



# Golden Hills

Orthopedic and Sports Physical Therapy

## j o u r n a l

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### Our Mission...

To further the prevention, diagnosis and treatment of movement dysfunction in order to enhance the physical health and functional abilities of our patients.

To maximize the patient's potential for regaining full physical health by providing rehabilitation through the use of advancements in physical therapy techniques and state-of-the-art equipment.

To establish a self-management program for the patient through education and a personalized home exercise program for each individual to enable the patient to maintain their physical health at home and at work.

## Seasonal Activity Spotlight: Swimming

While the high school and collegiate swimming seasons won't get underway until fall and winter, late summer brings competitive and recreational swimmers alike into the water for training, exercise or simply fun. Whether at the pool, the lake or the beach, your patients need to take basic steps to avoid injury and mishaps and should seek prompt medical attention if an injury occurs. Continuing our focus on seasonal sports, recreation and exercise (SRE) activities, the July-August issue of *Golden Hills Journal* delves into swimming, including strategies for injury prevention, the most common causes of injury and Golden Hills' approach to treating patient injuries.

We welcome referrals of patients who have suffered a swimming-related injury or who are simply looking to enhance their performance through effective training and safety practices. Just contact us at **(408) 274-0888**, or **[therapy@goldenhillspt.com](mailto:therapy@goldenhillspt.com)**. We're here to help!

### Swimming: An Overview

The popularity of swimming among non-competitive swimmers who have little or no formal coaching results in a pro-liferation of minor injuries, especially during the summer months when youth swimming programs and

recreational swimming opportunities abound. More serious injuries are seen among competitive swimmers and those who incorporate intensive lap swimming into a regular fitness program.

The freestyle (front crawl), backstroke, breaststroke and butterfly are the four competitive swimming strokes that are swum in various distances alone or in combination. There are four phases common to all strokes: the reach, catch, pull and recovery. The main power of propulsion (75%) is provided by arm action during the pull phase in all strokes except the breaststroke, which is unique in both upper and lower extremity motion. The torque created during the reach, catch and pull motions, combined with the overhead reaching motion of the swimmer, puts the shoulder at special risk for injury.

### Training Demands

Young athletes often begin their competitive careers as early as age 7. Most competitive swimmers train and compete year-round, frequently on several swim teams. College swimmers train and compete during most of the school year, from Sep-tember to March.

Competitive swimmers train in-tensely. Elite swimmers often swim up to 11 two-hour workouts per week.

In addition, 80% of these athletes also participate in weight training, which generally consists of three 30- to 50-minute sessions per week. The typical daily training distance averages 10,000 to 15,000 yards. Regardless of the swimmer's specialty stroke, 75% to 90% of training is done freestyle. This intense regimen continues throughout the season, often with no breaks, from October to February.

While success in swimming is judged primarily on performance at the championship meets, a swimmer's success relies heavily on strength and endurance established over many months of heavy training. A 4-week interruption in training dramatically changes the metabolic characteristics of a swimmer's muscle. Further work has shown that although aerobic capacity and muscle strength are maintained despite 4 weeks of

reduced training, the ability to generate power during swimming is significantly reduced.

Because of these factors, swimmers are reluctant to take time off, making injury rehabilitation difficult. When designing a rehabilitation program, physicians, physical therapists and coaches should keep in mind that extended time out of the water quickly results in detraining and may be detrimental to the whole season.

## Swimming-Related Injuries

Swimming has a distinct profile of injuries and medical conditions. Acute (traumatic) injuries in swimming are rare. However, cumulative (overuse) injuries are quite common and are often linked to overtraining or improper technique. In fact, overtraining has been observed in 10% to 21% of swimmers during the course of a competitive season.

### Shoulder

As the most mobile joint in the human body, the shoulder has little bony support. The stability that allows the arm to function with power and precision results from the interaction of the shoulder capsule, the surrounding ligaments, the rotator cuff muscles, and the pectoralis major and serratus anterior muscles. The rotator cuff muscles work in a force couple combination with the deltoid and the long head of the biceps to contain the humeral head in the glenoid fossa. The scapular muscles work constantly in swimming arm action. If they fatigue, a downward tilt of the scapula may occur that in

turn alters the mechanics of the glenohumeral joint.

In 1 year a swimmer may move the shoulder to its extreme range of motion in about 2 million arm strokes. Swimmers' shoulder injuries usually result from long-term overuse and repetitive microtrauma. Ten percent of 13- to 14-year-olds, 13% of 15- to 16-year-olds, and 26% of elite college swimmers reported current interfering shoulder pain. When surveyed for past shoulder pain, 47% of 13- to 14-year-olds, 66% of 15- to 16-year-olds, and 73% of elite college swimmers had positive histories. Almost half of masters swimmers, who participate in much less intense training, report pain episodes that last at least 3 weeks and interfere with swimming.

### Tendonitis ("Swimmer's Shoulder")

The term "swimmer's shoulder" was first used by Kennedy and Hawkins in 1974; it is by far the most common swimming injury and involves inflammation in the supraspinatus and/or biceps tendon usually caused by glenohumeral instability. Swimmer's shoulder can limit or stop training and hinder performance.

Additional degenerative changes in the supraspinatus tendon may result from repeated "wringing out" of its blood supply during adduction with the finish, or late pull phase, of the stroke. The repetitive irritation of supraspinatus tendinosis may lead to acute local inflammation that further decreases the subacromial space, causing secondary impingement and possibly subacromial bursitis.

## Signs and Symptoms of Overtraining in Swimmers

### Psychological

- Altered sleep pattern
- Appetite changes
- Fatigue
- Inability to concentrate
- Irritability
- Loss of motivation

### Physiologic

- Change in bowel habits
- Chronic muscle soreness
- Frequent illnesses
- Frequent musculoskeletal injuries
- Increased resting heart rate
- Weight change

Causal factors of swimmer's shoulder include the following:

- **Overwork** of the shoulder during the continuous, repeated demands made by swimming
- **Hypovascularity** in the supraspinatus and the biceps tendon during adduction and neutral rotation
- **Impingement** of the supraspinatus and biceps tendons
- **Increased laxity** in the shoulder, causing the rotator cuff muscles to work hard just to contain the humeral head
- **Shoulder strength imbalance**, in which the internal rotators become more developed than external rotators and can lead to rotator cuff tendonitis

Tendonitis is classified into four grades:

Grade	Characteristics
I	Pain is experienced after the activity
II	There is pain during and after the sport, but it is not disabling
III	Disabling pain is present during and after activity
IV	Pain continues to be experienced in the activities of daily living after the cessation of swimming

### Prevention

Appropriate prevention of swimmer's shoulder is critical in all training programs. Routine icing and prophylactic NSAIDs may be needed during heavy training. The characteristics of a sound training program include:

- Balanced strength training, including both pool and dry land
- Flexibility training and stretching incorporated into the daily training regimen, including pairs stretching for athletes 15 years of age and older
- Technique modification based on ongoing stroke analysis and recognition of breakdown in stroke mechanics
- Avoidance of overwork, including training sessions designed so that the difficult portion of the workout is completed early in the practice when the swimmer is rested

### Diagnosis

When evaluating a swimmer's shoulder pain, identifying the painful phases of the stroke may aid diagnosis and treatment. Frequently, irritation is worst during the catch or early to middle pull portion of the stroke, though arm abduction during the recovery phase sometimes also contributes to pain. The "painful arc" syndrome—pain on active abduction between 45° and 120°—suggests supraspinatus tendinitis. The physician should also evaluate the patient for:

- Impingement
- Internal or external rotator muscle weakness
- Anterior, posterior, inferior or multidirectional laxity/instability
- Point tenderness over the supraspinatus and/or biceps tendons

### Treatment

Though management of swimmer's shoulder requires rest, it is important

to minimize a swimmer's time out of the water. When possible, relative rest should include pool-based training alternatives such as non-aggravating strokes or one-arm butterfly.

NSAIDs and ice are part of the standard treatment. Massaging the shoulder with a frozen paper cup of water for 15 minutes works very well in the shower after workouts.

Physical therapy is often necessary, and will include internal and external rotator strengthening in arm abduction and adduction and supraspinatus strengthening. Steroid injections must be used with caution in all athletes; for swimmers, training load should be decreased for 3 to 4 weeks after injection. If necessary, complete rest from swimming often will allow the injury to heal.

Surgery is rarely needed in young swimmers. However, surgery is sometimes considered for athletes with chronic shoulder pain that does not respond to conservative treatment.

### Knee

Almost all knee injuries in swimmers are related to the use of the whip kick in the breaststroke. "Breastroker's knee" is a chronic medial collateral ligament (MCL) sprain that results from repetitive stress on the MCL. Symptoms of breastroker's knee are point tenderness along the MCL and pain on valgus external rotation. Though breastroker's knee arises more from stress than from technical errors, aligning the knee with the hip (allowing the knees to separate only to hip width) will minimize stress and maximize kick efficiency.

As with other overstress syndromes, prevention is the ideal. An adequate warmup period is an important first step. Altering training programs is also suggested.

Once pain occurs, early diagnosis and identification of the cause are both important. A knowledgeable coach will identify mechanical reasons, such as faulty whip kick technique, which is known to be a correctable cause of knee pain. Communication among coach, physician, physical therapist and swimmer is essential.

Therapeutic measures depend on the diagnosis; they include anti-inflammatory medication for inflammation of the MCL or medial synovial plica; during physical therapy treatment, ice and ultrasound may be used to control acute symptoms. Strength training will help overcome muscle deficiencies or strength imbalance and a stretching program will aid in regaining flexibility. Steroid injections should play only a minor role.

Since a multifactorial etiology may be present in many knee problems in swimmers, pathologies such as chronic ligamentous instability, torn medial meniscus and osteochondritis dissecans must be ruled out as causes of pain.

### **Foot and Ankle**

The extensor tendons of the ankle and foot are firmly bound over the dorsum of the ankle by the extensor retinaculum. Tendonitis of these tendons is the most common cause of pain, regardless of the stroke performed. The foot and ankle are

carried into extreme plantar flexion and then back to neutral in both the flutter and dolphin kicks. This repetitive work causes inflammation and edema, which are not well tolerated under the tight retinaculum. In most instances, diagnosis is obvious since the crepitus is both felt and heard when the foot is passively brought from plantar flexion to dorsiflexion. Prevention should be stressed with stretching of the extensor tendons.

Treatment includes stretching and rest in the form of increased pull-buoy use. During physical therapy treatment, ice and ultrasound can also be beneficial.

### **Elbow**

Although coaches often encourage swimmers to use a high elbow position during the pull phase, this position may predispose the swimmer to high medial elbow stresses that may overload the medial tendon and place the elbow at risk for injury. A swimmer may compensate for the sore elbow by dropping it throughout the pull phase. This position is much less efficient and can increase stress on the shoulder and common extensor muscles and tendons. The increased stress increases the risk of tennis elbow and shoulder injuries. Other overuse injuries of the elbow may occur with full elbow extension during the backstroke.

Elbow injuries are generally treated with ice, the discerning use of anti-inflammatory medication and physical therapy modalities such as ultrasound to relieve acute and chronic inflammation. Strength training, stretching and stroke alteration may also be beneficial.

### **Back**

Causes of low-back pain in swimmers include mechanical low-back stress, spondylolysis, spondylolisthesis and Scheuermann's kyphosis. Low-back injuries in swimmers most often are caused by repetitive stress during turns and the strain of poor head and body position in the water. Treatment includes avoiding diving and flip turns, abdominal strengthening, and improving hamstring-back flexibility.

### **Success through Teamwork and Patient Compliance**

While many injuries and illnesses in competitive swimmers require adjustments in the athlete's training plan, arrangements with the swimmer and coach can often allow for these adjustments to keep the swimmer in the water, a crucial component to a successful season and the key to compliance with a treatment program. Good communication among the physician, physical therapist, coach and swimmer is the key to successfully rehabilitating the injured swimmer.

Golden Hills' skilled physical therapists are committed to working closely with you, the patient and the patient's coach to help the patient achieve his or her recovery goals and return safely to a regular training program. For noncompetitive swimmer's, we also offer a wide range of physical therapy modalities to minimize the impact of minor injuries and we can even help the swimmer develop a more effective swimming program. Just contact us today for more information at **(408) 274-0888**, or **therapy@goldenhillspt.com**.