Smooth Sailing

Overuse injuries in sailing and windsurfing

By Tamara Mitchell
Edited by Sally Longyear

Sailing and windsurfing are just two of the numerous water sports that are potentially harmful to the musculoskeletal system. Sailing is one of the oldest forms of transportation; it predates historical records! [1,2] As a sport, yachting appears to have originated in Holland in the 17th century, was introduced to England in the 1660s by Charles II, and eventually spread to the American colonies.[1] Competitive sailing started in England in the late 1800s with the America's Cup yacht racing.[2]

It's pretty amazing that, with such a long history, there is minimal research on overuse injuries in this sport. Part of this is due to the diversity in sailing that makes comparison of data very difficult: there are hundreds of boat classes, competitions vary from dinghy racing to global circumnavigations, and there are various crew positions.[3]

In this article, we have pieced together information to 1) present a bigger picture of the most common traumatic and overuse injuries from page 1 to 6, 2) suggest prevention methods on pages 7 to 11, and 3) recommend treatment options.

Even with the available data, we caution that injury information is not well defined. However, we want to create an awareness of the risk of Cumulative Trauma Disorders (CTD), also known as Repetitive Strain Injuries (RSI), which affect sailors. There is no cure for this condition that makes sailing very painful and sometimes impossible, but it can be prevented. Risk factors include a lack of general fitness, overuse, overtraining, and/or macro traumatic accidents.[3] Many actions in sailing are sudden and sporadic, requiring muscles to perform with explosive, powerful moves when they are not warmed up.[3] Awkward postures such as rotation, hyperextension, and locking or twisting joints cause musculoskeletal problems.[3]

Traumatic Injuries

In general, it appears that sailing is a pretty safe "sport" due to the absence of physical contact (as in basketball and football). In addition, falls are often cushioned by water.[4,5] However, traumatic injuries do happen. In professional ocean yacht racing, 33% of the injuries occur below deck, largely because of the amount of time spent below and the violent and sudden movements of the yachts.[6] In shorter distance races and sailing, most injuries occur from impact with boat hardware on or above deck.[6] Injuries tend to happen in still air, when sailors lose concentration, and/or when they are cold and tired.[4]

Small boats injuries

During the 1984-87 Kiel week regatta, hospital care was twice as likely due to injuries from dinghy sailing rather than keelboats.[3] These injuries included open wounds (31.3%), hand injuries (31.3%), head injuries (22.1%), contusions/bruising (19.7%), and various fractures (15.1%).[3] Another source reports that the most common injuries are strains, sprains, and contusions.[2] The three most common areas of injury are the lumbar spine (lower back), the

knees, and the shoulders. However, there is very little data regarding small boat injuries, so the actual incidence of injuries is not known.[2]

Yachts

In one study observing participants in the 2003 America's Cup yacht race, the incidence of injury was 5.7 injuries/1000 hours during preparation for and participation in the Challenge.[6] Amateur ocean yacht racing has an injury rate of 1/1000 hours.[6] Comparatively, professional cricket, also a non-contact sport, has an injury rate of 7/1000 hours. Professional sports involving contact and collision (e.g., rugby and soccer) have injury rates of 114/1000 hours and 81/1000 hours, respectively.[6]

In this America's Cup study, 67% of the injuries were acute and 33% were overuse injuries, a statistically significant difference ($P<0.0005$; $x^2 = 26.3$; $df=1$).[6] The overuse injuries were relatively more disabling that the acute injuries. However, there was no significant difference in the total number of days absent from training between acute and overuse injuries (acute: 1210 days; overuse: 1142 days) or the total number of days absent from sailing (acute: 507 days; overuse: 437 days).[6] 40% of the injuries affected the shoulder, 25% affected the lower limb, 20% affected the trunk, and 14% affected the head and neck.[6]

The most common traumatic injuries that occurred while sailing in the 2003 race were contusions (bruises) and sprains from contact with boat hardware (e.g., Spinnaker poles, winch handles, foot chocks, ropes, sails, and winches).[6] Similarly, the amateur sailors participating in 1996-1997 British Telecom Global Challenge experienced mainly abrasions and contusions (36%).[7] Bowmen reported the highest incidence of injury due to the high intensity of their activities performed in the very small, unstable area of the bow.[6] These findings confirm the data from a study of all of the 2000 America's Cup teams that identified bowmen and jib winch grinders as the most frequently injured.[3] 76% of these injuries were soft tissue injuries: 16% in the lumbar spine, 16% in the shoulder, 10% in the knee, 8% in the cervical spine, and 7% in the hand.[3]

The 2001-2002 Volvo Ocean Race also reported that bowmen and helmsmen were the most likely to be injured, with the highest reports of lower back pain, shoulder pain, neck pain, and skin lesions.[3] Due to the lack of specific injury descriptions, it is not possible to determine whether some of these injuries were overuse or traumatic injuries.

In addition to abrasions and contusions, the 1996-1997 British Telecom Global Challenge experienced burns (15.7%) including thermal, rope, and sunburns, fractures (11%), lacerations (11%), damage to cartilage, ligaments, and tendons (9%), and head injuries (6.7%).[7] The site of injuries were predictable: foredeck, galley, winches, and helm. Injuries increased with wind strength and sea conditions.[7]

Olceranon bursitis was reported in the 2006 Volvo Ocean Race.[8] Three cases were also described in the 1996-1997 British Telecom Global Challenge.[7] This is a very specific swelling on the tip of the elbow caused by traumatic damage to the bursa, a little sack of fluid that helps the movement of joints that stick out.[8] This injury has started to occur with a new generation of boats. The medic in charge of the 2006 Volvo Ocean Race, Timo Malinen, believes it is caused by the very different and less predictable, more pronounced and jerky pitching motion caused by the canting keel.[8]

Malinen has also reported that stress of certain positions, such as skippers and navigators, results in the most weight loss.[8] This is not a traumatic injury, but stress is a significant risk factor in injury and loss at sea.[7] Loss of sleep or lack of eating could also contribute to the weight loss.[8]

Fatigue was suggested as a topic for further investigation in the report on the British Telecom Global Challenge. [7]

In the 2003 America's Cup study, stress-related disorders including hypertension, insomnia, and upper respiratory tract infections (URTIs) were identified. These disorders were likely worsened by living in hotels away from home, intense training and sailing demands, working and sailing in excess of 12 hours a day, little time off, cold and wet weather conditions, and routine monotony .[6] All of these conditions increase the risk for cumulative trauma to the musculoskeletal system.

Windsurfing/Boardsailing

Boardsailing injury rates appear to be quite low at 0.22 per 1000 hours of participation and an incidence of 1 per 1000 sailing days.[3, 2] Retrospective surveys of elite boardsailors from 1984 to 1989 showed similar injury rates.[3] The most common injured or painful areas are the lower extremities (44.6%), upper extremity (18.5%), head and neck (17.8%), and trunk (16.0%).[3] The most common types of injury are sprains (26.3%), lacerations (21.2%), contusions (bruises) (16.2%), and fractures (14.2%).[3] Injuries to the shoulder and spine are often the result of collisions with the boom.[2]

Another study in 2006 grouped windsurfers according to type of participation: [9]

RB: competitive national/international raceboarders
REC: recreational windsurfers
WS: competitive national/international wave slalom surfers

The first two groups were similar in ability levels, but the WS surfers were ranked higher, reflecting their involvement in aerial maneuvers.[9] The average number of injuries suffered by the WS surfers was approximately double that of the other two groups (i.e., approximately 2 incidences per person per year).[9] In all groups, the most common injury was muscle strain, which represented 35% of all injuries (to be discussed in the Overuse Injuries section). [9] This is a much higher figure than reported in earlier studies.

The chest ribs were at highest risk of fracturing.[9] Collision with equipment when overpowered by wind and waves was the major cause of traumatic injuries identified in the WS group. It was also a factor in 34% of the injuries in the REC group.[9] In addition, equipment faults such as ineffective foot strap release and harness release were identified as causes of injury.[9]

22% of all lower body soft tissue injuries involved muscular strain in the lower back.[9] The WS group also experienced lower leg muscle strains and ligament injuries to the knees and ankles, as well as cuts and grazes on the lower legs, ankles and feet, possibly due to the stress during takeoff for aerial flight and high forces on landing.[9] The REC group reported the most ligament sprains in the ankles and feet.[9]

42% of the upper body soft tissue injuries involved the shoulder, upper arms, and elbows. The highest rate of injuries was reported in the WS group.[9] Injuries included muscle and tendon strains as well as cuts and grazes to the head and face.[9]

Overuse Injuries

Unlike traumatic injuries that are associated with a particular incident, overuse injuries develop slowly over time. There are multiple, complicated factors that increase a sailor's risk for CTD. Often it is difficult to identify an exact cause. However, enough sailors have reported soft tissue disorders that can be associated with activity on and off the boat.

The 2003 America's Cup study found that most injuries occurred during weight training on land.[6] This may indicate one of several things:

1) intensity of training is a bigger factor in injury than is the volume of activity,
2) there is a decrease in training during the racing period, or
3) there is a reluctance of the crew to confess injuries for fear of jeopardizing their position on the race boat.[6]

Another reference also found that training too hard in the gym can result in the overuse of certain muscles needed during sailing.[5]

Small boat sailing and racing

In any type of sailing, when the wind fills the sails, the boat "heels" to one side.[2] In small boat sailing, the sailor counterbalances the heeling to keep the boat flat on the water by "hiking"out over the side of the boat.[2] Hiking is done in medium to heavy air conditions (over 8 knots).[2] In small boat sailing and board sailing, most injuries are to the knee and lumbar spine due to extensive forces applied during "hiking".[2,6] This activity is uncommon in yacht sailing or racing.[6] Hiking can be done either with bent legs or with straight legs.[3]

Bent-knee hiking

Straight-leg hiking

Illustrations courtesy of Reference 10

In bent-knee hiking, the knees, hips and trunk are bent with the posterior dragging in the water.[2] In straight-leg hiking, the knees are extended and the hip and trunk are in various degrees of extension.[2] Straight-leg hiking allows the sailor to respond to changes in wind velocity by swinging the upper body in and out.[2] Overarching the lower back due to weak abdominal muscles, or abnormal spinal stresses and overuse during sailing may be causes of back injuries.[3]

Hiking involves an isometric contraction of the upper leg muscles, which can impede or even halt blood flow to muscles and soft tissues.[11] Exhaustion can happen within a few minutes if the muscles are not in good condition.[11]

The bent knee hiking position puts little demand on the quadriceps, so people with weak upper leg muscles tend to resort to this posture.[11] With the help of friction from the back of your pants on the side of the boat and with all four knee ligaments taking up the knee reaction forces, a person can hang on the side of the boat for much longer, but the knee cartilage takes a lot of beating, especially over waves.[11]

Rapid and powerful movements of the upper extremities are involved in both steering the boat and trimming the sails.[2] Muscles needed while sailing during medium to heavy breezes include the rotator cuff, pectoralis major and minor, deltoid, triceps, bicep, brachioradialis, coracobrachialis, and wrist flexors and extensors.[2]

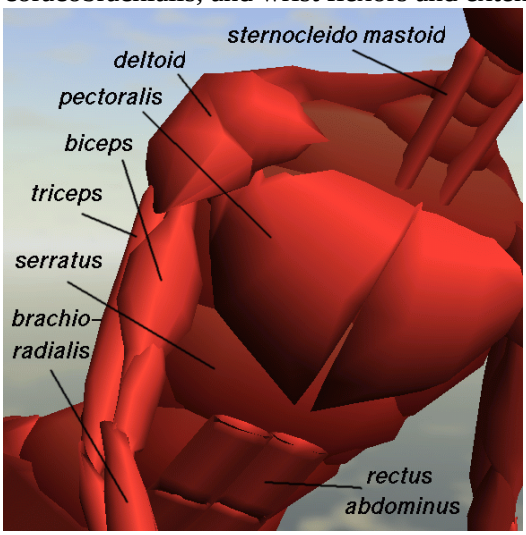
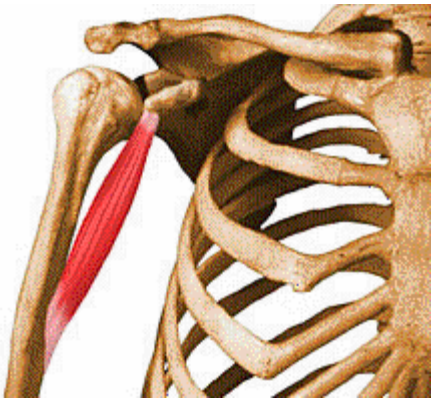


Illustration source:
http://www.soe.ucsc.edu/~wilhelms/fauna/Snaps/r_arm_bent.m.gif



Coracobrachialis muscle

Illustration source:
http://www.abcbodybuilding.com/anatomy/shouldersanatomy1_files/image008.gif

Anecdotal reports of Carpal Tunnel Syndrome are unverified, but reports are fairly common among small boat sailors where fingers go numb during sailing and at rest, resulting from gripping the ropes tightly.[12] It appears that this phenomenon is what many sports enthusiasts, especially motocross and dirt bike riders, call "arm pump".[12] It occurs whenever isometric gripping with the hands is required, especially with small diameter objects.

Windsurfing/Boardsailing

In the previously mentioned study of three different categories of windsurfers in 2006, competitive national/international raceboarders (RB), recreational windsurfers (REC), and competitive national/international wave slalom surfers (WS), all groups reported recurrent and ongoing injuries in the lower back.[9] The WS group reported about 250% more recurrent muscular strains to the body than the RB group, in addition to ongoing ligament injuries, especially to the knee.[9] This same group reported injury to the lower back twice as often as to the upper back. All groups reported recurrent muscular and tendon strains in the neck through elbow regions.[9] Muscle and tendon strains combined accounted for 55% of the injuries in the RB group, 43% in the REC group, and 42% in the WS group.[9]

Yacht sailing and racing

In the study of the 2003 America's Cup yacht crew, nonspecific overuse injuries affected the tendons in the elbows to biceps, as well as the cervical spine and hands. There were lateral/medial elbow tendinosis, biceps tendinopathy, cervicothoracic junction pathology, and intersection syndrome.[6] The illustrations below show the location of intersection syndrome in the wrist and how it differs from deQuervain's, another CTD.

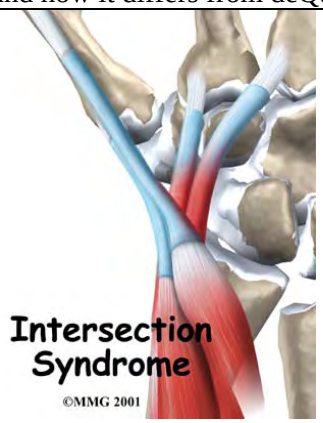


Image source: http://www.eorthopod.com/images/ContentImages/wrist/wrist_intersection_syndrome/wrist_intersection_syndrome_intro01.jpg

Image source: http://www.handuniversity.com/images/illustrations/wrist_dequervains_diag01.jpg

Nonspecific overuse injuries causing the greatest number of days absent from sailing were cervical spine degeneration, inguinal hernia, posterior interosseous nerve entrapment (PINE), and intersection syndrome.[6] PINE appears to have been reported previously as "grinder's elbow" and described as a "combination of tendonitis, fascitis, and epicondylitis causing local tenderness near the elbow and forearm."[6, 13] All of these CTDs were caused by muscle tension that aggravated the tendons, inducing inflammation.

The severity of overuse injuries in the 2003 America's Cup race, primarily tendenopathies, was significantly greater than the severity of acute injuries, perhaps because of the demands of highly repetitious activities such as grinding, top handle winching, sail trimming, and steering.[6] Helmsmen were at a greater risk of overuse injuries during ocean racing because of the high demands of steering in heavy weather conditions. [3,6]

Lumbar and cervical spine injuries are likely a result of the forward flexed and rotated position of the spine during the repetitive activities of grinding, pulling ropes, trimming sails, and lifting poles and heavy sails.[6, 3] Cervical spine injuries were likely related to the sustained extended and protracted postures of the neck of trimmers while looking up at the sails and helmsmen while steering.[6] Although there is no conclusive evidence, it appears that sustained postures and highly repetitious activities involved in America's Cup racing may contribute to degeneration of these joints over time.[6]

Pre-existing injuries accounted for only 8% of all injuries reported on the 2003 America's Cup crew; however, they were of greater severity than both new and recurrent injuries.[6] Cervical spine degeneration, PINE, long head of biceps, tendinopathy, and lumbar spine pathologies caused the greatest absence from sailing and training.[6]

As with small boat sailing, anecdotal reports of hand and elbow injuries appear in accounts of sailing yachts.[8,14] Paul Cayard recounts his experiences in the 2002 Volvo Ocean Race,

describing numbness and loss of strength in his hands due to gripping a slippery wheel that was too small in diameter, with too much load, in the cold.[14] This report also described another crew member with numbness in his feet and another with extremely swollen ankles.[14]

The report of the 2006 Volvo Ocean Race describes a crew member who couldn't close his hands due to the way he gripped the wheel.[8] Back problems and overuse injuries like epicondylitis (i.e., tennis elbow) were also reported in this race.[8]

Injury Prevention

For all types of sailing, appropriate fitness training and proper care of previous injuries is the best method of preventing future problems.[3, 8] There is very little research on the subject of injury prevention programs, but it is important to include exercises for general flexibility, hip flexor mobility, and overall stability.[3] Power, cardiovascular fitness and weight management are also factors in injury prevention during sailing.[3, 4] In addition, agility exercises may improve hand-eye coordination and the efficiency of movement on a sailboat.[3] All kinds of sailing require aerobic endurance and muscular strength, flexibility, and endurance.[3]

Warm-up

Proper warm up and cool down, appropriate stretching and flexibility can optimize balance and mobility while decreasing muscle tension.[3] The aim of warm-up is to increase body temperature, pulse rate, and circulation which can be accomplished on land prior to sailing by walking, jogging, skipping rope, or cycling.[2] Since there is often a long period of time on the water prior to sailing, muscles often cool down and stiffen up again, so 3-5 minutes of warm-up on the boat (e.g., arm circles, leg pedaling, and sit-ups) as well as the on-water drills (e.g., tacking and jibing) will raise the heart rate to reduce risk of CTD.[2]

Aerobic fitness

Research has shown that aerobic training and fitness is directly related to an improved reaction speed to wind shifts, as well as enhanced endurance, decision making, and concentration, particularly in the later stages of races.[3] Recovery, both mentally and physically, is faster for those who are fit.[3] Suggested types of aerobic exercise that are most appropriate for sailors are rowing, cycling, swimming, stair climbing, or running.[2,3] Aerobic fitness also reduces the risk of CTD.

Balance and core strength

The concept of balance in training is often mentioned. If all muscles are equally developed, there is much less risk of stress on the smaller ones.[5] Focusing on the big muscles while ignoring the important small ones that provide stability is a mistake that often leads to injury.[5] Weightlifting routines should involve commonly used muscle groups and their antagonists to maintain proper balance of strength, as well as developing optimum core stability and physical endurance.[3, 5] 60% of upper limb strength comes from the control of your torso. It doesn't matter how strong your arms are if you have no core strength.[8]

Training

It is currently recognized that training is critical for top performance.[5] Since the average age of an America's Cup team is generally significantly higher than other sports (e.g., up to 40 years), training is even more important.[5]

Specific training depends on the type of sailing as well as the crew member position. For example:

1) Sailors who hike require strength in the thighs, abdominals, hips, and arms.

2) Those who trapeze should focus more on upper body strength and endurance, aerobic endurance, and agility.[3]
3) Grinders who "man" the sails of big boats require aerobic endurance, muscular strength, power and endurance, especially in the upper body. [3] Working the sails requires powerful, often explosive performance repeatedly for a couple of minutes every one or two hours.[5] Grinders are at greatest risk of suffering from repetitive movements.
4) The afterguard has to be in very good shape and be able to concentrate for 2 or more hours at a time, often under demanding conditions.[5]
5) Sailors regularly involved with sail trimming need highly trained arms, shoulders, and upper back muscles.[3]
6) It was observed in the British Telecom Global Challenge amateur race that the high incidence of shoulder and cervical (neck) pain common in helmsmen could have been remedied partly by retraining.[7] Professional yacht races report lower rates of these types of injuries which may be a result of better balance, physical fitness, and sharper instinctive reflexes.[7]

Small boat sailing

1. Straight leg hiking provides minimal pressure on the kneecap and encourages development of both the inner, outer, and middle quadriceps.[10, 11]

2. Hiking with very tight toe straps and pointed toes puts less strain on the ankle and foot, the kneecap, the quads, relieves tightening of the hamstrings.[10] The toe straps need to be as close to the hiking point as possible so that the foot is just held by the toe strap, not encouraged to "hang on" to the toe-strap.[10]

Roostersailing.com has developed a boot that is designed for pointed toe hiking and helps support the foot, relieves stress on the ankle, and prevents soft tissue damage.

3. Strengthening the leg muscles is imperative in order to avoid injury to the knees during hiking.[10,11] The outer quadriceps muscles can quickly become the dominant muscle, which will pull the kneecap to the outer side, eventually causing chronic pain due to uneven tracking of the kneecap and the wearing of the cartilage.[10] To keep the kneecap tracking properly and to support the body while hiking, all of the muscles supporting the knee need to be strengthened during training.[10, 11]

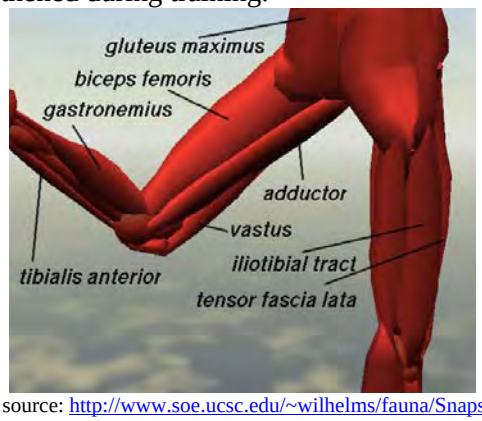


Illustration source: http://www.soe.ucsc.edu/~wilhelms/fauna/Snaps/hlegs.m.gi

4. Work on all of the major muscle groups: quads, hamstrings, gastrocnemius and soleus (ankle), glutes, tibialis anterior (front of shin), back and stomach.[11] Exercises should include squats, leg press, lunges, and wall sits.

5. Use a hiking bench to increase hiking endurance.[2]

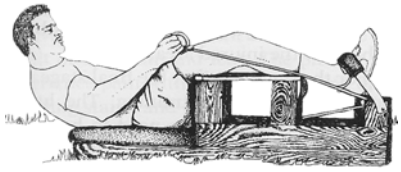


Illustration courtesy of Reference 2

6. Strength training the upper body should target the elbow flexor and extensor muscles. Exercises include dumbbell curls, hammer curls, cable curls, triceps presses, triceps cable presses and triceps dumbbell presses.[2] For the anterior chest wall and pectoralis major and minor, use both the flat and inclined bench press for flies.[2]

Windsurfing

Modifying training techniques has been found to be the most effective way of minimizing or preventing injury while windsurfing.[9]

1. A better warm up, improved stretching practices, increased lower body strength and improved body posture will support optimal sailing technique. [9]
2. Sufficient upper body strength will help the windsurfer cope with the demands of pumping in light winds and uphauling.[9] (Note: Pumping is the movement of a sail by pulling in or releasing the sail to increase the speed of the boat.[15])
3. Strength, endurance, and flexibility in the shoulders is needed since boardsailing requires sustained isometric action of the pectoralis major, deltoid, and scapular stabilizers.[3]
4. The high incidence of lower back muscle strain indicates a need for specific muscular training and flexibility exercises focused on the trunk and back muscles, especially the muscles at the hip and shoulder joints.[9]

Periodization and timing

Periodization of training creates peak fitness when it is most needed. Training starts six months before the target date.[3] Maintaining fitness in the off-season and reducing heavy training loads before regattas is important for injury prevention.[3] Rest is sometimes more important than more training in the gym if a sailor has used a certain body part extensively on the boat.[5] Overtraining must be avoided to reduce risk of CTD.

Nutrition, hydration, stress and fatigue

Whether sailing for a day or for long distances, proper nutrition is important to sustain blood glucose levels throughout the event which improves concentration and coordination.[3] In addition, hydration is very important. [3] Dehydration and inadequate caloric intake can hamper performance, cause early onset of fatigue, and increase risk of heat related injuries.[3, 4] Therefore, it is crucial to drink water or sports drinks prior to and throughout events.[3]

Recently, sailors are being treated like professional athletes; at least one school counsels sailors on their personal nutritional needs and sleep patterns to help maximize performance.[8]

Monitoring fatigue, eliminating overtraining and consuming a correct balance of carbohydrate, protein, and micronutrients will reduce risk for upper respiratory tract infections and overuse injuries.[6]

Staying warm.

Staying warm can be difficult if crew members are wet and it is windy. Waterproof attire that protects against the wind is important. It was observed on the British Telecom Global Challenge

amateur race that Gore-tex offshore foul weather gear consisting of a jacket and pants probably provided considerable protection from the elements, but was insufficient in maintaining dryness in heavy weather, especially on the foredeck.[7]

Injuries of all types are more likely to occur when people are fatigued and cold since circulation is restricted. [16] Cold muscles are less flexible and much more susceptible to injury and strain from overuse.[17]

Sailing gloves afford protection, but those designed to give maximum dexterity do not protect adequately against cold.[7]

Protection from sun and wind

Exposure to the sun and wind increases risk of skin cancer, sunburn, photoaging of the skin, and pteryguims in the eyes.[4,7] Wearing long-sleeved tops, sunscreen, hats, and sunglasses protects sailors from the sun's radiation.[4] Helmsmen require visors or goggles for protection from high velocity spray.[7]

Boat Design

Given the high percentage of abrasions and contusions, there appears to be a strong need for the application of ergonomics and human factors principles in the design of racing yachts to allow better movement and crew safety. [3,6]

Tools and equipment

Small Boat Sailing

Fast mechanism of foot strap release has been identified previously as critical to reduce fracture risk.[9]

Research suggests that, if using a harness, the best harnesses include rigid padding, shoulder through buttock support, and leg strap supports, though individual fitting is important to make sure the harness conforms to your body.[3]

Yacht Sailing

Clothing will most likely include more padding, especially for elbows and knees.[8] Some sailors have already been seen wearing kneepads or other padding for protection.[8] Bursitis, which occurred in the lower limb on the British Telecom Global Challenge amateur race, may have been prevented by additional padding within the foul weather pants.[7]

Windsurfing

Changing equipment (e.g., the harness), raising the boom, or wearing a back support are also helpful in reducing the risk of injury while windsurfing.

In the 2006 windsurfing study, no one wore a helmet.[9] Wearing a helmet in wave and slalom activities would be a sensible precaution, especially considering the risk of drowning as a result of concussion.[7,9] Some windsurfers are starting to wear them already, and it is predicted that helmet use will become more widespread.[8]

Ergonomics

Eliminating the overuse of muscles, tendons and ligaments requires concentration on technique and positioning. Maintaining a neutral posture whenever possible reduces the stress on soft tissues that eventually causes pain, numbness and tingling. For example,

1. Problems with the wrist and hand are usually a result of gripping too hard and too long. Take breaks, add padding to increase the diameter of wheels and other instruments, and be conscious of not gripping harder than required. Be aware of the angle of your wrist, arm and hand. The hands and wrists should be in a straight line. Alternate positions and grips to relieve forearm strain that causes wrist and elbow pain.
2. It may be safest to keep the back straight during hiking.
3. Relax the quadriceps muscles while hiking every so often to allow for blood flow to prevent quadriceps exhaustion while hiking.[11]

Injury Treatment

Get medical attention **as soon as** you start feeling pain. Pain associated with overuse might go away, but the cause of the pain does not. It pain is left untreated, it will result in permanent damage.

Dehydration

One of the most important things to do after sailing is to re-hydrate yourself.[8] It is wise to pass large amounts of clear fluids before drinking beer.[8] Most headaches are caused by dehydration. Some medics will not dispense pain medication until sailors have consumed considerable water.[8]

Knee

Knee injuries from hiking can be caught early. A strengthening program can relieve much of the problem.[11] Exercises can cause further injury, so it is best to work with a therapist to develop a progressive program that will strengthen, improve range of motion, and increase endurance.[2] The hiking bench should be used only after there is adequate strength and stability.[2]

Back

Back injuries may be treated with gentle stretching exercises, but see a physical therapist or a chiropractor who provides soft tissue treatment (i.e., not just spinal manipulations) if problems persist.[18] The goals in treatment are pain relief, education to identify poor or risky positions, restoring the active range of motion, and progressively developing balanced strength and stability of the injured area.[2]

Shoulder

Apply ice and use over-the-counter anti-inflammatory agents at the first sign of shoulder problems.[18] Stretch neck and upper back muscles. Then seek professional help to determine the cause of the pain and to develop a training strategy to strengthen the shoulder area.

Elbow

Lateral epicondylitis (i.e., tennis elbow) is very common among sailors.[18] It is a form of tendonitis that affects the outside tendons of the elbow.[18] If your elbows ache, ice them after sailing and stretch your forearms.[18] If elbows are painful, see a medical professional.[18]

Forearm, hand or wrist

If you have discomfort or loss of grip, ice after sailing and stretch the forearms.[18] See a physiatrist, chiropractor or hand therapist trained in soft tissue disorders if you experience pain, numbness, and tingling.

Post Injury

There is no literature regarding programs for returning to sailing after injury, however this should be done gradually.[2] For example, sail in light air conditions (i.e., under 8 knots) for 15 to 30 minutes during the first week and slowly progress to medium and heavy air if you do not

experience any symptoms such as achiness, soreness, stiffness and burning.[2] Stop immediately if you experience pain, numbness and/or tingling.

In comparison to other team sports, very few resources are allocated to the health and fitness of sailors.[6] The emphasis is largely focused on the research and development of the boats and hardware.[6] More research is needed in the field of sports science and medicine to reduce the risk associated with injury and illness while sailing.[6]

****

****

REFERENCES:

1. *History of Sport Sailing.* The Columbia Electronic Encyclopedia, 6th Ed., ©2007, Columbia University Press. http://www.factmonster.com/ce6/sports/A0860876.html
2. Sports Injury: Prevention & Rehabilitation, Shamus, E., and Shamus, J., eds, Chapter 8: Dinghy Sailing, by Snellenburg, K. pp 227-239.
3. *Sailing and sports medicine: a literature review.* Allen, J.B., and DeJong, M.R. British Journal of Sports Medicine, 2006; **40**: 587-593. ©2006 BMJ Publishing Group Ltd & British Association of Sport and Exercise Medicine. http://bjsm.bmj.com/cgi/content/full/40/7/587
4. *Health Promotion and Doping*. Chapter 11, by Tulio Giraldi (ITA), Youth & Development Training Manual, International Sailing Federation. http://www.sailing.org/default.asp?ID=j/~Fhouq&MenuID=t17mGP43x~NpEtRm840ECEM?Q?c567%60h0Bddl3NCVhXjLw0KodNk3PQXz8Ugsi
5. *Inside an America's Cup team: Keeping Alinghi's crew fit.* Valencia Sailing, October 30, 2006. http://valenciasailing.blogspot.com/2006/10/inside-americas-cup-team-keeping.html
6. *Epidemiology of injuries and illnesses in America's Cup yacht racing.* Neville, V.J., Molloy, J., Brooks, J.H.M., Speedy, D.B., and Atkinson, G. British Journal of Sports Medicine, 2006; **40**: 304-312. http://bjsm.bmj.com/cgi/content/full/40/4/304
7. *Patterns of illness and injury encountered in amateur ocean yacht racing: an analysis of the British Telecom Round the World Yacht Race 1996-1997.* Price, CJS., Spalding, TJW, and McKenzie, C. British Journal of Sports Medicine, 2002; **36**: 457-462. http://bjsm.bmj.com/cgi/content/full/36/6/457?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&author1=Price&fulltext=World+Yacht&andorexactfulltext=and&searchid=1&FIRSTINDEX=0&sortspec=relevance&volume=36&firstpage=457&resourcetype=HWCIT
8. *I Also Wanted to be a Doctor.* Volvo Ocean Race. June 15, 2006. http://www.volvooceanrace.org/features/article/2006/june/ialwayswantedtobeadoctor/index.aspx?bhcp=1
9. *Incidence of sports injuries in elite competitive and recreational windsurfers.* Dyson, R., Buchanan, M., and Hale, T. British Journal of Sports Medicine, 2006: **40**; 346-350. http://bjsm.bmj.com/cgi/content/full/40/4/346
10. *Rooster Sailing Coaching Tips. Hiking Styles – The secrets behind efficient and healthy hiking.* By Steve Cockerill. http://www.roostersailing.com/merchant2/merchant.mvc?Screen=hikestyle&Store_Code=1
11. *Laser Hiking Notes (email).* Iowa Sailing Club, Hiking Notes. By Shona Moss Lovshin, Thursday, Feb 1, 1996. http://www.uiowa.edu/~sail/library/skills/hikingkneestress1.htm
12. *Re: CT problems caused by sailing.* Carpal Tunnel Online Forum. http://ctsplace.com/ctsboard/messages/19260.php
13. *Treating the America's Cup sailors.* Phys Sportsmed 1987; **15**: 172-8. in Neville, et al
14. *Volvo Leg 4 – From 22 foot waves to 22 foot boats.* Cayard Sailing, April 01, 2002 by Paul Cayard. http://www.cayardsailing.com/cs_evntRpt.cfm?EvntRpt=263

15. *Interpretations of Rule 42: Propulsion.* International Sailing Federation, January 2005. http://www.sailing.org/rrs2005/42interpretations2005.pdf
16. *Muscular and Skeletal Problems: RSI Prevention Guidelines*. By Timothy Jameson, DC. ©1998-2004, Timothy Jameson. http://www.musicianshealth.com/rsi.htm
17. *Repetitive Strain Injury.* Agricultural Health and Safety Fact Sheet AHS-06. Utah State University Extension. Webster, J. and Gonzalez, M. http://extension.usu.edu/files/publications/factsheet/AHS-06.pdf
18. *How to beat aches and pains if you sail.* ©2004, Arthritis-Treatment-and-Relief.com. http://www.arthritis-treatment-and-relief.com/arthritis-sailing.html

****