Ovidius University Annals, Series Physical Education and Sport / SCIENCE, MOVEMENT AND HEALTH
Vol. XIX, ISSUE 1, 2019, Romania
The journal is indexed in: Ebsco, SPORTDiscus, INDEX COPERNICUS JOURNAL MASTER LIST,
DOAJ DIRECTORY OF OPEN ACCES JOURNALS, Caby, Gale Cengage Learning, Cabell's Directories

Science, Movement and Health, Vol. XIX, ISSUE 1, 2019
January 2019, 19 (1): 19 - 26
Original article

CONTRIBUTIONS TO THE MEANS USED IN SPORTS RECUPERATION

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Abstract

The aim of the present paper is to find, research and test the means of recovery using especially the water resistance, namely the buoyancy and hydrostatic pressure, as well as the anti-gravity resistance, thus discovering the most qualitative and rapid methods.

Objectives: Comparing the effects of anti-gravity means with those that use water resistance; Discovering the most beneficial methods of recovery and prophylaxis based on diagnosis.

Results: At the end of the treatment period, each athlete was subjected to a new clinical assessment and a new anamnesis.

Conclusions: The constant participation and cooperation of athletes at physical therapy sessions as well as the co-operation with their coach throughout the recovery process determines the shortening of the recovery time. For better rehabilitation it is necessary to adapt the program according to the needs and capabilities of each athlete. To avoid relapses, athletes have been trained to perform kinetoprophylaxy and ergo therapy exercises tailored to that sport so they can reintegrate into group play or contact sport where appropriate.

Keywords: functional recovery, performance, sports, sport recovery, training.

Introduction

Rehabilitation is the best anatomical and functional recovery (Frontera, 2003).

The rehabilitation name is given by the Latin prefix "re-", which means "again" and "habit", which means "to fit". It is a process that minimizes physical loss associated with acute lesions or chronic diseases to promote recovery and maximize functional capacity, effort and performance. PNF stretching (or proprioceptive muscular facilitation) is one of the most effective forms of flexibility training for increasing range of motion. PNF stretching is a method of flexibility training that can reduce hyper tonus, allowing muscles to relax and lengthen and can be applied to patients of all ages (Gidu, et. all, 2013). PNF can be used to supplement daily stretching and these techniques help develop muscular strength and endurance, joint stability, mobility, neuromuscular control and coordination. PNF techniques are as follows: Contract Relax, Hold Relax, Rhythmic Initiation, Rhythmic Stabilization, Slow reversals, Alternating isometrics and Alternating rhythmic stabilization (Gidu, et. all, 2013).

The rehabilitation plan must be done so that the patient's (athlete's) goal is to be reintegrated into the same environment and type of activity in which the injury has occurred. Its functional capacity must be the same or better than before the injury.

The rehabilitation of the injured athlete is led by a multidisciplinary team led by the physiotherapist, who is the coordinator. This team includes: physical trainer, coach, sports teacher, psychologist, nutritionist and orthopedist. The multidisciplinary team works closely with the athlete and his coach to jointly achieve the recovery goals to discuss the progress of all interventions and to decide together what time is needed to return the athlete to training and competitions. Communication is a vital factor. Lack of communication between members of the multidisciplinary team may slow the recovery of the athlete and may increase the risk of a new injury (Anderson, 2008).

Here are seven principles of recovery, which can be remembered as follows: **ATC IS IT**. (http://www.humankinetics.com/excerpts/excerpts/employ-the-seven-principles-of-rehabilitation)

A: Avoid aggravation.

It is very important not to aggravate injury during the recovery process. Therapeutic exercises, if not properly executed and supervised by the specialist, tend to aggravate the injury, thus making rehabilitation difficult (http://www.humankinetics.com/excerpts/excerpts/employ-the-seven-principles-of-rehabilitation).

T: Timing.

Therapeutic exercises should be started as quickly as possible, but without aggravating the injury. The sooner the recovery begins, the time goes on and the athlete can return to his work in a shorter time. It works by following the body's response to the program, observing the

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Received 15.10.2018 / Accepted 6.11. 2018

rest program, but too much rest can be detrimental to progress (http://www.humankinetics.com/excerpts/excerpts/employ-the-seven-principles-of-rehabilitation).

C: Compliance.

If recovery occurs with a patient who does not comply, the rehabilitation program will not succeed. In order to be able to collaborate properly with the patient, they should be informed about the content of the program and what to expect during recovery (http://www.humankinetics.com/excerpts/excerpts/employ-the-seven-principles-of-rehabilitation).

I: Individualization.

The body of each person responds differently to the injury and subsequent rafting program. Even as an injury appears to be similar in one patient to another in terms of type and severity, undetectable differences can make an organism react differently to the other (http://www.humankinetics.com/excerpts/excerpts/employ-the-seven-principles-of-rehabilitation).

S: Specific sequencing.

A program of therapeutic exercises should be followed using a specific dosage. This splice dosage is determined according to the response received from the athlete's body (http://www.humankinetics.com/excerpts/excerpts/employ-the-seven-principles-of-rehabilitation).

I: Intensity.

The intensity level of the exercise program should be dosed so that the patient is requested and feel feedback from the affected area but at the same time the program should not aggravate the injury. To know when to increase the effort without aggravating the injury requires observation of the patient and his response to the intensity (http://www.humankinetics.com/excerpts/excerpts/employ-the-seven-principles-of-rehabilitation).

T: Total patient.

During recovery, the athlete must be trained globally. It is very important that the unaffected regions are kept at a normal tonus. Maintaining the cardiovascular system in optimal parameters, maintaining joint amplitude, muscle strength, coordination and endurance are of great importance. The rehabilitation program should be focused on the entire body not only on the affected area. By offering the patient a global program, he is helped to be better prepared both physically and mentally for the moment the affected region is completely rehabilitated (http://www.humankinetics.com/excerpts/excerpts/employ-the-seven-principles-of-rehabilitation).

The purpose and tasks work

The aim of the present paper is to find, research and test the means of recovery using especially the water resistance, namely the buoyancy and hydrostatic pressure, as well as the anti-gravity resistance, thus discovering the most qualitative and rapid methods.

Work hypothesis

In order to carry out the present study we started from the hypothesis that applying both classical and modern methods, specific to the type of diagnosis of the athlete, both rehabilitation and relapses will be positively influenced.

Material and method

Athletic recovery means recovery after the effort and recovery after the injuries resulting in injury to the athlete. The traumas that concern the members of the performance athletes are characterized by a distinct etiological, morphological and pathogenic diversity.

If recovery after effort is attributable to the physical trainer and the coach, the functional prevention and rehabilitation of the traumatic affections rests with kinetotherapy and the physical medicine recovery programs.

Observing this concept, I sought to bring together a minimum of information on classical programs used in sport recovery, as well as finding relatively new methods used in rehabilitation of athletes, comparing the results obtained, thus observing the efficacy of both methods.

This study is a retrospective clinical trial for a period of 6 months (04.11.2017 - 08.05.2018) carried out in the Medical Recovery Clinic of Constanta Axis on the basis of the partnership protocol no. 522 from 11.09.2017 with the Faculty of Physical Education and Sport from Ovidius University of Constanta. From the experimental group, consent to the participation and use of personal data was obtained in the present paper; from the two participants aged 13 and 17, we received the parents' agreement. In the study, 7 athletes aged between 13 and 42 were included, the average age being 25, of which 3 practiced football, 1 basketball, 1 rugby, 1 Greek-Roman fights and one ski. Of these, 2 had fractures, 2 had sprains, 2 had ligament and meniscus rupture and one had a dislocation. All subjects agreed to participate in this study and the rehabilitation conditions were identical for the whole lot.

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Table 1. Lot of subjects included in the study, according to sources (Athlete's history, coaching, observation, discussion with medical staff and discharge sheets)

Case	Name	Age	Sex	Sport	Diagnostic
1	P.M.	13	F	Basketball	Ankle
2	P.G.I.	23	M	Football	Shin fracture and fibula
3	M.C.	17	M	Football	Medial meniscus rupture
4	P.A.	42	F	Skiing	Shin fracture
5	T.R.L.	21	M	Greek-Roman fights	Scapulo-humeral luxation
6	T.G.	30	M	Rugby	Knuckle
7	S.D.	33	M	Football	Cross-ligament rupture

Table 2. Distribution of subjects on Months

November	December	January	February	March	April	May
1	**1**	**2**	**0**	**1**	**2**	**0**

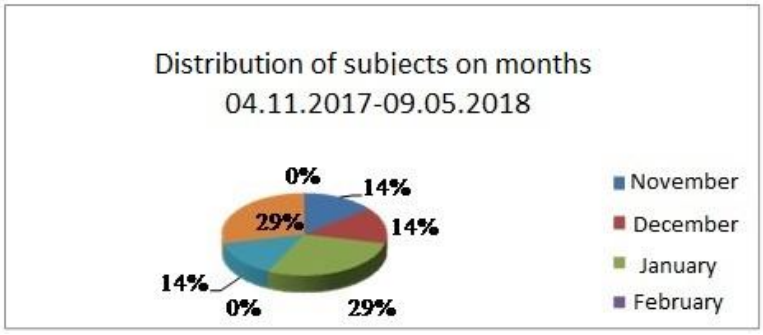

Figure 1. Distribution of subjects by months

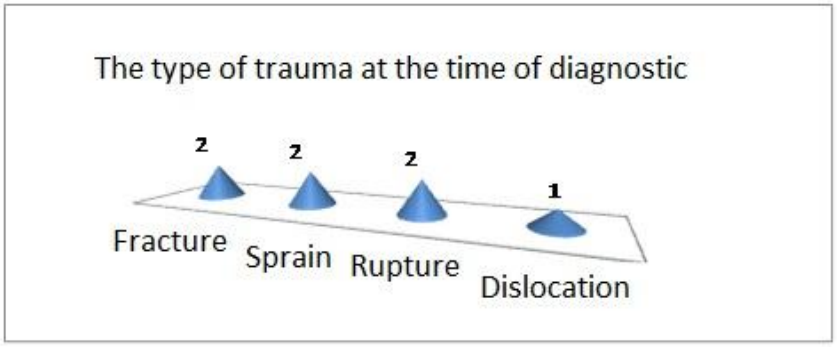

Figure 2. Traumatic repartition

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Tests applied for validation of research

To determine these types of complications as well as to diagnose correctly, in the present group of athletes the paraclinical methods were: radiological examination and nuclear magnetic resonance (NMR).

The second method is superior to the radiological examination due to the fact that besides the correct diagnosis and the diagnosis of the fractures, the nuclear magnetic resonance also reveals the vascular-nerve complications, the ligament or the damage of the joint surfaces. Unfortunately, this method is much more expensive than the classic radiological exam.

In connection with the current group of athletes, only 2 were diagnosed using nuclear magnetic resonance, the others being diagnosed after the clinical examination associated with the radiological examination (chart 3 shows this fact).

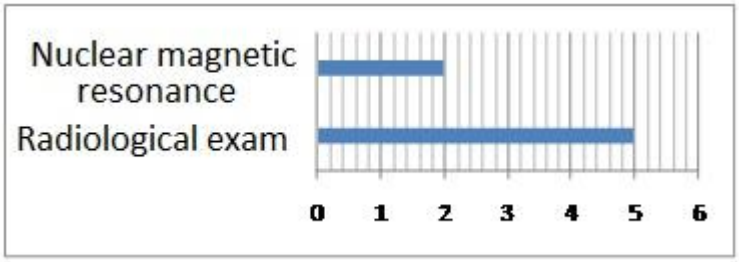

Figure 3. Paraclinic investigation used

In terms of pain, it was recorded both at the initial stage of the trauma, during recovery and at the end.

Next, we can see that in the early stage of a trauma the degree of pain is high, but it differs from one athlete to another and from diagnosis to diagnosis.

Table 3. The degree of pain according to Visual Analogic Scale in the early stage

Case	Name	Sport	Diagnostic	Grade pain (VAS)
1	P.M.	Basketball	Ankle	8
2	P.G.I.	Football	Shin fracture and fibula	10
3	M.C.	Football	Medial meniscus rupture	7
4	P.A.	Skiing	Shin fracture	10
5	T.R.L.	Greek-Roman fights	Scapulo-humeral luxation	9
6	T.G.	Rugby	Knuckle	8
7	S.D.	Football	Cross-ligament rupture	8

Musculo-articular clinical testing

The articular balance assesses the ability to move a joint using the instrument called goniometer. This instrument gives objective values, appreciating the degree of mobility and is similar to a fixed-arm reporter, sitting in the axis of the test member, also having a mobile arm that follows the segment that is mobilizing, assessing the degree of mobilization (the amplitude).

Simultaneously with the articular balance being carried out, the following are also highlighted, having a special impact on the choice of the corresponding recovery program:

- for muscle testing, an international rating system with a scale from 0 to 5 is used to assess tension in the tendon, muscle mass, strength and strength of the muscle.

The meaning of these values is as follows:

- value 0 - There is no tension in the tendon and muscle mass. No shrinkage is drawn, practically the muscle is nerve-free.

- value 1 - There is tension in the tendon and muscle mass, the contraction is a modest one, without performing the movement.
- value 2 - A shrinkage is made by which the segment moves under the force of gravity or any other resistance.
- value 3 - The contraction is sufficient to move the antigravity segment but without any other resistance.
- value 4 - The contraction achieves segment mobility versus gravity plus mean resistance
- value 5 - The contraction is possible and performs segment movement against gravity and against significant resistance.

Table 4. Initial results of joint testing

Articular test result	Number of cases
Joint articulation	4
Normal mobility	2
Articular hyperlaxity	1

It can be seen in Chart 4 that the results of the articular test were different. This difference is due to the secondary complications of each diagnosis, as well as to the degree of mobility that each individual person presented before the injury.

We have noticed that in the case of bone fractures and ligament breaks, articular rejuvenation is present, and in the case of sprains and dislocation, hyper laxity and normal mobility are present.

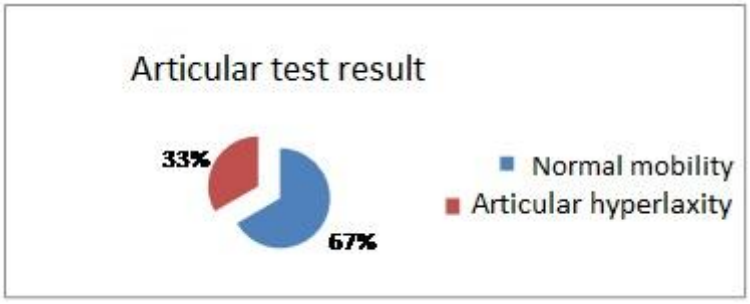

Figure 4. Initial results of joint testing

Table 5. Initial muscle balance

Force	Number of case
0 - Insufficient	0
1 – Fair but unnecessary for function	1
2 – Useful but insufficient strength	1
3 – Forceful force for an ordinary function	3
4 –Normal but slightly exhausting force	2
5 – Normal force	0

After performing the initial muscular balance, we could see that no athlete showed a force equal to 0 or 5. As with the joint amplitude, the force depends on the type of diagnosis and secondary complications.

Also in fractures and ligament breaks where immobilisation is prolonged, muscle strength is lower due to muscle atrophy and hypotonia. In the case of sprains and spurs, loss of muscle mass is not so significant.

Results and analysis

At the end of the treatment period, each athlete was involved to a new clinical assessment and for a new anamnesis, thus finding the following:

- articular mobility increased in amplitude;
- muscle tone has improved significantly, muscle testing demonstrating this fact;
- the pain has decreased significantly or completely disappeared, this being noted in the Visual Analogic Scale;
- coordination of global movements has improved significantly due to water exercises;
- the athletes managed to resume their isolated training, starting the group training;
- each athlete has regained his muscular tonus and activity-specific strength.

Objectives:

- continuing the development of strength and muscle strength;
- reintegration of all athletes in the specific activities and setting of the maintenance program used outside training, according to the ergotherapy;
- communication of the athlete with the coach for better reintegration;
- continue the abilities restoration exercise and regain the normal coordination.

Methodological guidelines:

- gradual increase of difficulty levels of exercises during training, depending on the athlete's evolution;
- periodic return of athletes to control to monitor the effects of the maintenance program and to avoid recurrence, especially for athletes who presented such cases.

As previously noted, rehabilitation methods were effective, due to effective collaboration with athletes but also their involvement, thus succeeding in overcoming the initial stage of muscular tonus, obviously the results differ according to the athlete, but the muscular forces have improved considerably. The final check muscle confirms this fact.

With the restoration of muscle tone, athletes gradually regained the physiological amplitudes of the basal and adjacent joints, the initial redness disappearing throughout the treatment period, demonstrating that the exercises in water were effective due to joint discharge compared to the current tension to exercises using gravity.

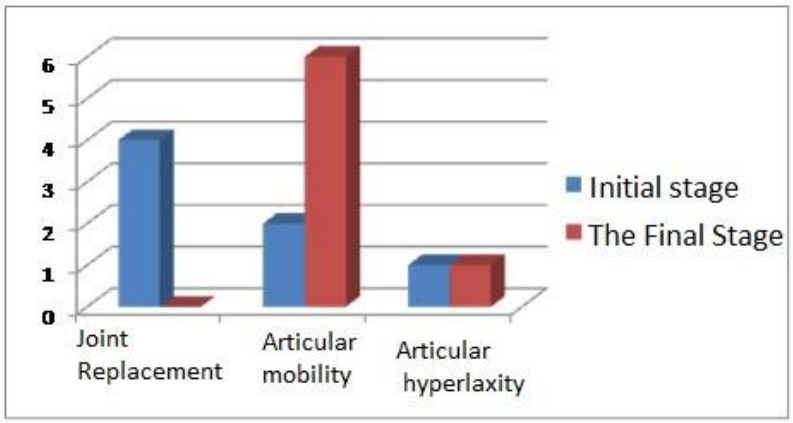

Figure 5. Evolution of articular edges in final assessment

During the treatment period, the pain intensity was even decreased, even the complete disappearance of the pain in some cases, due to uncharged exercises on the joints, the beneficial factor being water, which also helped to increase muscle tone, of joint stability and implicitly less pain.

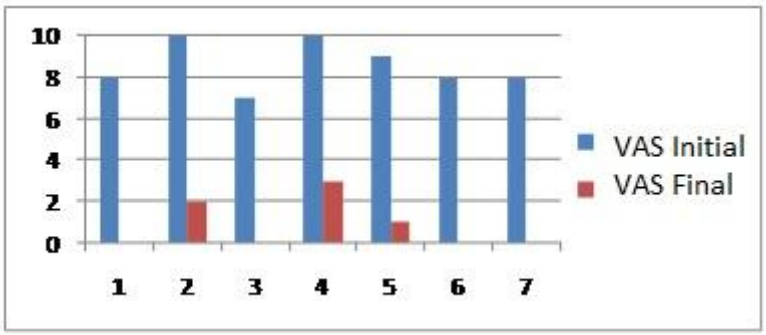

Figure 6. Pain progression according to Visual Analogic Scale

Discussion

As can be seen in Chart 6, the VAS pain index decreased significantly, so at the beginning of the recovery program the average index was 8.57 and at the end of the average recovery it fell to 0.85.

This first phase of the athlete's recovery takes about 4-6 days (Gray, 2009). The first response of the body to a trauma is inflammation (http://www.sportsinjuryclinic.net/sport-injuries/general/inflammation). The functions of inflammation are to protect the body from harmful substances, tissue death and tissue repair (http://www.sportsinjuryclinic.net/sport-injuries/general/inflammation). The objectives of the first phase of the rehabilitation process include limiting tissue damage, reducing pain, controlling inflammation and protecting the affected anatomical region. Pathological events that occur immediately after the lesion can lead to complications such as weakness or muscle atrophy, joint redness.

These complications result in a decrease in functionality, for example, the imbalance of salt or the raising of objects. The duration of the decrease in functionality is influenced by the nature and time required for therapeutic activity. If the drop in functionality is severe and becomes permanent, the athlete will no longer be able to participate in his sporting activity.

The RICE method is used to control the pain and edema. This term is used as an abbreviation for Rest, Ice, Compression and Elevation (Leaning, Ice, Compression, Elevated Position of the member). RICE can be used immediately after injury and 24 to 48 hours, until ecchymosis and pain disappear (http://www.uhs.wisc.edu/health-topics/muscles-and-bone/rice.shtml).

Conclusions

Injury in the sports environment and beyond that causes posttraumatic injuries such as those present in this study is a disabling condition because it is caused by painful traumas that cause the person to lose the segment's dynamics and coordination, where appropriate, restoring muscle tone for good locomotion.

Following the results, the conclusions are:

Accurate diagnosis of the type of trauma, choosing the appropriate contentious method as well as the early start of the recovery program are the basic elements for functional ravishing and avoiding complications.

The kinetotherapeutic recovery of post-traumatic injuries is the main pillar after removal of the contentions.

Traumatism complications are quite high and are caused by the force of the trauma and the circumstances of its occurrence.

The constant participation and cooperation of athletes at physical therapy sessions as well as the co-operation with their coach throughout the recovery process determines the shortening of the recovery time.

For better rehabilitation it is necessary to adapt the program according to the needs and capabilities of each athlete.

To avoid relapses, athletes have been trained to perform kinetoprophylaxis and ergotherapy exercises tailored to that sport so they can reintegrate into group play or contact sport where appropriate.

Recommendations

Avoid situations that can cause injury.

The continuation of the learned kinetic program as well as the occupational therapy exercises that promote the mobility, the tone, the ability and the coordination corresponding to the needs of the practiced sport.

Avoid overloading and overloading the area that has been recovered.

Perform a new clinical assessment after 6 months to establish mobility and muscle tone.

It is recommended to continue exercising in water and swimming.

Avoiding drugs, tobacco and alcohol.

Acknowledgments

Thanks to all subjects who participated in this study.

We mention that in the Ethics Commission of the Faculty of Physical Education and Sport, from Ovidius University of Constanta dated January 22, 2018, was voted and approved the article with the provisions that contain it according to the methodology.

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