MINISTRY OF EDUCATION NATIONAL UNIVERSITY OF PHYSICAL EDUCATION AND SPORT – BUCHAREST DOCTORAL SCHOOL



Abstract of the doctoral thesis:

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Title of the thesis: FUNCTIONAL RECOVERY AND PREVENTION OF RECURRENCES OF GRADE II ANKLE SPRAINS IN JUNIOR FOOTBALL PLAYERS

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Abstract

The doctoral thesis focuses on the functional recovery of ankle sprains and the prevention of recurrences in junior football players, aiming for optimal recovery and recurrence prevention. The primary research direction involves rehabilitation and prevention strategies for this frequently occurring injury. Through a review of specialized literature on the functional recovery of grade 2 ankle sprains and aspects related to recurrence prevention, this scientific research aims to establish a protocol incorporating modern equipment and techniques to enhance athletic performance.

Introduction

Proprioception represents the human body's unconscious ability to perceive spatial orientation and movement of body segments through sensitivity transmitted by peripheral receptors. Ankle sprain is a highly common traumatic condition affecting the talocrural joint, resulting from exceeding the physiological limits of joint amplitude. Football is a team sport associated with a high risk of injury, impacting both professionals and amateurs due to its dynamic and contact nature. Multiple factors contribute to injuries, with muscle imbalances due to inadequate physical preparedness being among the most common. Medical recovery plays a crucial role in the life of an injured athlete, often influencing their sports performance. Rehabilitation and injury prevention in football are highly valuable and rely on various methods. However, in Romania, the lack of application of these recovery methods and programs frequently leads to the recurrence of injuries.

Motivation and Purpose

The desire to acquire detailed and up-to-date knowledge regarding therapeutic interventions in post-traumatic recovery, especially among athletes, stems from the goal of identifying recovery possibilities that can expedite the return of injured athletes to the sports field and contribute to secondary prevention.

Through a review of specialized literature, I observed an increased incidence of post-traumatic pathology, such as ankle sprains, among junior football players. This observation aligns with my experience as a volunteer since my first year of college, initially at Clubul Sportiv Universitatea "Dunărea de Jos," and later during my master's and doctoral studies at football clubs ACS Juniorul, FC Voluntari, and FC Rapid Bucharest.

Further exploration of specialized literature and the application of traditional treatment methods led me to the conclusion that the effectiveness of modern intervention technologies needs to be experimented with and compared to traditional means.

Theoretical, Methodological, and Operational Framework of the Research

The research undertaken in this thesis was conducted under the auspices of the National University of Physical Education and Sport in Bucharest, within the framework of the Doctoral School. The thesis was structured into two parts.

There is a wide variety of functional recovery programs for ankle sprains at both national and international levels. However, difficulties arise in achieving comprehensive treatment, preventing recurrences, and addressing the sequelae that result from the trauma.

Conclusions

Football, as a physically and mentally demanding team sport, is prone to injuries, especially at the level of the foot and ankle. The incidence of injuries in football players aged 13-19 ranges from 1 to 5 per 1000 training hours and increases to 15-20 per 1000 match hours after the age of 15. The game has evolved to be more aggressive and faster, leading to increased muscle fatigue and, consequently, a higher risk of injury and reduced athletic performance. Most ankle sprains result from lateral or medial forces acting on the ankle or foot, leading to excessive inversion or eversion. 85% - 90% of sprains occur through inversion. Identifying therapeutic solutions for the complete post-traumatic functional recovery of athletes has become a major concern for specialists. This not only accelerates the return to previous sporting activities but also aims to prevent recurrences. In an era of technology, our goal is to experiment with the effectiveness of modern equipment in the recovery of grade 2 ankle sprains in junior football players.

Part II of the thesis

Part 2 of the thesis comprises two elements: Study 1, focusing on the functional recovery of grade 2 ankle sprains, and Study 2, discussing the prevention of recurrences in grade 2 ankle sprains.

The objectives of STUDY 1 ON FUNCTIONAL RECOVERY THROUGH CONVENTIONAL MEANS VERSUS MODERN MEANS OF GRADE 2 ANKLE SPRAINS IN JUNIOR FOOTBALL PLAYERS

To formulate and simultaneously test the effects of two different functional recovery protocols applied to grade 2 ankle sprains in junior football players:

* A protocol consisting of conventional treatment methods

* A protocol applied using modern equipment (with dual use – assessment and recovery)

Permits

* Developing and implementing an individualized recovery protocol will reduce rehabilitation time and the risk of recurrences, representing a significant step in our field of activity. Interventions can be made through both classic and new, original programs to optimize the recovery process, ensuring a faster return to sports activity and achieving superior athletic performances. The new information we provide regarding the effects of modern recovery technologies will help therapists refine their skills, experiment with new concepts and methods, benefiting individuals recovering from injuries.

Conducting a comprehensive evaluation of study participants to determine the most accurate monitored parameters and interpret the obtained results.

Identifying and comparing the effects of the two functional recovery protocols, playing a decisive role in determining the protocol with the highest efficiency and the shortest recovery time for participants to return to sports activity.

The hypotheses of Study 1 were as follows:

1- Physical exercises performed with modern equipment (Biodex 1) combined with myofascial techniques (dry needling, kinesio taping, ergon therapy), compared to conventional means, reduce the duration of the interruption of sports activity for football players with grade 2 ankle sprains.

2- Implementing a functional recovery program using modern technologies (Biodex 1 equipment) leads to an increase in ankle joint stability after grade 2 ankle sprains.

Subjects, place and duration of the study

Preliminary research was conducted from July 2021 to March 2022 at the following locations:

• Rapid Football Academy;

• National Football Center (FRF);

• ACS Juniorul Bucharest;

• Provita Clinic;

• Movement Care Clinic.

Participant selection for Study 1 was based on clinical and paraclinical examinations to assess the degree of trauma to the ankle joint. The study included 22 subjects, evenly divided into 11 for each control and experimental group.

Inclusion criteria for subjects were as follows:

• Age between 17-20 years.

• Diagnosis - grade 2 ankle sprain.

• Junior football players in various positions.

Exclusion criteria for subjects were as follows:

• Age below 17 or above 20 years.

• Diagnosis - grade 1 and grade 3 sprains.

• Female athletes.

Preliminary conclusions of the research

The intervention with modern recovery methods applied to Group G1 highlighted significant differences in ankle joint mobility evaluation for both flexion and extension movements, statistically ($p < 0.00$), between the results obtained for the healthy and affected ankle, both at the initial and intermediate testing. However, at the final tests, there were no significant differences ($p > 0.05$) between the results obtained for the healthy and affected ankle. This demonstrates the effectiveness of recovery programs based on modern methods, ensuring a faster return to training/competitive activity and complete recovery.

The evaluation of ankle joint mobility for flexion and extension movements in Group G2, subjected to intervention through classical recovery methods, showed significant differences statistically ($p < 0.00$) at the initial, intermediate, and final testing between the healthy and affected ankle. The lower efficiency of the classical program necessitates a prolonged application of therapeutic intervention and recovery period to return to previous training/competitive activity after the traumatic episode.

The results confirm the hypothesis of Study 1, indicating complete recovery and a faster return to training/game activity in subjects treated with modern means compared to those using classical recovery methods.

Muscular strength assessed through ankle flexion and extension tests, highlighted by statistical calculations ($p > 0.05$), indicates that intervention with modern methods was more effective compared to classical means. The strength values for the affected ankle were relatively similar to those of the healthy ankle, reflecting good stability of the talocrural joint.

The comparative evaluation and interpretation of results recorded in the three tests (initial, intermediate, and final) for symmetry and step cadence, performed with the PODOsmart system, revealed the following:

* Step symmetry in Group G1 recorded a median of 84 at the initial test, 92 at the intermediate, and 98 at the final, while in Group G2, the median values in dynamics were 76, 88, and 91.

* Step cadence recorded a median value of 76 at the initial test, 88 at the intermediate, and 107 at the final for Group G1, while for Group G2, which underwent classical recovery methods, the median values evolved as 75, 86, and 90.

The results obtained confirm the hypothesis of Study 1, indicating that muscular strength, joint mobility, and symmetry, cadence recorded better results in subjects treated with modern means compared to those using classical methods.

The objectives of Study 2 - ON THE PREVENTION OF GRADE 2 ANKLE SPRAIN RECURRENCES IN JUNIOR FOOTBALL PLAYERS

To highlight the importance of computerized dynamometry in the recovery and prevention of recurrent grade 2 ankle sprains, ultimately enhancing athletes' performances.

Demonstrate the significance of proprioception recovery in recurrence prevention.

Permits

Maintaining a balance between agonistic and antagonistic muscle forces, as well as motor control, increases joint stability and reduces the risk of recurrent grade 2 ankle sprains.

The risk of ankle sprain recurrence can be reduced through the application of modern secondary kinetoprophylaxis technologies.

The use of modern recovery devices and techniques can provide valuable information in the therapeutic management of grade 2 ankle sprains.

Developing explosive strength in junior football players without adequate control over movement increases the risk of post-traumatic recurrence.

Hypothesis

Comparatively, the application of a comprehensive program of secondary kinetoprophylaxis, consisting of specific proprioceptive exercises related to football, performed using modern technologies, induces better effects on ankle strength and range of motion. This, in turn, reduces the risk of recurrence in junior football players with a history of grade 2 ankle sprains compared to classical means.

Subjects, Location, and Duration of the Study

The research took place from March 2022 to December 2022 at the following locations:

• Rapid Football Academy;

• National Football Center (FRF);

• ACS Juniorul Bucharest;

• Provita Clinic;

• Movement Care Clinic.

Participant selection for Study 2 was based on clinical and paraclinical examinations to assess post-traumatic sequelae at the ankle joint level. The study included 30 subjects, evenly divided into 15 for each control and experimental group.

Inclusion criteria for subjects were as follows:

• Age between 17-20 years.

• Less than 2 sprains in history.

• Male gender.

Exclusion criteria for subjects were as follows:

• Age below 17 or above 20 years.

• More than 2 sprains in history.

• Female gender.

Research Results

Analyzing the data from this study, it can be concluded that athletes belonging to experimental group 1, for whom the intervention was performed using modern means (Biodex system), did not record any ankle recurrences, compared to athletes in experimental group 2, where the intervention was carried out using classical recovery methods, and who averaged 1.46 recurrences (sprains) at the ankle.

Conclusions for Study 2

Both participants in experimental group 1 (intervention with modern methods) and those in experimental group 2 (intervention with classical methods) showed significant statistical differences ($p < 0.00$) in the results obtained in the evaluation tests for:

* Muscle strength - flexion and extension (Biodex - Dynamometry) - for both the healthy and affected ankles,

* Joint mobility (Lunge Test – Lunging Test),

* Balance (Biodex balance - Clinical Test of Sensory Integration of Balance),

* Symmetry and step cadence (PODOsmart system).

For athletes in experimental group 1, no recurrences (sprains) were identified, either at the dominant foot ankle or the other ankle.

In the case of experimental group 2, regarding the incidence of injuries, statistical calculations revealed that there were no significant differences ($p > 0.05$) between the groups established based on the dominant foot where recurrences were recorded (right dominant foot, left or ambidextrous).

However, comparing the arithmetic means obtained by the three groups, particularly in group G2 where classical methods were applied, it was observed that athletes with a left dominant foot recorded a higher average number of recurrences (m = 1.80) compared to those with ambidextrous podality (m = 1.66) and those with a right dominant foot (m = 1.14).

Comparing the results of experimental group 1 with the results of experimental group 2 regarding the number of recorded recurrences, through the Mann-Whitney non-parametric statistical test (U), significant statistical differences were found ($p < 0.01$). Therefore, at the end of the research, participants in experimental group 1 recorded significantly better results (median = 0) compared to participants in experimental group 2.

The exercise program using the Biodex 1 device proved to be much more efficient compared to the classical exercise program, thanks to the control over movement execution and targeted stimulation of proprioceptors.

The results obtained confirm the hypothesis of Study 2, namely that muscle strength and range of motion showed better results in subjects treated with modern means compared to the group where classical means were used, while the risk of recurrence was significantly reduced in the experimental group, demonstrating statistical significance.