International Journal of Academic Health and Medical Research (IJAHMR)
ISSN: 2643-9824
Vol. 7 Issue 2, February - 2023, Pages: 186-190

Prevention of Shoulder Injuries in Swimmers

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Abstract*: The aim of this research was to examine and point out the prevention of sports injuries in swimmers. Swimming training involves repetitive movementsshoulders that provide propulsive forces by using the arms as oars to propel the body through the water.Overtraining in swimming causes muscle fatigue that can lead to reduced rotator cuff efficiency and ineffective positioning of the scapula during each stroke. Another major risk factor for swimmers and shoulder injury is muscle imbalance that leads to shoulder instability, which results from ligamentous laxity and increased range of motion. the most commonly used are:external rotation,lifting a full bucket, raising arms with a full bucket,ball to the wall, rowing with an elastic band, auto-stopper, push-ups with one addition. It can be concluded that coaches have a very big role in recognizing, but also in the preventive action of shoulder injuries through monitoring the training load, correcting certain segments of swimming technique (swimming stroke), as well as strengthening and muscle stretching in the so-called "dry" training for swimmers.*

Keywords - swimming, stroke, shoulder joint, injuries, prevention

INTRODUCTION

Tens of millions of people participate and enjoy various sports as individual sports[1-3]. as well as collective [4-7]. Swimming as an individual and at the same time void sport is an extremely popular recreational and competitive sport [8]. Health effects are caused by versatile demands on the entire musculoskeletal, cardiovascular and respiratory systems. Participating in sports is a good way to maintain a level of physical fitness, but it can sometimes lead to injury. Modern training and competitions represent a great effort for the athlete's body [8]. In the desire to achieve the best possible result, the athlete does his best, not considering the danger of injuries that threaten him in the process [7].

The risk of injury in any sport is regulated by its nature and, among others, that risk is an integral part of participating in competitions. Sports injuries occupy a high place in the order of frequency of injuries in the modern world. That is why prevention is of great importance. A large number of sports injuries occur due to overloading of muscles, tendons or ligaments.The term sports injuries refers to injuries that are most often caused by the effect of mechanical force, during any sports activity [9].

The most common causes of injuries are: overtraining (local muscle fatigue leads to weakening of shoulder joint stabilization); improperly adopted swimming technique (which does not sufficiently reduce the frontal resistance, which is an additional load for the shoulder muscles that carry out thrust); Abdominal muscle weakness (because strong and well-controlled abdominal muscles enable good rotation around the longitudinal axis of the trunk when swimming, which makes it easier for the shoulder muscles to remove the arm from the water at the end of the push movement); breathing technique only on one side (this leads to muscle asymmetry, followed by their inadequate activation and overload)[5,8,10].

Swimming is the ability to maintain the body on the surface of the water and the ability to move in the water with appropriate movements of the arms, legs and body [11].. It is a non-contact sport that involves a lot of upper body strength. Research into sports injuries confirms that recreational swimmers have a very low risk of injury [4,5,11]. Swimming is one of the sports with a very low frequency of traumatic injuries. Muscle imbalances can lead to injuries, especially in the shoulder [8]. Also, the high intensity of training used by top swimmers almost inevitably makes them vulnerable and susceptible to overexertion syndrome. Where training is intense, these factors can contribute to shoulder injury and pain. Therefore, it should come as no surprise that shoulder pain is one of the leading injuries among competitive swimmers. Therefore, the goal of this research was to examine and point out the prevention of sports injuries in swimmers.

THEORETICAL CONSIDERATION OF THE PROBLEM

SWIMMER TRAINING

The subject of study in sports science ismovementas individual and the basic manifestation of movement, that is, as a complex and complex manifestation human motor skills [16,17]. Movement, that is, movement, cannot be achieved without muscle system. The basic property of muscles is the ability to contract. A muscle can to achieve a contraction without manifest consequential movement, i.e. to achieve contraction in the isometric (static) mode of stress, and can achieve contraction with consequent manifest movement, i.e. achieve contraction in dynamic mode of stress: eccentric, concentric or combined [18-20].

In addition to training in water, swimmers also apply training on dry land, the goal of which is the development of general and targeted physical preparation of swimmers [11]. Today, exercises that develop motor skills are increasingly applied [13,14]. The physical preparation of swimmers can be divided into: general (involves developing the strength of all muscle groups regardless of the specifics of the swimming discipline), directed (developing the strength of those muscle groups that are represented in the performance of competitive movements, but those exercises must imitate their structure and impact on the body competitive movement) and specific (strength development exclusively through performing competitive movement in water) [13,14].

Achieving a high level of muscle strength is necessary in every sport, including swimming [9,15,21]. For the successful implementation of a swimming race, a swimmer must possess: maximum strength, speed strength and strength endurance [8,22]. To develop muscle strength in swimmers, the following are used: isometric, dynamic, isokinetic and plyometric training [11]. The best results, i.e. the greatest impact on swimming efficiency, have strength exercises performed in water and directed strength exercises on dry land. In the preparatory period, classic strength training with load is used more, while in the later stages of preparation, directed exercises on dry land are increasingly used in combination with specific exercises for developing strength in water [15,18,22]. The experimental treatment of this research contains directed exercises on dry land and specific exercises for developing strength in water.

PAINFUL SHOULDER

Competitive swimming is a very popular and demanding sport [8].It has been included in the program of the Olympic Games since 1869. Due to their popularity, top swimmers start their careers already at the age of seven, in some literature it is even mentioned that they start at the age of 5 or 6 [8,20], and most of them train and participate in competitions throughout the year.The time devoted to training in competitive swimming can range from at least five to 30 hours per week.Swimming training involves repetitive movements. In a typical two-hour training session, an elite swimmer can swim between 6,000 and 7,000 meters. That swimming is on average about 35km - 65km per week, which is equivalent to aerobic running 130km - 260km. This means that swimmers perform between 1,500 and 4,000 arm strokes per day, or about 1,000,000 arm strokes per year [13].Since female swimmers, on average, have a shorter arm stroke, they can perform an additional 660,000 stroke cycles per year.In swimming, speed depends on the arms, especially the adductors and external rotators of the shoulder. Because of this, the shoulder joint is the main site of overexertion syndrome.Over a million rotations are performed in the shoulder annually, so it is easy to understand why there are so many shoulder injuries in swimmers [8,14], respectively90% of swimmers' complaints are about shoulder injuries [10].

The shoulders provide propulsive forces by using the arms as oars to propel the body through the water,and shoulder pain is a common occurrence in swimmers [22]. Johnson (2003) reported that shoulder injuries account for about 30% of all swimming injuries, followed by back injuries for 20%, and knee injuries for 10% of all swimming injuries.[23]. The term "Swimmer's shoulder" was first described by Kennedy & Hawkins in 1978 as a general painful syndrome of the shoulder joint in swimmers.[24].ResearchMcMaster et al. (1998) showed that 35% of senior national team and Olympic swimmers experienced shoulder pain that prevented them from training effectively [25].

Overtraining in swimming causes muscle fatigue which can lead to reduced rotator cuff efficiency and ineffective positioning of the scapula during each stroke. The causes of shoulder pain depend on many factors and include gender, swimming experience, length of training, type of stroke, training intensity, upper extremity weight training, stretching (especially when working with a partner) and use of swim paddles [9-11].

Puckree and Thomas (2006) conducted a study to determine the incidence of shoulder injuries in competitive swimmers in KwaZulu-Natal, a province in South Africa. A cross-sectional study was conducted. A random sample of 96 swimmers from a group of 300 swimmers registered in the first division of KwaZulu - National Swimming Federation clubs participated in the study, and all voluntarily agreed. Data were collected using a valid questionnaire. Seventy-one percent of swimmers had shoulder pain and 64% reported shoulder injuries. Forty-six percent of swimmers complained of pain in the front of the shoulder, while 65% of all injuries were due to overtraining. The most common diagnoses are tendinitis (35%), muscle imbalance (29%), and other (17%). Sixty-nine percent of swimmers swim crawl, which is associated with 70% of injuries. Eighty-one percent of injured swimmers sought physiotherapy for shoulder pain. The authors conclude that the frequency of shoulder injuries in competitors is high [26].

Standardized clinical examination of the shoulder and glenohumeral joint laxity testing using a non-invasive electronic lactometer. 52/80 swimmers underwent MRI (magnetic resonance imaging). The results obtained by the authors indicate that 73/80 swimmers reported shoulder pain. 69% of those examined with MRI had supraspinatus tendinopathy. The conclusions of the study indicate that supraspinatus tendinopathy is the main cause of shoulder pain in swimmers and that this injury is caused by high volumes of training [27].

PREVENTION OF SHOULDER INJURIES IN SWIMMERS

Coaches are not only an integral part in recognizing the early indicators of these injuries, but they can help in prevention by monitoring the training load, but they should pay special attention to the mechanics of the swimming stroke, training with weights or other dry training for swimmers [26].There are ways to prevent overexertion syndrome in swimmers. Increasing shoulder stability and muscle imbalance is a key factor in reducing the incidence of shoulder injuries. Rowing rotator cuff exercises and scapular positioning will be credited with reducing injuries. Pay attention to proper techniques and, if injured, it is most effective to practice on a cross machine [9,10].

There are simple strategies swimming coaches can implement to reduce injury rates:

The first factor is the correction of the swimming stroke, i.e. the correction of incorrect stroke mechanics is essential for the prevention of injuries [11].

Second, training loads, i.e. total reductions in weekly training mileage, and this will not be possible from a physiological point of view. However, coaches can help by reducing shoulder stress during each week by setting tasks that will relieve the shoulders (eg, relaxation exercises, active arm recovery) and maximizing the use of fins in the warm-up and final part of the turn [11].

Third, Screening, athletes at higher risk for injury can be identified during musculoskeletal screening. Individualized exercise programs that may be prescribed include stretching for areas of insufficient flexibility and strengthening/stabilization for hyper-mobility. It is important that the screening is carried out by a physiotherapist trained in specific swimming screening protocols [11,28].

ChFourth, Strengthening and Stretching, a comprehensive dry strength training program incorporating rotator cuff and scapular stabilization exercises is recommended for all swimmers. Swimmers should regularly stretch in areas of insufficient flexibility during screening(Walker, H. et al. 2005; Yanai, & Hay, 2000). Strengthening should concentrate on the rotator cuff and scapular muscles. This is best done with formal training that focuses on these muscles with light weights, high repetitions. Good mobility enables the swimmer to perform the necessary movements more simply and easily and helps prevent injuries [9,11,28].

Kluemper, Uhl and Hazelriggin this study determined whether a training program would reduce the forward shoulder position.Participants in the study were 39 swimmers (age 16±2 years), divided into an exercise group (n=24) and a control group (n=15). The experimental group performed an anterior shoulder muscle stretching program with a partner and a posterior shoulder muscle group strengthening regimen for 6 weeks. The control group participated in standard swimming activities in the water. The experimental group significantly reduced the distance of the acromion from the wall in the resting position (-9.6 ± 7.3 mm) compared to the control group (-2.0 ± 6.9 mm) [29].

PRIMARY EXERCISES OF THE MUSCLES AND TENDONS OF THE ROTATOR CUFFAND STABILIZATION OF THE SHOVEL

Because the shoulder is characterized by joint and flexion instability, muscle strength and stiffness are critical to maintaining stability, proper movement, and pain-free function. The risk of injury and pain becomes serious and real [30-32], especially in swimmers who swim with poor technique. It is well known and certainly already proven that an extensive program of developing strength and muscle flexibility is the most important way to prevent "swimmer's shoulder" injuries [10]. The primary exercises for the muscles and tendons of the rotator cuff and scapula stabilization are as follows [8-11]:

Exercise 1 – External rotation,

Exercise 2 - Lifting a full bucket / raising arms with a full bucket,

Exercise 3 - Ball to the wall,

Exercise 4 - Rowing with an elastic band,

Exercise 5 - Stopwatch,

Exercise 6 - Push-ups with one addition.

CONCLUSION

In order to achieve a maximum good result, the coaches draw the maximum from their swimmers. Considering that the shoulder joint is the most mobile in swimmers, it is also the most likely to be injured. That's why coaches in the process have a very big role in recognizing, but also in the preventive action of shoulder injuries through monitoring the training load, correcting certain segments of swimming technique (swimming stroke), as well as strengthening and stretching the muscles in the so-called "dry" training for swimmers. The shoulder joint should be brought to such a state that it is strong enough to bear heavy training loads and maximally mobile in order to contribute to the large amplitude of movements that are very important in the swimming sport. The paper describes exercises for strengthening the muscles of the rotator cuff and the muscles that stabilize the scapula, all with the aim of preventing shoulder injuries in swimmers.

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