

# ORTHOPAEDIC

# PHYSICAL THERAPY PRACTICE

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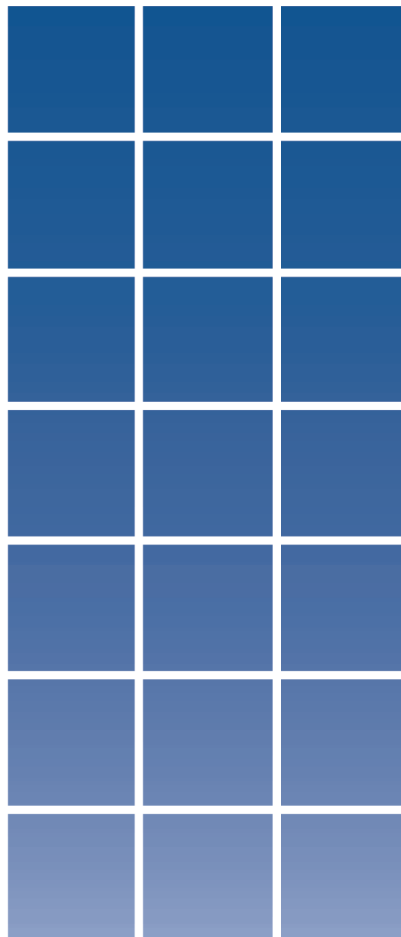


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# ORTHOPAEDIC PHYSICAL THERAPY PRACTICE

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# Injuries in Competitive Amateur Sailors

Jeremy J. McVay, DPT; John R. Parziale, MD

## INTRODUCTION

Sailboat racing is a multifaceted sport that places the competitive sailor in different ergonomic positions and requires activities that depend upon the boat size, boat class, and/or the responsibilities of the individual sailor. Little information is available regarding the types of injuries sustained in this sport (JB Allen, RC Cody, unpublished data, December 2004). Overuse injuries of the lower back and shoulder were cited among 28 world-class female athletes who participated as crewmembers for the America 3 yachts in pursuit of the prestigious America's Cup (JB Allen, RC Cody, unpublished data, December 2004). The injuries seen amongst elite athletes on these larger yachts measuring 100 feet or more in length are not the same types of injuries seen in recreational sailors racing 20 to 50 foot vessels.

The purpose of this study was to provide information about the frequency and types of injuries sustained by subjects sailing on recreational craft measuring 20 to 50 feet in length over a 3-year history of a typical yacht club season (Memorial Day to Labor Day).

## METHODS

Written surveys were distributed to 70 competitive sailors participating on the last day of the racing season in 2003 at Barrington Yacht Club in Barrington, Rhode Island. A total of 62 surveys were returned completed (89%); 57 were fully completed (81%), with the results included in this study. Survey questions were designed to determine the frequency of sailing injuries, the types of injuries sustained, treatment sought, and the effectiveness of treatment.

## RESULTS

Of the 57 individuals completing surveys, 43 were male (75%) and 14 female (25%). The age of these sailors ranged between 13 and 63 years, with a mean age of 43.9 years (mode of 49 and median of 47). Twenty-two sailors reported a sailing frequency of 1 to 2 times a week,

28 sailed 2 to 3 times per week, and 7 sailed 4 or more times per week during the sailing season.

Thirty-two of the 57 sailors surveyed reported sustaining at least one injury directly related to sailing during the last 3 competitive seasons (56% of those surveyed experienced injuries). Twenty out of 21 reported had successful treatment of their injuries. Seven of these required a visit to the emergency department. Twenty-three sailors reported 1 to 2 injuries over the season, 7 reported 3 to 5 injuries, and 3 reported 6 or more injuries over the most recent season. The most common injuries cited were to the hand(s) (12), thigh or leg (11), lower back (10), shoulder (7), head or neck (6), arm/elbow (5), ankle (5), foot (4), eye (3), wrist (3), or trunk (2) (Figure 1).

Body mechanics (13) was cited frequently as the most likely cause of injury. Explanations under 'Other,' another frequent answer for mechanisms of injury,

included repetitive motion, equipment failure, and/or a trip or fall (Figure 2).

Diagnoses were self-reported and generally nonspecific, although 2 persons reported sustaining a fracture. Ice and nonsteroidal anti-inflammatory medications were the most frequently used treatments (14 each). Four sailors required physical therapy and 2 opted for surgery (Figure 3). All but one person responded that treatment was successful.

The incidence of injuries was higher for males versus females surveyed. Sixty-five percent of males were injured, compared to 43% of females (Figure 4). The incidence of injury increased with age until the age of 38, and the number of injuries decreased markedly after age 38.

The highest rate of injuries occurred at a frequency of approximately 3 days per week of sailing. The results tended to increase with the frequency, but decreased slightly for those sailors that sailed most frequently.

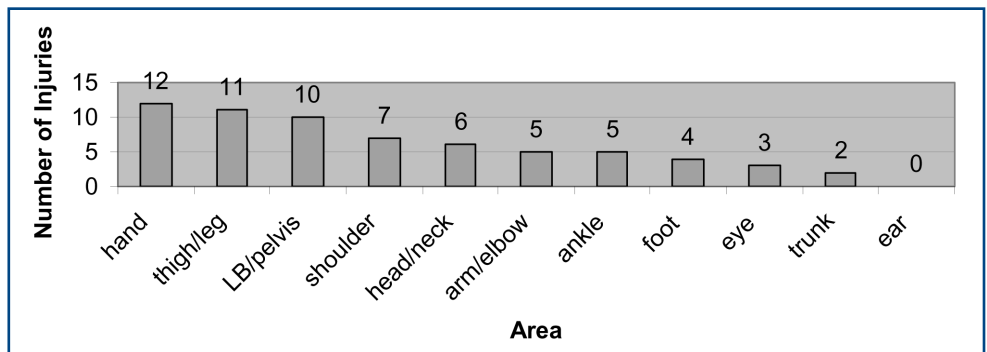


Figure 1. Injuries cited by amateur sailors specified by region.

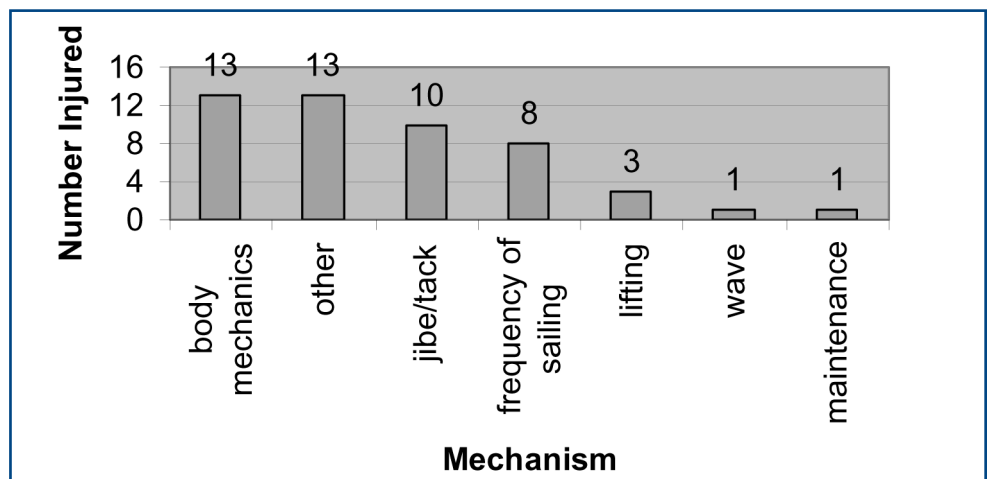


Figure 2. Self reported mechanism of injury for competitive sailors.

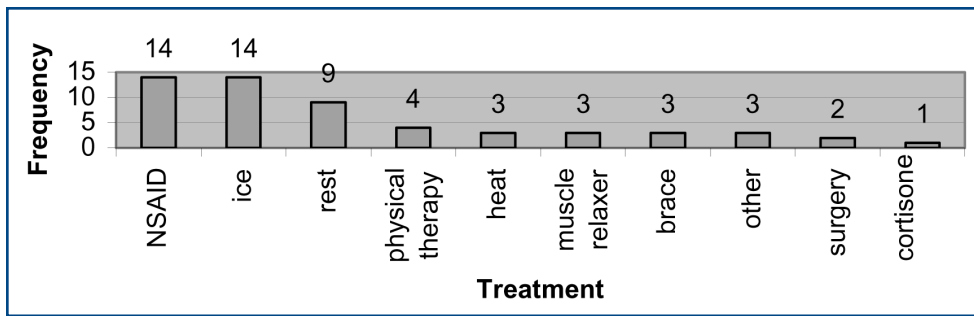


Figure 3. Treatments reported by competitive sailors following injury.

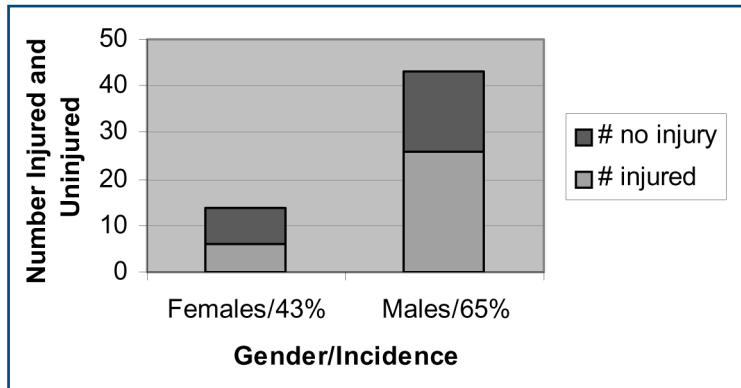


Figure 4. Injuries by sailors classified according to gender.

## DISCUSSION

The wind has been harnessed to move and power vessels for many centuries. However, technology has altered the technique of sailing over the last few decades. Competitive wind-powered racing takes on such varied forms as America's Cup yacht racing, ice boating at over 160 mph, and windsurfing. Many individuals in the United States participate in weekly racing program sponsored by local or regional clubs.

While many team sports have been studied extensively, there is a dearth of sailing injury research. Searches on MedLine, Pubmed, and Ovid using the term *sailing* produced very limited information, pertaining primarily to high-level competition or windsurfing. An article on windsurfing injuries and prevalence was found; however, these injuries may not be comparable to common amateur sailing injuries.<sup>6</sup> Little to no information is available regarding recreational sailing competitions, the type of activity involving most competitive amateur sailors throughout the United States.

The estimated number of persons using sailboats in the US, from 2001 to 2002, was 10,838,282.<sup>13</sup> The US Coast Guard reports that: "Each year hundreds of lives are lost, thousands are injured... and millions of dollars of property damage occurs because of preventable recreational boating accidents on US

waterways."<sup>13</sup> There are more than 70,000,000 Americans who participate in boating, and over 13,000,000 registered recreational vessels in the US alone.<sup>13</sup> A Coast Guard conducted a study in 2001-2002 of 25,547 individuals show-

ed that sailors remain on the water in their boats longer than any other type of boating vessel other than houseboats.<sup>13</sup> This is significant because the average number of hours on the water when an injury occurred that required medical treatment was 14.9.<sup>13</sup>

There is scarce information available regarding recreational sailing competition, a common activity for amateur

sailors throughout the United States. There is little question that competitive sailing at the elite level of the America's Cup is demanding. These boats are longer than those considered in this study. This study involved amateurs sailing boats 20 to 50 feet in length, and the study of injuries over a 3-year history of typical yacht club racing seasons (approximately Memorial Day to Labor Day).

On smaller craft, sailors experience increased stress on the quadriceps mechanism during 'hiking' maneuver, which may play a role in thigh, leg, and/or patellofemoral pain (Picture 1). This finding is consistent with previous studies from the Olympics that suggest that patellofemoral joint syndrome is more common in those racing in the smaller Finn and Laser class boats. Such vessels may be unstable at high speed, and these considerations are important in designing boats and/or boating equipment for physically challenged sailors.<sup>1,7,10,11</sup>

The boats studied have crew positions that require varied ergonomic actions. There is usually one helmsman who steers the boat and is constantly watching both the actions of all other crewmembers and the sails to ensure they are properly set. There are usually 2 to 3 persons that run the sheets to the sails using winches while performing other activities such as pulling up the



Picture 1. Darrell Peck: Finn Sailor "Hiking" (Top American at the World Championships in 1994, '95, '96, '97, & '99).

sails, releasing, and/or pulling in sheets/lines. Another crewmember or 2 may be positioned on the foredeck, with responsibilities that include changing sails, ensuring that sheets do not get caught on equipment, etc.

Injuries to the hand, lower back, and leg were most common in the population we studied; this finding is at variance with elite crews sailing 100 foot yachts in which lumbar strain [24%, occurring in the "grinder" positions or those handling the sheets (ropes)] and rotator cuff tendonitis (16%, in the foredeck positions) were the most frequent injury sites (JB Allen, RC Cody, unpublished data, December 2004). Sailors commonly use leather gloves to avoid injuries to the hands, such as rope burns and compression injuries. The rapid changes that occur in tacking (changing direction) may increase risk for this type of injuries. More research is needed to determine causal relationships of the injuries.

The phenomenon of differing injury types and/or frequencies amongst elite performers as compared with amateurs has been reported in other recreational sports such as golf.<sup>7,10,11</sup> Although technology has increased to allow multispeed winches and/or low-stretch sheets and lines, the sleek racing machines that sport this technology often have poor footing, and may require crouching for extended periods of time and other potentially hazardous activities. Study of injuries on smaller and or larger vessels than those studied may be completely different as well. This is due to the difference in responsibilities of these sailors.

Discussions with sailors led the authors to suspect that adjustments of body mechanics and avoiding hazardous situations were more common in more experienced sailors. This could account for the decreasing frequency of injury in persons greater than 38 years of age. Persons younger than 38 years may be less cautious due to inexperience. Conditioning may have been another factor, and some individual comments alluded to this. Lack of conditioning was not formally addressed in this study, and further investigation may be helpful in understanding injury prevention in sailors. There were 43 males studied compared to 14 females. The lower sample of females may result in a less accurate rep-

resentation of injuries from this group. The frequency of sailing correlated with the frequency of injury for those sailing up to 3 times per week. After this, the frequency of injury decreased.

The retrospective methodology used in this study has limitations, and is likely to under-report the frequency and/or severity of injuries in amateur sailors. Those who were injured to the point that they were unable to return to sailing would not have been present to race on the final day of competition, and therefore more serious injuries may not have been included in the completed surveys. Other sources of error include those who may have forgotten an injury or thought it not important enough to include in this study.

### CONCLUSION

Competitive amateur sailors frequently experience injuries while sailing. Two of the 37 individuals in our study reported fractures and 2 reported having surgery. However, most reported injuries are treated effectively with conservative measures. The nature and types of the injuries suffered by competitive amateurs may not be the same as those experienced by elite racers, ie, those racing and/or practicing daily on large vessels. More research is needed to determine causal relationships and the role of safety, experience, and conditioning practices play in preventing injuries during competitive sailing activities.

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