program was designed by the researchers with a progressive increase in physical load intensity and exercise difficulty. The program began with weightless workouts, then moved on to bodyweight exercises and finally weighted exercises using barbells and iron dumbbells. The study's findings revealed:
1. The wrestlers' physical characteristics of the muscles affecting their knee joint improved by 2.87% to 3.95% as a result of the preventive training program.
2. Sprains are the most frequent injury among wrestlers, followed by bruising, muscle tears, and cramping.
3. The wrestlers' muscular strength in the knee joint improved by 14.08% to 21.34% as a result of the preventive training program.
The study concluded that initiatives to avoid the most prevalent sports injuries among wrestlers should be put in place. The researchers also suggested that plyometric activities be used in all sports because of how well they improve muscular balance.
Keywords: rehabilitation program, sports injuries, soft tissues, knee joint, wrestling players

1. Introduction to the Research

1.1 Research Introduction and Importance

Under the general heading of sports medicine, which is an area in which people are progressively devoting their efforts to discover the most effective practices and implement them for the good of humanity, are the sciences of rehabilitation and therapeutic exercises. Rehabilitation is defined by the World Health

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Organization (WHO) as the delivery of coordinated services in the disciplines of medicine, social work, education, and vocational assessment with the goal of retraining or training people to reach their maximum functional potential.

Many kinds of knee injuries commonly happen to regular people because of job weariness, or mishaps. The approaches used by different rehabilitation techniques include the use of therapeutic exercises created by experts in the field. These exercises vary in length, intensity, and repetitions, as well as in the kinds of assessments that are employed to gauge how well an injury is healing. Depending on the nature of the injury and the patient's general health, these tests aim to reduce pain, increase activity, postpone the onset of weariness, and promote range of motion.

The significance of developing a rehabilitation program for specific soft tissue injuries in wrestlers' knee joints is emphasized by this study. Since lower limb movement significantly depends on the integrity and functionality of the knee joint, maintaining the joint's health is essential for people to carry out daily activities.

1.2 Research Problem

For a variety of reasons, many people experience joint disorders and injuries, regardless of their age, gender, or surroundings. The degree of the injury determines the different treatment modalities and approaches. In order to speed up full recovery following physical therapy, the researchers plan to create a customized rehabilitation program that may be utilized either in isolation or in combination with other therapies. The objective is to return range of motion, strength, and endurance to pre-injury levels.

There is a great need for this research because there are few well-defined rehabilitation programs for both athletes and non-athletes to treat these problems, and there are few books in our libraries that address these ailments from a therapeutic standpoint. Teachers and coaches in this sector need these rehabilitative exercises badly.

1.3 Research Objectives

1. Create a suggested rehabilitation plan to address specific soft tissue injuries (ligaments, capsules, and muscles) in wrestlers' knee joints.
2. Determine which of the three measurements—pre, mid, and post—is most useful by comparing how shoulder joint injuries are treated and rehabilitated in the examined tests.

1.4 Research Hypotheses

1. When it comes to the rehabilitation and treatment of specific soft tissue injuries in the knee joint of wrestlers, there are variations amongst the three measurements (before, mid, post).
2. Among wrestlers in the examined tests (pre, mid, post), there are variations in the rehabilitation and treatment of knee joint injuries.

1.5 Research Fields

1. Human Field : Individuals with soft tissue injuries (muscles, capsules, ligaments) in the knee joint, totaling 14 wrestlers.
2. Time Field : From January 3, 2024, to March 1, 2024.
3. Location Field : Al-Adhamiya Sports Club.

2. Research Methodology and Procedures

2.1 Research Methodology

The experimental method was chosen using the equivalent single station design due to its suitability for the nature of the research.

2.2 Research Population and Sample

77 teenage wrestlers from Baghdad who are competing in the 2022 sports season make up the initial population. The 14 freestyle wrestlers from the Al-Adhamiya Sports Club team were chosen by the researchers

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to be the research sample. The players, club management, and coach all gave their approval for the sample to be purposefully selected. They were split up as follows:

- Experimental Group : 7 wrestlers who applied the proposed preventive training program.
- Control Group : 7 wrestlers who applied the traditional program set by the coaches.

2.3 Research Procedures

2.3.1 Data Collection Methods

1. Injury Diagnosis and Information Form : Researchers designed a form to diagnose shoulder joint injuries, to be filled out by individuals with such injuries.
2. Tests and Measurements

2.3.2 Tests and Measurements

- Pain Measurement Test : Using a specially designed questionnaire, researchers estimated the degree of pain.

2.4 Rehabilitation Program

The pre-planned rehabilitation program consists of targeted physical activities with medicine balls, dumbbells, and barbells, as well as exercises utilizing body weight and no weights to heal shoulder joint ailments. The purpose of these exercises is to improve the range of motion, strengthen the muscles of the shoulder joint, and try to restore the joint's normal range of motion in all directions.

During the course of the six-week rehabilitation program, the physical load intensity and exercise difficulty were gradually increased. Body weight exercises were performed first, then workouts with weights such dumbbells and barbells.

2.5 Statistical Methods

The SPSS statistical package was used to analyze the results of the pre, mid, and post-tests.

3- Findings :

3-1 Presentation and Discussion of the First Hypothesis Results

The sample was given a questionnaire to determine their exposure to common knee injuries, including knee joint bruising, sprains, anterior cruciate ligament tears, and fractures, in order to determine the most common knee injuries in wrestling.

Table (1) The Most Common Knee Joint Injuries Among Wrestlers

No.	Type of Injury	Injury Location	Yes (Frequency)	Yes (%)	No (Frequency)	No (%)	Rank
1	Bruises	Knee Joint	1	1.88	52	98.12	1
2	Sprain (Strain)	Knee Joint	2	3.77	51	96.23	2
3	Ligament Tear	Anterior Cruciate Ligament	3	5.69	50	94.34	4
		Posterior Cruciate Ligament	2	3.77	51	96.22	3
4	Fractures	Knee Bone	7	13.21	46	86.79	5

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It is clear from Table (1), which deals with the answers of the research sample and their exposure to common knee joint injuries in terms of frequencies, percentages, and statistical significances. The following is the ranking:
First place: Knee joint bruises.
Second place: Knee joint sprains (strains).
Third place: Posterior cruciate ligament tears of the knee.
Fourth place: Anterior cruciate ligament tears of the knee joint.
Fifth place: Knee bone fractures.

Table (2) Analysis of Variance (ANOVA) Between the Three Measurements (Pre, Mid, Post) in Muscle Strength of the Knee Joint for the Experimental Group

Variables	Source of Variation	Degrees of Freedom (df)	Sum of Squares	Mean Square	F-value	Significance Level
Right Flexion	Between Measurements	2	39.528	19.764	2.812	0.092
	Within Measurements	15	105.417	7.028		
	Total	17	144.944			
Right Extension	Between Measurements	2	122.111	61.056	9.023	0.003
	Within Measurements	15	101.500	6.767		
	Total	17	223.611			
Right Adduction	Between Measurements	2	44.111	22.056	9.636	0.002
	Within Measurements	15	34.333	2.289		
	Total	17	78.444			
Right Abduction	Between Measurements	2	56.444	28.222	9.621	0.002
	Within Measurements	15	44.000	2.933		
	Total	17	100.444			
Left Flexion	Between Measurements	2	28.000	14.000	3.088	0.075
	Within Measurements	15	68.000	4.533		
	Total	17	96.000			
Left Extension	Between Measurements	2	120.444	60.222	7.655	0.005
	Within Measurements	15	118.000	7.867		
	Total	17	238.444			

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Left Adduction	Between Measurements	2	69.333	34.667	8.571	0.003
	Within Measurements	15	60.667	4.044		
	Total	17	130.000			
Left Abduction	Between Measurements	2	165.333	82.667	9.751	0.002
	Within Measurements	15	127.167	8.478		
	Total	17	292.500			

Significant at the 0.05 level; the table value of (F) at the 0.05 level = 3.682

It is evident from Table (2), and the variance analysis (ANOVA) for the measurements (pre, mid, post) in knee joint muscle strength tests for the experimental group:

- The Least Significant Difference (LSD) test as indicated in Table (2) was used to determine the significance of the differences among the three measurements (pre, mid, post). - There are significant differences among the three measurements (pre, mid, post) in knee joint muscle strength tests (right extension, right abduction, right adduction, left extension, left abduction, left adduction), where the F-value ranges from 7.655 to 9.751. This value exceeds the tabular F-value at the 0.05 level of significance.
- In the right and left flexion knee joint muscle strength tests (F-values: 2.812 to 3.088; measurements pre, mid, and post) there are no significant differences. At the 0.05 level, this number is less than the tabular F-value.

Using the Least Significant Difference (LSD) test, Table (3) illustrates the significance of differences between the three measures (before, mid, and post) in the knee joint muscle strength test results for the experimental group.

Variables	Measurements	Mean	Standard Deviation	Significance of Mean Differences	LSD Value
Right Flexion	Pre	18.08	2.76	0.917	3.500
	Mid	19.00	2.10	2.583	
	Post	21.58	3.01		
Right Extension	Pre	31.17	2.99	-3.833	2.500
	Mid	27.33	1.03	6.333	
	Post	33.67	3.20		
Right Abduction	Pre	15.50	1.52	-1.833	2.000
	Mid	13.67	1.51	3.833	
	Post	17.50	1.52		
Right Adduction	Pre	20.67	1.97	-2.333	2.000
	Mid	18.33	1.51	4.333	
	Post	22.67	1.63		
Left Flexion	Pre	17.67	2.34	-2.000	1.000
	Mid	15.67	2.34	3.000	
	Post	18.67	1.63		
Left Extension	Pre	22.33	3.01	-3.000	3.333
	Mid	19.33	2.50	6.333	
	Post	25.67	2.88		

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Left Abduction	Pre	15.00	2.10	-3.333	1.333
	Mid	11.67	1.51	4.667	
	Post	16.33	2.34		
Left Adduction	Pre	24.17	2.48	-4.667	2.667
	Mid	19.50	3.94	7.333	
	Post	26.83	1.94		

Based on Table (3), and the significance of differences among the three measurements (pre, mid, post) in knee joint muscle strength tests for the experimental group using the Least Significant Difference (LSD):
- In knee joint muscular strength tests (right extension, right abduction, right adduction, and left adduction), there are statistically significant differences favoring the pre-term measurement over the mid-term data.
- In knee joint muscular strength tests (right flexion, right abduction), there are statistically significant differences favoring the post-term assessment over the pre-term measurement.
- In knee joint muscular strength tests (right extension, right abduction, right adduction, left flexion, left extension, left abduction, left adduction), there are statistically significant differences favoring the post-term measurement over the mid-term data.

Table (4) Analysis of Variance (ANOVA) among the three measurements (pre, mid, post) in knee joint muscle strength test results for the control group.

Variables	Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F-value	Significance Level
Right Flexion	Between Measurements	2	43.896	21.948	2.663	0.093
	Within Measurements	21	173.094	8.243		
	Total	23	216.990			
Right Extension	Between Measurements	2	138.083	69.042	5.183	0.015
	Within Measurements	21	279.750	13.321		
	Total	23	417.833			
Right Abduction	Between Measurements	2	54.333	27.167	7.869	0.003
	Within Measurements	21	72.500	3.452		
	Total	23	126.833			
Right Adduction	Between Measurements	2	93.813	46.906	7.471	0.004
	Within Measurements	21	131.844	6.278		
	Total	23	225.656			
Left Flexion	Between Measurements	2	64.146	32.073	8.543	0.002
	Within Measurements	21	78.844	3.754		

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	Total	23	142.990			
Left Extension	Between Measurements	2	95.083	47.542	3.606	0.045
	Within Measurements	21	276.875	13.185		
	Total	23	371.958			
Left Abduction	Between Measurements	2	45.438	22.719	4.114	0.031
	Within Measurements	21	115.969	5.522		
	Total	23	161.406			
Left Adduction	Between Measurements	2	261.333	130.667	6.784	0.005
	Within Measurements	21	404.500	19.262		
	Total	23	665.833			

Statistically significant at the 0.05 level. Critical F-value at the 0.05 level = 3.467

From Table (4) it is evident in the analysis of variance (ANOVA) between the three measurements (pre, mid, post) in knee joint muscle strength tests for the control group:

- In knee joint muscular strength tests (right extension, right flexion, right abduction, left flexion, left extension, left abduction), there are notable variations across the three measurements (before, mid, and post), with F-values ranging from 3.606 to 8.543. At the 0.05 level, these results are higher than the crucial F-value. The Least Significant Difference (LSD) test was used to assess the significance of the variations between the three measurements (before, mid, and post).
- In knee joint muscle strength testing (right abduction), where the F-value is 2.663, which is less than the essential F-value at the 0.05 level, there are no significant changes between the three measurements (before, mid, and post).

Table (5) Significance of Differences among the three measurements (pre, mid, post) in knee joint muscle strength test results for the control group using the Least Significant Difference (LSD) test.

Variables	Measurements	Mean	Standard Deviation	Significance of Mean Differences	LSD Value
	Pre	Mid	Post		
Right Flexion	Pre	18.06	2.57	.43750	3.0625
	Mid	18.50	3.34		2.625
	Post	21.13	2.64		
Right Extension	Pre	32.38	4.41	-2.88	3.00
	Mid	29.50	2.98		5.875
	Post	35.38	3.42		
Right Abduction	Pre	15.50	1.98	-2.750	0.75
	Mid	12.75	2.12		3.500
	Post	16.25	1.39		
Right Adduction	Pre	19.00	3.54	-0.88	3.68750
	Mid	18.13	1.36		4.56250
	Post	22.69	2.12		

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Left Flexion	Pre	15.31	2.84	-1.06	2.8125
	Mid	14.25	1.16		3.875
	Post	18.13	1.36		
Left Extension	Pre	24.25	3.88	-2.50	2.38
	Mid	21.75	3.49		4.875
	Post	26.63	3.50		
Left Abduction	Pre	15.31	2.84	3.0625	-0.31
	Mid	12.25	1.75		2.750
	Post	15.00	2.33		
Left Adduction	Pre	28.25	6.02	-3.00	5.000
	Mid	25.25	3.41		8.000
	Post	33.25	3.15		

From Table (5) and Figure (2), it is evident in the significance of differences among the three measurements (pre, mid, post) in knee joint muscle strength tests for the control group using the Least Significant Difference (LSD) test that:

- In tests of knee joint muscular strength (left flexion, right flexion), there are notable discrepancies between the pre and mid measurements, favoring the pre measurement.
- In knee joint muscular strength tests (right extension, right abduction, left flexion, and left abduction), there are notable variations between the pre and post measurements, favoring the post measurement.
- In knee joint muscular strength tests (right extension, right flexion, right abduction, left flexion, left extension, and left abduction), there are notable variations between the post measurement and the mid measurement, favoring the post measurement.

Table (6) illustrates the differences between the experimental group and the control group in knee joint muscle strength tests in the post measurement, n = 14 .

Variable	Group	Sample Size (n)	Mean	Standard Deviation	Mean Difference	t-value	Significance Level	Percentage Difference (%)
Right Flexion	Experimental	6	21.583	3.007	0.458	0.767	0.303	2.170
	Control	8	21.125	2.642				
Right Extension	Experimental	6	33.667	3.204	-1.708	-0.949	0.361	-4.829
	Control	8	35.375	3.420				
Right Abduction	Experimental	6	17.500	1.517	1.250	1.604	0.135	7.692
	Control	8	16.250	1.389				
Right Adduction	Experimental	6	22.667	1.633	-0.021	-0.020	0.984	-0.092
	Control	8	22.688	2.120				
Left Flexion	Experimental	6	18.667	1.633	0.542	0.679	0.510	2.989
	Control	8	18.125	1.356				

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Left Extension	Experimental	6	25.667	2.875	-0.958	-0.545	0.596	-3.599
	Control	8	26.625	3.503				
Left Abduction	Experimental	6	16.333	2.338	1.333	1.058	0.311	8.889
	Control	8	15.000	2.330				
Left Adduction	Experimental	6	26.833	1.941	-6.417	-4.379	0.001	-19.298
	Control	8	33.250	3.151				

The significant level of 0.05 corresponds to a critical t-value of approximately 2.179.

Muscle strength is an essential skill for both men and women in all events, according to Peter Thompson (1996). The effects of weight or resistance cause muscle fibers to react, improving the muscle's capacity to react to the central nervous system.

According to Essam Mohamed Amin and Mohammed Jabir Breqea (1997), one of the most important physical characteristics needed to participate in sports is muscle strength. The foundation of movement and athletic exercise is appropriate muscular strength, which has a major impact on an athlete's performance. It has a connection to agility, stamina, and speed.

3-2 Regarding the second hypothesis presentation and discussion: (There are statistically significant differences between the pre-test, post-test, and intermediate test in knee joint flexibility (range of motion)).

Table (7): Analysis of Variance (ANOVA) Between the three measurements (pre, mid, post) in the flexibility tests (range of motion) for the knee joint in the experimental group.

Variables	Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Value	Significance Level
Right Flexion	Between Measurements	2	47.444	23.722	9.124	0.003
	Within Measurements	15	39.000	2.600		
	Total	17	86.444			
Right Extension	Between Measurements	2	55.444	27.722	11.498	0.001
	Within Measurements	15	36.167	2.411		
	Total	17	91.611			
Left Flexion	Between Measurements	2	40.583	20.292	5.581	0.015
	Within Measurements	15	54.542	3.636		
	Total	17	95.125			
Left Extension	Between Measurements	2	128.111	64.056	9.821	0.002
	Within Measurements	15	97.833	6.522		
	Total	17	225.944			

Significant at the 0.05 level. The critical (F) value at the 0.05 level = 3.682

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- Table (7) makes this clear by showing the analysis of variance (ANOVA) between the measurements (before, mid, and post) in the range of motion (flexibility tests) for the experimental group's knee joint.
- When it comes to the range of motion (right, left, and right extension) of the knee joint, there are notable variations between the three measures (before, mid, and post). At the 0.05 level, the F-values are greater than the crucial F-value, ranging from 5.581 to 11.498. The Least Significant Difference (LSD) test was employed to ascertain the significance of the variations between the three measurements (before, mid, and post).

Table (8) Significance of Differences Between Measurements (Anterior, Intermediate, Posterior) in Flexibility Test Results (Range of Motion) for the Experimental Group Using LSD Post Hoc Test

Variables	Measurements	Mean	Standard Deviation	Significance of Mean Differences	LSD Value
Right Flexion	Before	16.83	1.60	1.00	3.833
	Intermediate	17.83	1.60		2.833
	Posterior	20.67	1.63		
Right Extension	Before	22.67	1.75	-1.17	3.000
	Intermediate	21.50	1.38		4.167
	Posterior	25.67	1.51		
Left Flexion	Before	14.33	2.07	1.58	3.667
	Intermediate	15.92	1.96		2.080
	Posterior	18.00	1.67		
Left Extension	Before	21.83	2.48	-3.833	2.670
	Intermediate	18.00	3.10		6.500
	Posterior	24.50	1.95		

It is evident from Table (8) regarding the statistical significance of differences between the three measurements (anterior, intermediate, posterior) in flexibility tests (range of motion) of the knee joint for the experimental group using the Least Significant Difference (LSD).

Table (9): Analysis of Variance (ANOVA) between the three measurements (Anterior, Intermediate, Posterior) in the results of flexibility tests (Range of Motion) for the knee joint for the control group.

Variables	Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Value	Significance Level
Right Flexion	Between Measurements	2	120.146	60.073	3.363	0.054
	Within Measurements	21	375.094	17.862		
Total		23	495.240			
Right Extension	Between Measurements	2	115.083	57.542	10.219	0.001
	Within Measurements	21	118.250	5.631		
Total		23	233.333			
Left Flexion	Between Measurements	2	72.583	36.292	9.602	0.001
	Within Measurements	21	79.375	3.780		

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Total		23	151.958			
Left Extension	Between Measurements	2	201.613	100.807	19.255	0.000
	Within Measurements	21	109.940	5.235		
Total		23	311.553			

The statistical significance at the 0.05 level is indicated by the critical F-value at 0.05 significance level = 3.467.

It is evident from Table (9) which depict the analysis of variance (ANOVA) between the measurements (pre, mid, post) in flexibility tests (range of motion) of the knee joint for the control group.

Table (10) significance of differences between the three measurements (pre, mid, post) in flexibility tests (range of motion) of the knee joint for the control group using the Least Significant Difference (LSD) test.

Variables	Measurements	Mean	Standard Deviation	Significance of Mean Differences	LSD Value
	Pre	Mid	Post		
Right Flexion	Pre	16.44	2.82	-	5.180
	Mid	17.50	2.33	-	4.13
	Post	21.63	6.34		
Right Extension	Pre	23.38	3.02	-	4.375
	Mid	22.88	1.46	-	4.875
	Post	27.75	2.38		
Left Flexion	Pre	15.00	1.60	-	4.250
	Mid	17.38	1.69	-	1.88
	Post	19.25	2.43		
Left Extension	Pre	26.75	2.12	-	2.800
	Mid	22.50	1.96	-	7.050
	Post	29.55	2.71		

From table (10) it is evident that there are statistically significant differences between the three measurements (pre, intermediate, and post) in knee joint flexibility tests for the control group using the LSD test.

Table number (11) illustrates the differences between the experimental group and the control group in flexibility tests (range of motion) for the knee joint in the post-measurement, n=14 .

Variable	Group	n	Mean	Standard Deviation	Mean Difference between Groups	t-value	Significance Level	Percentage Difference (%)
Right Flexion	Experimental Group	6	20.667	1.633	-0.958	-0.358	0.727	-4.43
	Control Group	8	21.625	6.340				

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Right Extension	Experimental Group	6	25.667	1.506	-2.083	-1.874	0.085	-7.51
	Control Group	8	27.750	2.375				
Left Flexion	Experimental Group	6	18.000	1.673	-1.250	-1.076	0.303	-6.49
	Control Group	8	19.250	2.435				
Left Extension	Experimental Group	6	24.500	1.949	-5.050	-3.859	0.002	-17.09
	Control Group	8	29.550	2.711				

The significance level at 0.05 is 2.179 .

From table (11), differences are evident between the experimental and control groups in knee joint flexibility tests in the posterior measurement:

According to Zaki Mohamed Hassan (2007), balance affects both the equilibrium of the body's components and the balance between the agonist and antagonist muscles that control joint movements and produce the mechanical equilibrium of the body. Different body parts tilt and curve as a result of mechanical stress, which results in structural deformation from an excessive load. The neuromuscular system continuously works to keep the body's center of gravity inside the confines of its support base in order to maintain balance in static poses (Zaki Mohamed Hassan, 2007, pp. 52-92).

3-3 Presentation and discussion of the third hypothesis:

There are statistically significant differences between anterior, medial, and posterior measurements in motor performance tests.

Table (12): Analysis of Variance (ANOVA) between the three measurements (anterior, medial, posterior) for the experimental group for leg movements. n=6

Variable	Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Value	Significance Level
Pushing Competitor Out (Pushing)	Between Measurements	2	14.778	7.389	1.550	0.244
	Within Measurements	15	71.500	4.767		
	Total	17	86.278			
Falling on Front Middle	Between Measurements	2	16.333	8.167	8.963	0.003
	Within Measurements	15	13.667	0.911		
	Total	17	30.000			
	Between Measurements	2	14.778	7.389	1.550	0.244

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Arm Encirclement, Neck Throw Backward	Within Measurements	15	71.500	4.767		
	Total	17	86.278			
Arm Encirclement Outside, Pushing Out Mat	Between Measurements	2	109.000	54.500	8.984	0.003
	Within Measurements	15	91.000	6.067		
	Total	17	200.000			
Arm Encirclement, Neck Throw Backward	Between Measurements	2	1.524	0.762	3.048	0.078
	Within Measurements	15	3.752	0.250		
	Total	17	5.276			
Neck Pull Down, Arm and Neck Encirclement	Between Measurements	2	109.000	54.500	8.984	0.003
	Within Measurements	15	91.000	6.067		
	Total	17	200.000			
Focus Points	Between Measurements	2	1.524	0.762	3.048	0.078
	Within Measurements	15	3.752	0.250		
	Total	17	5.276			

Table (13): Statistical Significance of Differences Between the Three Measurements (Anterior, Medial, Posterior) for the Experimental Group in Leg Movements, Least Significant Difference (LSD), n=6

Variables	Measurements	Mean	Standard Deviation	Significance of Differences between Means	LSD Value
Pushing Competitor Outward	Anterior	10.83	2.48	-1.50	-2.17
	Medial	9.33	2.25	-0.67	
	Posterior	8.67	1.75		
Falling Forward on the Middle	Anterior	11.17	1.17	-1.17	-2.333
	Medial	10.00	0.89	-1.17	
	Posterior	8.83	0.75		
Arm Encirclement and Backward Throwing	Anterior	10.83	2.48	-1.50	-2.17
	Medial	9.33	2.25	-0.67	
	Posterior	8.67	1.75		
Arm Encirclement and Pushing Competitor Out (Mat)	Anterior	36.17	2.93	-3.50	-6.0
	Medial	32.67	2.34	-2.50	
	Posterior	30.17	2.04		
Neck Pull Down and Arm and Neck Encirclement	Anterior	2.38	0.49	0.47	0.700
	Medial	2.85	0.52	0.23	
	Posterior	3.08	0.48		

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Neck Pull Down then Arm and Neck Encirclement	Anterior	36.17	2.93	-3.50	-6.000
	Medial	32.67	2.34	-2.50	
	Posterior	30.17	2.04	1.42	
Focus Points	Anterior	2.38	0.49	0.47	0.700
	Medial	2.85	0.52	0.23	
	Posterior	3.08	0.48		

Table (14) Analysis of Variance (ANOVA) between the three measurements (pre, post, and follow-up) for leg movements in the control group, n=8

Variables	Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Value	Significance Level
Pushing Competitor Outside	Between Measurements	2	45.583	22.792	7.449	0.004
	Within Measurements	21	64.250	3.060		
	Total	23	109.833			
Falling on Front Middle	Between Measurements	2	45.750	22.875	21.000	0.000
	Within Measurements	21	22.875	1.089		
	Total	23	68.625			
Arm Encircling, Neck, and Throw Backwards	Between Measurements	2	45.583	22.792	7.449	0.004
	Within Measurements	21	64.250	3.060		
	Total	23	109.833			
Arm Encircling Outward then Pushing Competitor Outside on Mat	Between Measurements	2	134.333	67.167	4.781	0.019
	Within Measurements	21	295.000	14.048		
	Total	23	429.333			
Arm Encircling, Neck, and Throw Backwards	Between Measurements	2	1.376	0.688	11.615	0.000
	Within Measurements	21	1.244	0.059		
	Total	23	2.620			
Pulling Neck Down then Arm and Neck Encircling	Between Measurements	2	134.333	67.167	4.781	0.019
	Within Measurements	21	295.000	14.048		
	Total	23	429.333			
Focus Points	Between Measurements	2	1.376	0.688	11.615	0.000

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	Within Measurements	21	1.244	0.059		
	Total	23	2.620			

Significant at the 0.05 level. The critical F-value at the 0.05 level = 3.467.

Table (15): Significance of Differences between the Three Measurements (Pre, Mid, Post) for Leg Movements in the Control Group using LSD Test, n=8

Variables	Measurements	Mean	Standard Deviation	Significance of Mean Differences	LSD Value
	Pre	Mid	Post		
Pushing competitor outward	Pre	12.63	2.26	-1.75	-3.375
	Mid	10.88	1.64	-1.63	
	Post	9.25	1.16		
Falling forward	Pre	11.88	1.55	1.875-	3.375-
	Mid	10.00	0.76	-1.500-	
	Post	8.50	0.53		
Arm encirclement, neck throw backward	Pre	12.63	2.26	-1.75	-3.375-
	Mid	10.88	1.64	-1.63	
	Post	9.25	1.16		
Arm encirclement outward then pushing competitor outward on the mat	Pre	31.25	3.85	-3.50	-5.750-
	Mid	27.75	3.73	-2.25	
	Post	25.50	3.66		
Arm encirclement and neck throw backward	Pre	1.71	0.25	0.14	.56250
	Mid	1.85	0.21	.42500	
	Post	2.28	0.27		
Neck pull down then arm and neck encirclement	Pre	31.25	3.85	-3.50	-5.750-
	Mid	27.75	3.73	-2.25	
	Post	25.50	3.66		
Focus Points	Pre	1.71	0.25	0.14	.56250
	Mid	1.85	0.21	.42500	
	Post	2.28	0.27		
	Mid	28.25	2.19	-4.000-	
	Post	24.25	2.19		

Table (16) illustrates the differences between the experimental group and the control group in foot movements for the post measurement, \(n=14 \).

Variable	Group	n	Mean	Standard Deviation	Mean Difference	t-value	Significance Level	Difference Percentage (%)
Push Competitor Outside	Experimental Group	6	8.667	1.751	-0.583, -0.751, 0.467	-6.31	-	
	Control Group	8	9.250	1.165				

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Fall Forward Middle	Experimental Group	6	8.833	0.753	0.333, 0.973, 0.350	3.92	-	
	Control Group	8	8.500	0.535				
Arm Enclosure, Neck Throw Back	Experimental Group	6	8.667	1.751	-0.583, -0.751, 0.467	-6.31	-	
	Control Group	8	9.250	1.165				
Arm Enclosure Outside Then Push Competitor Out	Experimental Group	6	30.167	2.041	4.667, 2.793, 0.016	18.30	-	
	Control Group	8	25.500	3.665				
Arm, Neck, and Throw Back	Experimental Group	6	3.083	0.483	0.808, 4.020, 0.002	35.53	-	
	Control Group	8	2.275	0.266				
Pull Neck Down Then Arm, Neck Enclosure	Experimental Group	6	30.167	2.041	4.667, 2.793, 0.016	18.30	-	
	Control Group	8	25.500	3.665				
Focus Points	Experimental Group	6	3.083	0.483	0.808, 4.020, 0.002	35.53	-	
	Control Group	8	2.275	0.266				
	Control Group	8	24.250	2.188				

The statistical significance at the 0.05 level is t -value = 2.179.

It is evident from Table (16) regarding the differences between the experimental and control groups in the results of leg movements in the post-measurement:

According to Abu Al-A'la Ahmed Abdul Fattah (1997), using contemporary training methods to develop the strength of the agonist and antagonist muscles at the knee joint increases the productivity of muscle strength when applying force on a force platform. This rise in joint capacity during performance—which is represented in the muscle's oscillatory planning—causes this development in force application.. In order to achieve the concept of economy of effort and generate maximum force in the shortest amount of time to prevent the dispersion of produced force, strength training that focuses on muscle work within the necessary angles provides the optimum muscular strength and precise muscle recruitment. This leads to high performance fluidity and economy, which in turn increases muscle strength and reduces the risk of injury. It also helps the

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athlete focus considerably on force application during performance by recruiting the greatest number of motor units without focusing on other internal factors that may hinder applied force. (Abu Al-A'la Abdul Fattah: 1997, 98)

4- Conclusions and Recommendations

4-1 Conclusions:

1. For wrestlers, the preventative training program improved the physical characteristics of the muscles affecting the knee joint by a percentage of (2.87%: 3.95%).
2. The most frequent injuries sustained by wrestlers are sprains, which are followed by bruising, rips, and spasms of the muscles.
3. Wrestlers that participated in the preventive training program saw an increase in their knee joint muscle strength of 14.08% to 21.34%).
4. There are variations in range of motion measures between the pre- and post-measurements.
5. Poor warm-ups and disregard for physical conditioning before to training and tournaments are two major causes of sports injuries among wrestlers.
6. Not connecting well with wrestlers in practice or matches.

4-2 Recommendations:

1. The need to create injury prevention initiatives for the sports ailments that wrestlers sustain most frequently.
2. Because plyometric exercises have a positive effect on muscular balance, researchers advise employing them in all sports.
3. The need to reduce knee joint problems by strengthening muscles through proprioceptive neuromuscular facilitation (PNF) activities and plyometric workouts.
4. To reduce the risk of injuries in wrestlers, both male and female, researchers advise using structured training regimens.
5. Using the research's findings in competitions and individual sports.

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