

## Effectiveness of Plyometrics Training by Using Ozone Gas in Fast Healing of Torn Ligaments of Ankle Joint Injury for Adult Wrestlers

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### Introduction and Research Problem:

Wrestling is considered one of the sports that requires great effort by players during performance as well as a high level of fitness for all body organs specially the lower end of the body.

Both Elsayed Kandil (2003) and Dan Gable (1999) agree that the lucky wrestler is distinguished by legs muscle strength to be used effectively during competition for the maximum usage (1:12) (10:60).

Weakness of muscles during performance, specially muscles that work on the ankle joint, or lack of stability in the sub talus bone (astragalus) joint may lead to torn ligaments of the ankle joint injury and then recurrence again (9:1) (15:34).

Adel Abo Quraish (2001) and Waleed Hussein (2002) mention that the injury of the ankle ligaments occurs repeatedly since the foot is the base on which the human body mainly depend and by which the whole body moves. The percentage of the torn ligaments of ankle joint injury is 58% of the total injuries of this joint. Moreover, 4 out of 5 injuries include the lateral ligament of the ankle joint which illustrates that such joint must be treated seriously (4:4) (7:5).

Sports Rehabilitation is essential for the injured especially when knowing that the injured organ depends on both the speed and the level of rehabilitation by 75% to work naturally again (6:39).

Ozone is used as an effective method for injury fast healing. G. Jonovich

(1995) assures that among the benefits of medical ozone in the field of sports that it

reduces swelling, bruises, and pain after injury and it accelerates healing. In addition, medical ozone is efficient in improving the capability of both the body and the blood circulation for athletes (12:230 – 245).

Active ozone gas is capable to provide body cells, when being treated, safely with large amounts of oxygen so it is considered one of the natural methods that duplicate the activity of muscular tissues and cells (2:55).

Dintiman (2004) refers to the anonymous importance of plyometrics training to coaches. Such training is the result of combining the elements of both strength and speed as it appears clearly in training sessions of both humping and leaping as they develop the body explosive strength in general and the lower end of the body in specific. Also, these training sessions are used to develop the explosive reaction of the player throughout the strong muscular contractions that are resulted from fast eccentric contractions (11:3).

Concerning what previously mentioned, the researcher has noticed that the methods used to rehabilitate torn ligaments of ankle joint injury are traditional that are used for a long time ago. They do not depend on improving the physical efficiency of wrestlers since wrestling requires explosive strength besides the speed of the ankle joint for its great importance in kinetic performance and feet movements.

The researcher was urged to apply the plyometrics training program with using ozone gas to recognize fast healing to rehabilitate torn ligaments of wrestlers' ankle joint and to recognize its functional efficiency.

**Research Goal:**

The research aims at recognizing the effect of plyometrics training program with using ozone sessions on the speed of healing torn ligaments of ankle joint throughout:

1. The improvement range of muscular strength that works on the ankle joint.
2. The improvement of the kinetic range and the degree of pain of the ankle joint.

**Research Hypotheses:**

1. There are statistically significant differences between pre and post evaluations in favor of the post evaluation of the experimental group in the variable of muscular strength working on the ankle joint.
2. There are statistically significant differences between pre and post evaluations in favor of the post evaluation of the experimental group in the variable of kinetic range and the degree of pain of the ankle joint.

**Research Procedures:**

**Research Methodology:** The researcher used the experimental method as it suits the research nature.

Research sample: The sample was selected deliberately from the international wrestlers who have torn ligaments of ankle joint Injury. The sample consists of (10) injured who are registered in the Egyptian Wrestling Federation. The sample was divided into two groups: experimental (5 wrestlers) and controlling (5 wrestlers) who have torn ligaments of ankle joint Injury.

**Conditions of Sample Selection:**

The sample was selected according to the following conditions:

1. The sample must be selected from the injured with torn ligaments of ankle joint.

2. The wrestler (of the experimental group) agrees to submit to sessions of ozone in the anus.
3. The approval of participating in rehabilitation programs.
4. Not having any other injuries.
5. Regularity in rehabilitation and plyometrics training programs.

**Research Executive Steps:**

a. Pre Evaluation

Pre evaluations were conducted on the basic sample by applying tests for variables (under discussion) from ..... until .....

b. Research Basic Experiment:

Basic experiment was applied on both the experimental and controlling groups at the same time. Plyometrics training programs were applied on the experimental group for (8) weeks by (3) sessions weekly. Also, medical ozone doses were given to wrestlers in the experimental group by (3) sessions a week in the anus under the guidance of a doctor before starting the daily training session. Concentration was specified by the doctor according to the research goal.

At the same time, the traditional rehabilitation program was applied on the controlling group for (8) weeks by (3) sessions weekly. Each session took (20) minutes to be gradual according to each case. The period was from ..... until .....

Post Evaluation

By using the same method and order of the pre evaluations, the post evaluations were conducted for variables (under discussion) after finishing plyometrics training and rehabilitation programs. The period was from ..... until .....

## Results and Discussion

Table (1) shows percentages of improvement between Pre and Post Evaluations of the Experimental Group in Variables under Discussion S = 5

Variable	Evaluation Unit	Pre Evaluation Median	Post Evaluation Median	Differences between Medians	Improvement Percentage
Muscular Strength	Kg	11.8	45.8	34	288%
Kinetic Range	Degree	90	138.8	48.8	54.2%
Pain Degree	Degree	7	2.6	-4.4	-62.9%

Table (1) shows the improvement percentage between both pre and post evaluations. The highest percentage of a variable was of the muscular strength (288%) while the lowest was of the kinetic range (54.2%).

Table (2) shows percentages of improvement between Pre and Post Evaluations of the Controlling Group in Variables under Discussion S = 5

Variable	Evaluation Unit	Pre Evaluation Median	Post Evaluation Median	Differences between Medians	Improvement Percentage
Muscular Strength	Kg	11.2	40.80	29.6	264.2%
Kinetic Range	Degree	90	133.40	43.4	48.2%
Pain Degree	Degree	6	4.6	-1.4	-23.3%

Table (2) shows the improvement percentage between both pre and post evaluations. The highest percentage of a variable was of the muscular strength (264.2%) while the lowest was of the pain degree (23.3%).

Table (3) shows Differences between Improvement percentages of both the Experimental and Controlling Groups in Research Variables S = 10

Variable	Evaluation Unit	Experimental Group	Controlling Group	Difference
Muscular Strength	Kg	288%	264.2%	23.8%
Kinetic Range	Degree	54.2%	48.2%	6%
Pain Degree	Degree	62.9%	23.3%	39.6%

Table (3) shows the existence of differences between improvement percentages of both groups (under discussion) in favor of the former group.

Tables (1,2, and 3) show clear statistic differences between the experimental and the controlling groups in improvement percentage for the variable of muscular strength of the ankle joint in favor of the experimental group. Pre evaluation median of the experimental group was (11.8 kg), post evaluation median

was (45.8 kg), and improvement percentage was (288%). On the other hand, post evaluation median of the controlling group was (11.2 kg), post evaluation median was (40.80 kg), and improvement percentage was (264.2%). Hence, there are clear differences in the improvement

percentage (23.8%) in favor of the experimental group.

The researcher attributes such differences in favor of the experimental group to the plyometrics training programs and ozone gas sessions which had great effect in increasing the amount of the muscular strength of muscles that work on ankle joint as well as the improvement of the surrounding ligaments of the ankle joint.

Victor (2004), Wesson (2002), and Yehia Zakaria (2001) agree that plyometrics training has a great effect on improving the explosive muscular strength of legs and hence the improvement of the ankle joint and increasing the speed of reflexive reaction (17:141) (18:143) (8:64).

Also, previously mentioned results agree with their counterparts of Fady Fakhry (2007), Haddad (1996), and Reham Hamid (2002) that medical ozone works on fast healing of tissues with rationed training performance throughout increasing the amount of oxygen inside the body in general and inside the muscular cell in specific besides it reduces recovery period.

From what previously mentioned, it is clear that the first hypothesis is achieved: "there are statistically significant differences between both pre and post evaluations in favor of the post evaluation of the experimental group in the variable of the muscular strength of muscles that work on the ankle joint" (3:70) (5:57) (13:33).

Tables (1, 2, and 3) show statically significant differences between the experimental and controlling group in favor of variables of the kinetic range and pain degree. The variable of the kinetic range is (54.2%) in favor of the experimental group as an improvement percentage between the average of pre and post evaluation while the improvement percentage of pain degree is (-62.9%). The improvement percentage of the kinetic range variable in the controlling group is (48.2%) between the average of pre and post evaluations. Also, the pain degree variable has an improvement percentage between the average of pre and post evaluation that reached (23.3%).

There are clear statistically significant differences in the improvement percentage in favor of the experimental group that reached

(6%) in the kinetic range variable while it reached (39.6%) in pain degree variable.

The researcher attributes the improvement in both the variables of the kinetic range and pain degree in favor of the experimental group to the gradual integrated structure in the plyometrics training used in rehabilitating torn ligaments of wrestlers' ankle joint and the efficiency of ozone gas sessions in fast healing, raise the efficiency of the ankle joint and disappearance of pain.

This result agrees with what mentioned by Michael (2009) and Westlin (2003) that plyometrics training has a positive effect as it develops muscular stretching, increases muscles elasticity and ligaments that lead to an increase in the kinetic range of the ankle muscles besides pain disappears as a result of wrestlers kinetic range in this stage . (14:24) (16:5).

### Conclusions

Depending on the research results and discussions and in the light of their sample, the following can be concluded:

- Plyometrics training has good effect in improving rehabilitation of torn ligaments of the ankle joint throughout the variable of muscular strength. Improvement percentage of the experimental group under discussion reached (23.8%) in muscles strength that work on ankle joint.
- Ozone gas sessions has a great effect on increasing the efficiency of the kinetic range of the ankle joint after torn ligaments injury and it decreases pain percentage in which improvement percentage was (39.6%) in favor of the experimental group in pain percentage variable.
- Improvement percentages were in favor of the experimental group against the controlling group. Kinetic range variable was (6%) as a result of plyometrics training and ozone gas session.

### Recommendations

- Making use of plyometrics training and ozone gas sessions to rehabilitate torn ligaments of the ankle joint for adult wrestlers.

- Studying common injuries in various sports and designing treatment and rehabilitation programs by using multiple modern methods.
- Conducting regular examinations for wrestlers at different ages to discover any functional or physical defects to be treated.
- Conducting an immediate treatment and rehabilitation for wrestlers' injuries not to be chronic.
- Taking care and focusing on teaching basic skills for wrestlers and correcting mistakes.
- Allowing sufficient time to teach wrestling basic skills and not to participate in national and international competitions until making sure of learning these basic skills.

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