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# MAINTAINING COMPETITIVE ACTIVITY IN ELITE SPORTS WITH ACUTE PLANTAR FASCIITIS

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## ABSTRACT

Competition in the modern pentathlon in the new 2024 Olympic program are tense and high intensity. Before reaching the final the athlete must go through 8 types of events in 4 days performs before 5 events in final competitions. It's quit difficult to restore the function of damaged link of the musculoskeletal system during competition in a short time. The time of breaks for rest and recovery in the competitive activity of an all-around athlete in the modern pentathlon is limited. The presented rehabilitation program after an acute injury was implemented at modern pentathlon competitions. A distinctive feature of the effects is the practice of rehabilitation and recovery after physical exertion. The peculiarity was in short periods of rest during intense multi-day competitive activity. There was a clear organization in the procedures, a strict sequence of methods and techniques.

The presented material rather as an exception confirms the possibilities of the applied systemic rehabilitation techniques. This made it possible to continue competitive activity in modern pentathlon after an acute injury without compromising the athlete's health.

**KEY WORDS:** sports injuries, plantar fasciitis, recovery during competition.

## INTRODUCTION

Competition in the modern pentathlon in the new Olympic program are tense and high intensity. Athlete must complete 13 recurring events in 5 days of performance. Competition days:

- the first day 4 events: Fencing, Swimming, Laser-Run with laser pistol shooting (Laser-Run), 36 best athletes are selected;
- the second day of fencing competitions;
- the third day 4 events. 14 athletes and 4 with the best result are selected for 2 semi-finals are formed the final;
- the fourth day – rest and recovery;
- the fifth – final day: 18 athletes perform in 5 types of the full program of modern pentathlon (Fencing, Swimming, Laser-Run, Concour). A total of 13 types of competitions in 5 days [1].

A distinctive feature of the presented impacts is the practice of rehabilitation after an acute injury and recovery after physical exertion in short periods of rest during intense multi-day competitive activity. An extensive literature base has now been identified that studies the interaction of factors associated with stress and the occurrence of trauma. Showing psychosocial and physiological factors that can lead to injury. It is shown that

athletes who use several strategies, rather than one, have an advantage, but justification and periodization of the use of various technologies is required. Most studies provide data on changes in physical performance and markers of perceptual or muscle damage after an exhaustive protocol of methods or competitive results [2-4]. Our work is no exception, but is of interest due to a special sequence, a certain combination and frequency of procedures. In elite sports, even small changes experienced by an athlete can make a big difference for performance. This also applies in the context of post-work-out recovery, where timing, frequency, sequence, and exercise regimen are of the utmost importance [5].

It is known that during competitions, athletes sometimes experience acute injuries of the musculoskeletal system. Often this is due to a violation of technical conditions when performing a fast or complexly coordinated movement. Key mechanisms underlying the development and progression of diseases include inadequacy of neuromotor control-balance-coordination. [6].

The possibility of continuing participation in competitions in case of an acute injury is determined by the correct diagnosis, complexity, and degree of damage to the musculo-articular apparatus, qualified first aid. Functional restoration of the damaged link seems possible

during short-term breaks in the competitive activity of an athlete in the all-around events rather as an exception. This requires a combination of certain factors: individual sensitivity, reactive properties of the functional and nervous system of the athlete's body. In those cases when this happens gradually and quickly enough, recovery and rehabilitation changes occur to continue the competitive activity; well-known and accessible for use in sports practice methods and means that have shown high efficiency as rehabilitation, recovery, and mobilization [4, 7]; medical personnel and physiotherapist, massage therapist and trainer qualification, understanding of fascio-muscular pain signals [8]; adequate and comprehensive use of means for correcting recovery processes when planning special rehabilitation, recovery, and mobilization activities [9]; rehabilitation should include exercises performed in resistive modes [10].

The presented rehabilitation program after an acute injury was implemented at modern pentathlon competitions. A distinctive feature of the effects is the practice of rehabilitation and recovery after physical exertion. The peculiarity was in short periods of rest during intense multi-day competitive activity. There was a clear organization in the procedures, a strict sequence of methods and techniques. Various approaches to recovery and rehabilitation after injuries that are commonly used in sports are presented [11]. We used the special influences which presented in the sequence of application: contrast procedures (cold - warm), massage techniques: palpation, Typaldos, Jones, Rolting methods, recovery sports massage techniques, compression methods, sports flossing, blood flow restriction training (BFRT) [12], kinesiotaping, cross-taping, special exercises and elements of autogenic training.

### CASE STUDY

High class athlete (X), modern pentathlon specialization, female, 22 years old. Acute plantar fasciitis of the right foot. The injury was received in the first round of the program in the first day of the competition (fencing).

During the competitions of the first day in the all-around (fencing), three fights before the end of the competition, the athlete developed a sharp pain in the sole of the right foot closer to the heel. After the end of the competition and the return of the athlete to the hotel (1.5 km on foot) with fencing equipment (10 kg), 1 hour 30 minutes passed. The athlete's assessment of pain before the first examination was 8 points on a sensitivity scale [13]. It is known that the assessment of pain is not a one-time occurrence. This is a way to monitor therapy as well as changes in pain over time. But it is very important to evaluate the effect of therapy, sometimes observational assessment underestimates the self-assessment of pain. This narrows down the differential coloration as well as controls the treatment regimen and changes in pain over time, which is very important for evaluating the effect of therapy [14].

### INVESTIGATION OF THE INJURY SITE

When analyzing the video recording, one of the causes of damage was found - a technical error of the athlete when performing a motor action. The fencing technique "protection" was performed, the athlete's right leg, due to a quick and inaccurate movement in a step back with a partial pronation of the foot shifted to the edge of the fencing track during the shock movement of the heel. A preliminary examination, palpation, checking the amplitude of possible movements without pain, with pain, a survey of the athlete was carried out. Conducted the "windlass" test. Deformation of the fascia was determined due to traction and compression with a rotational component. The symptoms of acute plantar fasciitis were revealed. Manual therapy in these cases is commonly used by physiotherapists to improve mobility and reduce pain [15, 16]. Upon in-depth examination and palpation, comparison of subtypes of trigger points, the position of the fascia more closely corresponded to the known injury in the form of tissue herniation through the noncavitary fascial plane. If we compare trigger point subtypes according to S. Typaldos [17, 18], correction ends with the end of trigger therapy. L. Jones is known to have defined this technique as that brings the body to its most comfortable position, thereby alleviating pain eliminating and stopping inappropriate proprioceptor activity that supports somatic dysfunction. It identifies sensitive points within the fascia that cause dysfunction and pain. After evaluation it takes only 90 seconds to relieve the identified pain at a specific point. This technique eliminates the tender point and the associated tension reflexes that cause neuromuscular dysfunction along the fascial chain. It can also treat structural dysfunctions of the pelvis, knee, ankle, and foot [18, 19]. These provisions became decisive when choosing a special technique for influencing the identified trigger points [20].

The first procedure was carried out: cooling the injury site with a wet cold towel, then applying ice for 7 minutes, special massage of injured the sole of the foot along the entire length of the ligaments from the fingers to the base of the calcaneus. An adequate pressure technique was applied with two thumbs on either side of the pain zone from the side of the middle part of the long plantar ligament. There was a displacement of the ligament towards the calcaneus, which caused the transition of the damaged area (according to our feelings) into a neutral configuration. The manipulation consisted in pressing on the zone of plantar pain syndrome (PPS) for tissue reposition. Then, a sports flossing was applied to the injured sole of the foot for 1 min (BFT). This was followed by the application of cross-tapes and a special technique for correcting fascia by kinesiotaping. In the treatment of plantar fasciitis, taping has been noted to be effective in combination with other methods or alone and the effects are reported to be comparable to steroid injections [21].

The second procedure after 2 hours was performed which included a preliminary massage of the calf muscles. Then a special massage of the injured sole of the

foot was performed. The procedure included three series of massage influences (20 min each) with the technique according to the method recommended for distortion correction (DC) [20].

Each episode of recovery procedure included:

1. Rubbing and kneading with non-steroid-inflammation (NSIM) gels until completely absorbed by the skin. After each absorption the skin was cleaned.
2. Warming up the muscles of the fascia and ligaments of the sole with the DK technique during the massage.
3. Cooling the injured the sole of the foot with a wet towel with ice.
4. Sports flossing (compression technik).
5. Brief training in the method of self-regulation of the psycho-emotional state in the form of autogenic training exercises (10 min.) after each treatment procedure.
6. Partner resistance exercises (isokinetic) for the sole. In the specialized literature, isometric techniques are not always marked with a positive effect, more often a delayed one. Heavy-slow resistance training (HSR) is treatment, but it often takes considerable time before the effect starts to manifest [22]. Shown small or no effect after isometric exercises [23]. In our sports practice isokinetic exercises in special regimes have shown high therapeutic and mobilization effects [24].
7. Walking 50 steps barefoot.
8. Cross-tape, sports flossing and kinesiotape before bed.
9. As elements of autogenic training, phrases were used to focus on individual techniques and methods of exposure, sensations of warmth and muscle relaxation after exposure.

The athlete rated the pain syndrome on a scale of sensitivity after the evening procedure at 3 points. On the day of the injury, two full rehabilitation procedures were performed. The next day, the competitions were in the evening program, which made it possible to carry out the planned procedures.

#### THE SECOND DAY

In the morning of the next competitive day, the pains after the night did not change and on the sensitivity scale, they were the same as after evening procedure - 3 points. Immediately after sleep, a general sports restorative massage was performed (20 min). Then three series of therapeutic massage techniques were applied, as on the eve (3x20 min). Added impact techniques of intermittent vibration (three types) on the injured foot sole. At the end of procedure, the pain decreased, according to the athlete, to 2 points. After 2 hours (10:30 p.m.), the procedure was repeated in the same sequence and dosage. The athlete rated pain as its absence (0 points). After 3 hours (13:30). A walk was performed in high-heeled sneakers duration 25 min, heart rate (HR) up to 130 beats/min (b/m.). After the walk - 10 min. ice on the injured the sole of the foot. Next three series of massage influences were performed shorter in time than the

previous ones (15 minutes each series). The sequence of actions is the same, after walking barefoot - jumping like on a rope, the effort is only with the muscles of the sole of the foot, no bending the knee joints - 25 jumps. Sports flossing, cross taping, kinesiotaping, Walking for 30 minutes (HR 130 b/m.). The athlete rated pain as its absence (0 points). After 2 hours (15:30). Due to the absence of pain, the effects in this series differed from the previous ones: massage influences are shorter (10 minutes each series) and more intense. Added corrective muscle technique for reducing the load on the calf muscles and kinesiotaping of the achilles tendon.

#### DEPARTURE TO THE COMPETITION IMMEDIATELY AFTER THE PROCEDURE

Warm-up 20 min, fencing competition 30 min. Moved on to the next competition. Before swimming competition sports flossing on the sole of the foot with a compression for 1 min. Immediately after competition in swimming sports flossing on the sole of the foot with compression for 1 minute. Then applied a cross tape and kinesiotape to the Achilles tendon, calf muscles and the middle part of the sole of the foot. Moved on to the next kind of competition. After 15 minutes, the competition continued in LaserRun: running 3 km at the highest possible speed and shooting. After the competition, the athlete walked 2.5 km to the hotel. The athlete did not feel pain during the competition and walking to the hotel. Emotions after the competition ended and the athlete felt pain in the injured sole of the foot, which she rated on a 7-point scale. Two hours after the competition, restorative sports massage of the whole body and a special therapeutic massage. Swelling of the plantar muscles was noted after 5 hours of competition. 1 series of impacts on the sole of the foot, without percussive massage techniques, cooling of the sole after the procedure. Sports flossing compression on the sole 1 min. The swelling was significantly reduced after the procedure. The use of four cross tapes along the length of the ligament has been applied to the problem of the plantar surface. Kinesiotaping before bed.

#### THE THIRD DAY

The competition program includes a break for rest. In the morning ice on the sole of the bruised foot. Repetition of two series of special intermittent vibration on the sole, as described earlier. The athlete rated the pain after the procedure at 2 points. Walk 30 min. (HR 130 b/m.), after a walk - ice on the sole of the right foot and 2 series of special percussion on the sole of the right foot, as in the morning. There was no pain, on a scale of 0 points. After the procedure, walk for 20 minutes (heart rate 130 b/m.). Two hours later run at a slow pace for 30 minutes (HR 130 b/m.), after loading ice application on the sole of the right foot for 10 minutes. General recovery sports massage 30 min., medicine massage for the sole of the right foot - 2 series of special influences. Athlete rated the pain on a standard scale of 1, noted a positive sen-

sation of the plantar muscles after the procedure. The procedure is completed with isokinetic exercises for the muscles of the sole, walking, jumping, sports flossing compression, cross tape and kinesiotaping. After 2 hours repeat the scheme of therapeutic influences before bed like day before.

#### THE FOURTH DAY

In the morning special preparation for participation in competitions. Shaking and superficial kneading of the muscles of the upper and lower back and legs (30 min.). Mobilization massage techniques for the foot of both legs, isokinetic exercises for the muscles of the right foot, sports flossing 1 min., cross- and kinesiotape on the sole of the right foot, calf muscles and Achilles tendon.

#### DEPARTURE TO COMPETITIONS

Short workout (10 min.). Participation in Concour and fencing. Rest in the bus (7 min) during transfer to the next type of program, swimming. Immediately after 200 m. swim – sports flossing was done for 1 min, cross- and kinesiotape on the sole of the right foot, calf muscles and Achilles tendon. Transfer to the competition site and rest (7 min. in the bus). Short warm-up (10 min.) and competition in the Laser Run program, running 3 km. with shooting at the highest possible speed. Assessment of pain sensations by an athlete immediately after the competition – 2 points. After 2 hours, restorative sports massage (30 min.). Special therapeutic massage of the sole of the right foot. 1 series of special actions with gels of non-steroidal anti-inflammatory drugs (NSAIDs), rubbing, kneading, 3 types of vibration resumed. Cross- and kinesiotaping on the sole of the foot. The athlete's assessment of pain after the procedure is 1 point. After 2 hours, a general sports restorative massage was applied (30 min.). Special therapeutic massage of the sole of the right foot, as in the previous procedure. Assessment of pain by the athlete – there was no pain.

#### THE FIFTH DAY

In the morning of the last all-round competition day, preliminary influences were applied before leaving to competition. It took 30 min., and they were in the same sequence, dosage, and mobilization orientation as in the morning the day before.

#### DEPARTURE TO FENCING COMPETITIONS

Before the start, rubbing, surface kneading and kinesiotaping of the trapezius, deltoid muscles and triceps of the athlete's hands are carried out in the hall. Immediately after the end of the fencing tournament (without rest) the next warm-up and competition in Concours. After the competition (without rest) the next competition in bonus fencing. Short tournament and transition (rest 10 min.) to swimming competitions. Immediately after the swimming competition, during a 5-minute pause, cross tape and kinesiotape were applied to the sole of the right foot, calf muscles and Achilles tendon. The ath-

lete's assessment of sensations in the sole after swimming is the absence of pain (0 points on a scale). After the transition to the stadium there was a running short warm-up (10 min.). The competition in the last event was the Laser Run program – a 3 km. run with shooting at the highest possible speed. After the competition and day later, athlete did not experience any pain in the right foot. After the end of the competition, traditional recovery procedures were carried out.

In the practice of high-level sports competitions an algorithm of special means use in case of acute damage to the musculoskeletal system is presented. The sequence of procedures, frequency, duration, and features of application during 5 competition days are shown. As a result the athlete prolonged and completed competition without pain. The normal functionality of the sole and foot as kinematic link is shown.

Plantar Fasciitis (PF) is an inflammatory and painful condition occurring at the site where the medial part of the plantar fascia attaches to the calcaneus. This is one of the most common causes of plantar heel pain and is responsible for most of the foot pain, which is due to the biomechanical imbalance that occurs because of excessive strain in the fascia. Plantar fasciitis is typically a self-limited condition, and studies have reported a resolution incidence of up to 90% with nonsurgical measures [25]. Therapeutic methods used in the Fascial Distortion Model (FDM) are becoming increasingly popular among chiropractors and physical therapists. Unfortunately, there is still insufficient evidence in the literature for treatments for FDM, and claims that clinical experience is sufficient to confirm therapeutic results have been repeatedly refuted in the literature [19]. Perhaps this also applies to acute injuries, as in our case, therefore, we consider the presented technique as a fairly successful special case from sports practice. It is known that the choice of applied methods of treatment depends on the characteristics of the patient and pathology [26, 27, 28]. Stretching, strengthening, manual techniques and the use of orthoses are effective in the practice of long-term treatment of a chronic process. There is a consensus that stretching, strengthening methods, manual techniques, and orthosis applications are effective [29, 30]. It can be noted that the technical performance of the athlete's movements in the types of the program during the competition after injury was quite coordinated according to the coach. This is probably the mobilization of attention at the reflex level and partially conscious correction to prevent a slight "positional error" of the ankle joint, causing a restriction of physiological movements [31, 32].

#### CONCLUSIONS

In the practice of prevention and recovery from injuries of high-class athletes, the search and development of special effective means is carried out. A set of means for recovery in acute injury (plantar fasciitis) in competitions is presented. The methodology is based on a certain combination of methods: sports and therapeutic mas-

sage, sports flossing, cross- and kinesiotaping, resistive exercises, elements of autogenic training. The effectiveness of the technique depends on the correct diagnosis, the specifics of the athlete's competitive activity, the individual biological capabilities of the body, and the qualifications of the physiotherapist. Fundamentally in

this approach is the possibility of using special means to help a high-class athlete during the competition. The presented special methods and techniques, which showed the effect in the proposed sequence, can be recommended for use in the clinical practice of improving athletes, when there are no time limits.

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