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Original article

RECOVERY AFTER INJURIES AT THE LEVEL OF THE PECTORAL ARCH IN HANDBALL PLAYERS

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Abstract

Aim. The study aimed to the application of the propose kinetic programme that conduce to the complete recovery of the athlete participating in the study.

Methods. The study was carried out on a subject - case study - 20-year-old athlete, at Club Sportiv Medgidia (Division A), dominant right arm, position on the field: pivot, has been playing handball for 11 years. Diagnosis – subluxation (partial dislocation) right shoulder. The tests applied to validate the research: 1.VAS scale, an acronym for the Analog-Visual Pain Assessment and Quantification Scale - to assess the pain parameter. 2. Upper limb dysfunction assessed by the DASH questionnaire. 3. Evaluation of muscle strength by manual testing for flexion, extension, abduction, internal rotation and external rotation movements of the shoulder. 4. Evaluation of shoulder joint amplitude for flexion, extension, abduction, internal rotation and external rotation movements.

Results. Pain parameter evaluated by the VAS scale was reduced from initial to final testing – from 6 to 1. Upper limb dysfunction assessed by the DASH questionnaire show us a significant improvement from initial score – 38.81% to 1.31% to final score. The statistical analysis on the functional balance of the shoulder, revealed that the values recorded at the final test are significantly better than those from the initial test ($p < 0.05$).

Conclusions. The application of our prevention programme led to the athlete's return to competitive life and managed to combat the athlete's absence from both training and matches. The effectiveness of the programme for the prevention of shoulder injuries in performance in handball players led to an increase in muscle strength, an improvement in ability, mobility and joint stability, thus, we conclude that through the prevention programme we have prepared the athlete for the limiting situations during matches and training.

Keywords: recovery after injury, pectoral arch, handball players

Introduction

The shoulder joint is the most mobile joint of the osteo-articular apparatus, which connects the free extremity of the upper limb to the shoulder girdle. It represents a complex joint that provides increased mobility of the upper extremity and contributes to the execution of the individual's daily activities (Cutts, Prempeh & Drew, 2009)

Traumatic shoulder injuries are common in daily activities and especially in sports. They can affect performance and even compromise individuals' careers. Traumatic shoulder injuries are the result of continuous forces that are concentrated on the shoulder during certain movements.

Prevention of injuries during sports activities is sometimes a greater challenge than diagnosis or treatment, and the literature dedicated to this topic is still limited. In any case, in the last years, the interest of clinicians and researchers has been focused on the development of multidisciplinary strategies to prevent injuries in sports. What is more, the importance of exercise therapy, and the need to develop this form of treatment as quickly as possible, for the benefit of both performance athletes and other categories of patients, cannot be questioned.

The recovery of post-traumatic sequelae is the subject of intense research both nationally and internationally in the case of performance athletes, and not only because it is attempted to shorten the time in which the athlete and/or patient resumes their socio-professional activity, but also for professional reinsertion and decreasing the time of specialized medical assistance. Fleancu (2009) Landreau et all (2018), sustain that an interdisciplinary approach to the stress of injuries and the determinants of diseases is necessary and that psychophysiological approaches to stress still arouse many controversies among specialized authors. The scapular girdle or pectoral girdle is an incomplete annular bony structure, formed by the two clavicles and scapulae (shoulder blades), which supports the free upper limbs, swinging them to the trunk.

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Recovery is an active process, through which those who have disabilities as a result of injuries or diseases recover completely or, if this is not possible, reach their optimal physical, mental or social potential and are integrated into the environment that is most suitable for them.

Methods

The place of conducting the experimental research was the kinesio therapy room at "Life Rehab" - recovery and kinesiotherapy clinic, Constanța. Room where we had all the necessary material resources at disposal. The duration of the experimental research was approximately 5 months - between February and June 2022.

During this period, the athlete from the experimental study benefited from 60 recovery and recovery sessions (3 sessions per week), and when he was able to resume training, he also benefited from another 3 training sessions per week, held within training lessons, sessions whose objectives were to increase joint amplitude, increase joint stability and muscle strength, also benefiting from preparatory massage for physical exertion.

The study was carried out on a subject - case study - 20-year-old athlete, at Club Sportiv Medgidia (Division A), dominant right arm, position on the field: pivot, has been playing handball for 11 years. Diagnosis – subluxation (partial dislocation) right shoulder.

The tests applied to validate the research

1. To assess the pain parameter, we used the VAS scale, an acronym for the Analog-Visual Pain Assessment and Quantification Scale. The VAS scale represents a *"simple method of quantifying and objectifying the pain parameter by assigning a score from 0 to 10 where 0 signifies the absence of pain and 10 represents an extremely high pain threshold"*
2. Upper limb dysfunction assessed by the DASH questionnaire. (https://orthotoolkit.com/quickdash/)
3. Evaluation of muscle strength by manual testing for flexion, extension, abduction, internal rotation and external rotation movements of the shoulder.
4. Evaluation of shoulder joint amplitude for flexion, extension, abduction, internal rotation and external rotation movements.

The proposed recovery programme

Programme content subject to experimental research.

The means used in the prevention of shoulder trauma are shown in table 1 and consisted of exercises to increase joint mobility, neuroproprioceptive facilitation techniques to increase joint stability, exercises to promote muscle strength and joint stability, massage, exercises to increase muscle strength, hydrokinetotherapy.

Tab. 1. Means used in the prevention of shoulder injuries in performance handball players.

training session held during the training lessons	- exercises to increase joint mobility; - exercises to promote muscle strength and joint stability; - preparatory massage for training and competition.
training session held at the strength room	- exercises to increase muscle strength.
recovery session	- hydrokinetotherapy, sauna; - electrotherapy; - neuroproprioceptive facilitation techniques to increase joint stability; - prophylactic and therapeutic mass therapy and relaxation massage.

Kinesiotherapy:

Neuroproprioceptive facilitation techniques (described in the prevention programme):

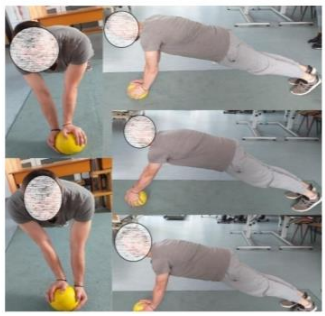
• Isometric contraction in the shortened area;
• Alternating isometry;
• Reluctant reversal with opposition.
- Exercises to promote muscle strength and joint stability.

Tab. 2. Exercises to increase joint mobility

Stretching for the adductor muscles of the shoulder.	
EXERCISE DESCRIPTION Initial position standing with feet shoulder-width apart, arm in maximum abduction, elbow maximally flexed, palm on the opposite shoulder blade, the other arm pulls the elbow amplifying the abduction movement	
OPTIONS It can be done sitting with your feet at shoulder level, standing or moving (walking) and sitting.	DOSAGE 10 repetitions. The stretch of the muscle is maintained for 10 seconds.
Stretching for the internal rotator muscles of the shoulder	
EXERCISE DESCRIPTION Initial position standing with feet shoulder-width apart, elbow flexed 90°, arm in internal rotation, forearm behind torso, other arm pulls elbow amplifying internal rotation movement.	
OPTIONS It can be done sitting with your feet shoulder-width apart on the spot or moving (walking) and sitting.	DOSAGE 10 repetitions. The stretch of the muscle is maintained for 10 seconds.

Tab. 3. Exercises to develop muscle strength and joint stability

1. EXERCISE DESCRIPTION From the starting position standing with the legs shoulder-width apart, with the arm flexed at 90°, releasing and catching a 2 kg weight.	

OPTIONS It can be performed sitting with feet shoulder-width apart on the spot or moving and sitting.	DOSAGE 20 repetitions
2. EXERCISE DESCRIPTION From the initial position, standing with the feet shoulder-width apart, with the arm abducted at 90° and the elbow flexed at 90°, release and catch a 2 kg weight.	
OPTIONS It can be done sitting with feet shoulder-width apart on the spot or moving (walking) and sitting.	DOSAGE 20 repetitions
3. EXERCISE DESCRIPTION From the initial squatting position forward with support on the extended arms, the extended trunk and the tips of the feet on the ground (floating position), the anterior-posterior and lateral rolling of a single ball with both hands.	
DOSAGE 20 repetitions	

Results

Tab. 4. Results

Athlete, 20 years old, right-arm dominant, position occupied on the field: pivot, has been playing handball for 11 years.					
Pain parameter evaluated by the VAS scale			Upper limb dysfunction assessed by the DASH questionnaire.		
Initial score	Final score		Initial score	Final score	
VAS 6	VAS 1		38.81%	1.31%	
Joint amplitude.			Muscle balance.		
Flexion	Initial	180°	Flexion	Inițial	F4
	Final	175°		Final	F5

Extension	Inițial	50°	Extension	Inițial	F4
	Final	70°		Final	F5
Abduction	Inițial	158°	Abduction	Inițial	F4
	Final	175°		Final	F5
Internal rotation	Inițial	90°	Internal rotation	Inițial	F4
	Final	85°		Final	F5
External rotation	Inițial	68°	External rotation	Inițial	F4
	Final	85°		Final	F5
Following the injury, the athlete presented a decrease in joint amplitude and muscle strength. The athlete had elevated shoulder pain and upper limb dysfunction scores. Upper limb dysfunction, pain, muscle strength and joint range were improved following the rehabilitation programme.					

Data analysis and interpretation

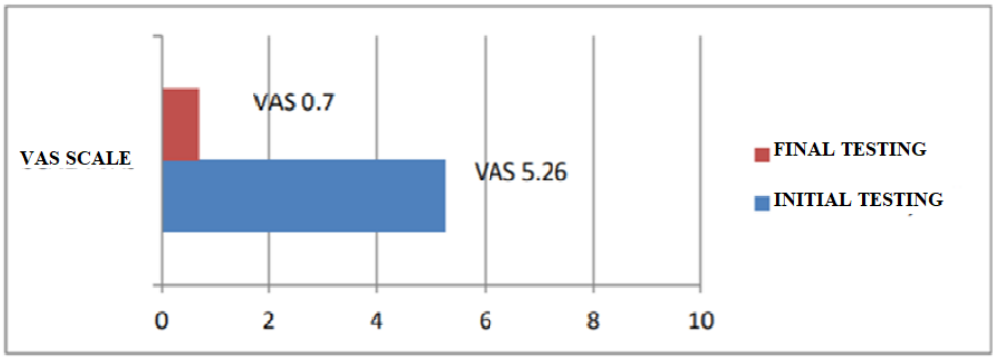


Fig. 1. Analysis of the effects of the preventive programme on the pain parameter

For the pain parameter, at the initial evaluation an average of the results of 5.26 VAS was calculated, and at the final evaluation an average of VAS 0.7. The statistical analysis showed that at the final test, the value obtained for the VAS is significantly better than at the initial test. Similar results were recorded by Asker, Whitley & Cools (2018) and Constant & Murley (1987).

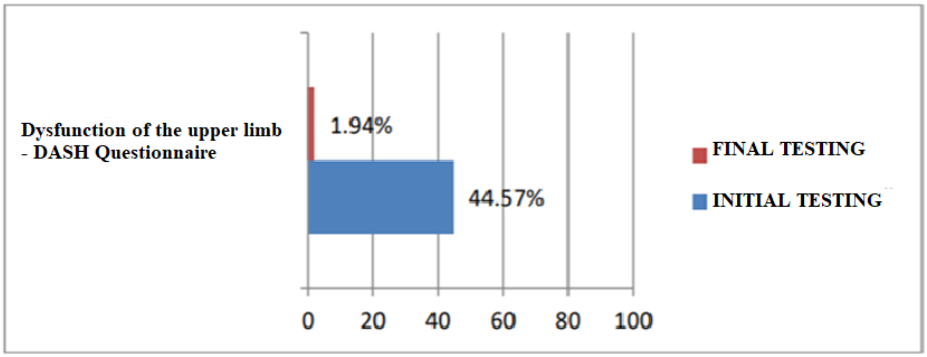


Fig. 2. Analysis of the effects of the preventive programme on upper limb dysfunction

The arithmetic mean obtained at the initial evaluation of upper limb dysfunction using the DASH questionnaire was 44.57%, and at the final evaluation 1.94%. The difference between the two averages being 42.63 percent, which indicates a progress in terms of decreasing the degree of dysfunction of the upper limb.

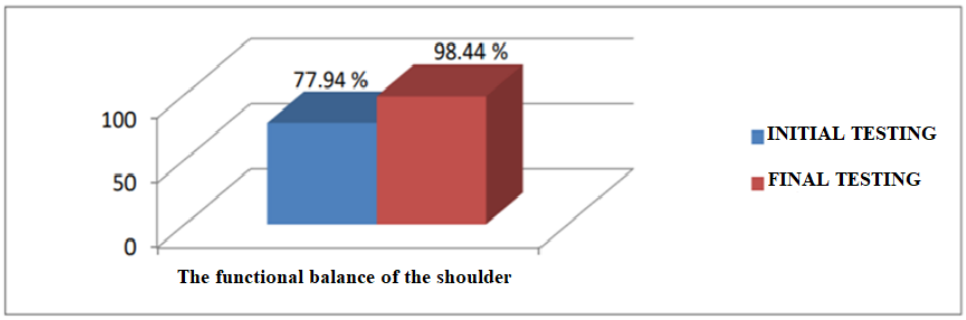


Fig. 3. Analysis of the effects of the preventive programme on the functional balance of the shoulder

The arithmetic mean of the values recorded for the initial tests of the functional balance at the level of the employee was 77.94%, and the arithmetic mean of the values recorded for the final attestations of the functional balance at the level of the employee was 98.44%. The statistical analysis also showed that the values recorded at the final test are significantly better than those from the initial test ($p < 0.05$).

We can therefore state that the preventive programme implemented by us is effective on the functional balance of the shoulder.

Conclusions

1. In the VAS pain test, the values recorded at the final test are significantly better than those at the initial test.
2. The results recorded on the DASH questionnaire indicate a significant progress in terms of decreasing the degree of dysfunction of the upper limb, from one test to another.
3. And regarding the functional balance of the shoulder, the statistical analysis revealed that the values recorded at the final test are significantly better than those from the initial test ($p < 0.05$).
4. The application of our prevention programme led to the athlete's return to competitive life and managed to combat the athlete's absence from both training and matches.
5. The effectiveness of the programme for the prevention of shoulder injuries in performance in handball players led to an increase in muscle strength, an improvement in ability, mobility and joint stability, thus, we conclude that through the prevention programme we have prepared the athlete for the limiting situations during matches and training.

The working hypothesis was verified – the application of the proposed kinetic programme led to the complete recovery of the athlete participating in the study.

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