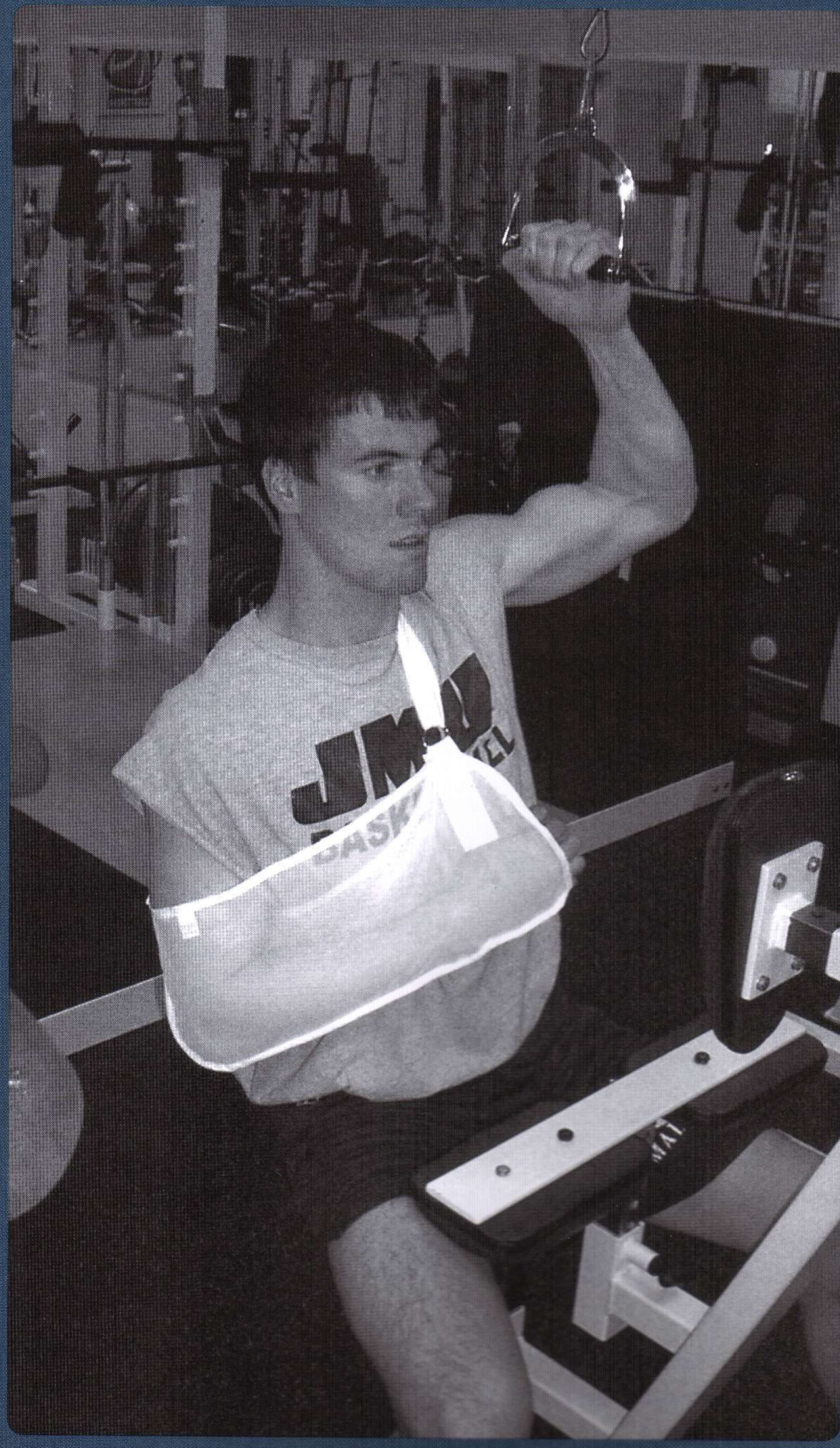


ALL PHOTOS COURTESY OF GREG WERNER, MS, CSCS, CHFI, CSNC

To the weight room AFTER injury—NOW

KNOWING HOW TO TRAIN WHILE INJURED WILL DECREASE YOUR HEALING TIME

GREG WERNER, MS, CSCS, CHFI, CSNC
and MATTHEW LINK, CSCS

IN TODAY'S COMPETITIVE ATHLETIC ARENAS, IT'S WELL KNOWN THAT WHEN TWO ATHLETES WITH EQUAL SKILL AND MATURITY COMPETE, THE STRONGER, MORE POWERFUL ATHLETE WILL WIN MOST OF THE TIME. CLEARLY, YOU WOULD BE WELL ADVISED TO HOLD DEVELOPING STRENGTH AND POWER AT A PREMIUM. AND SO, IN AN EFFORT

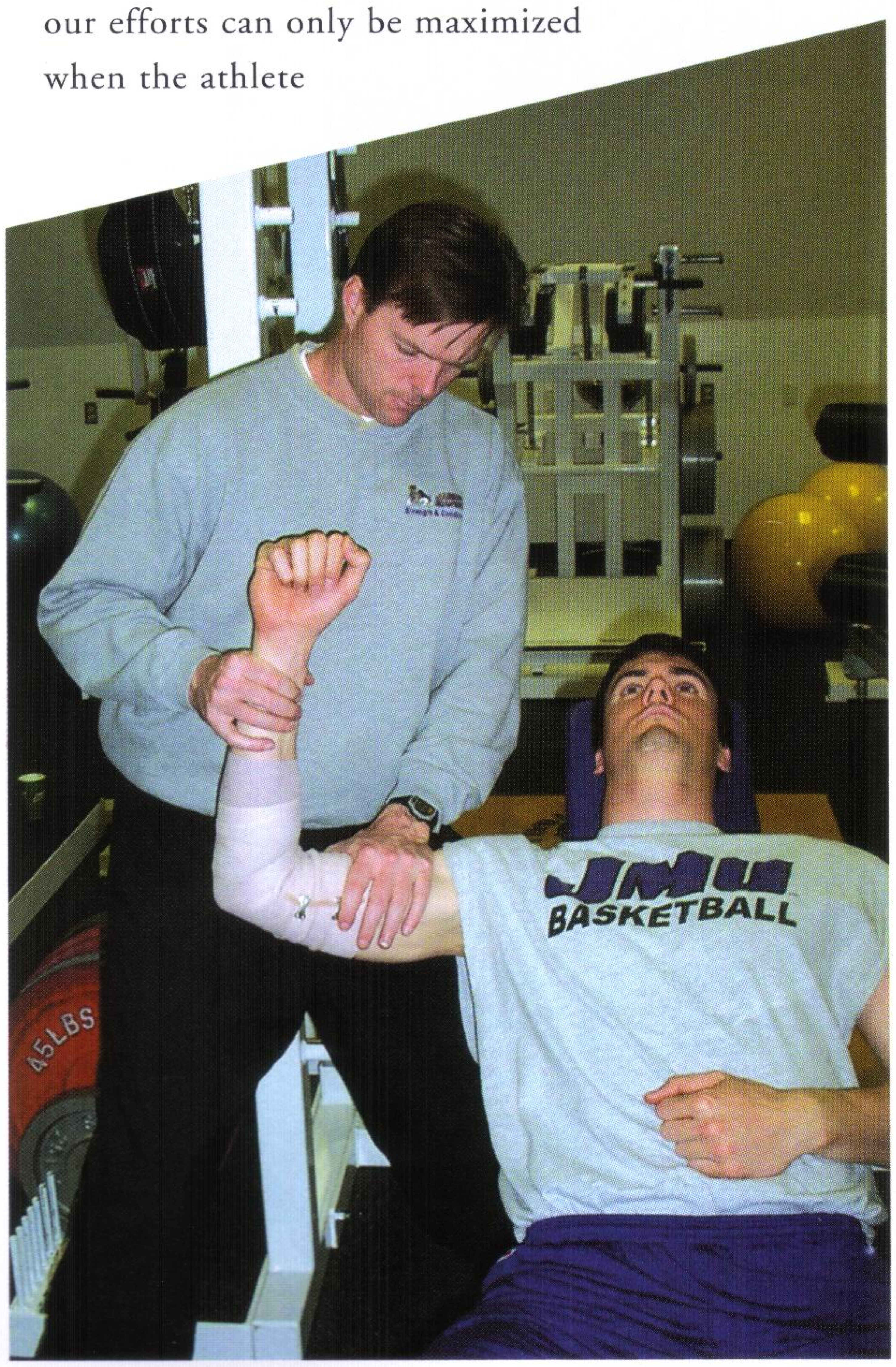
TO OBTAIN THE COMPETITIVE EDGE, YOU PUSH YOUR TRAINING TO THE LIMIT. YOU KNOW THAT YOU CAN'T AFFORD TO MISS ANY TRAINING IN THE WEIGHT ROOM, EVEN IF YOU'RE INJURED. BUT YOU MIGHT BE ADVISED NOT TO LIFT WEIGHTS AT ALL IF YOU'RE INJURED OR TO AVOID CERTAIN LIFTS TO PREVENT DAMAGING WEAKENED TISSUE DURING YOUR RECOVERY. POOR ADVICE!

A MATTER OF RESPONSIBILITY

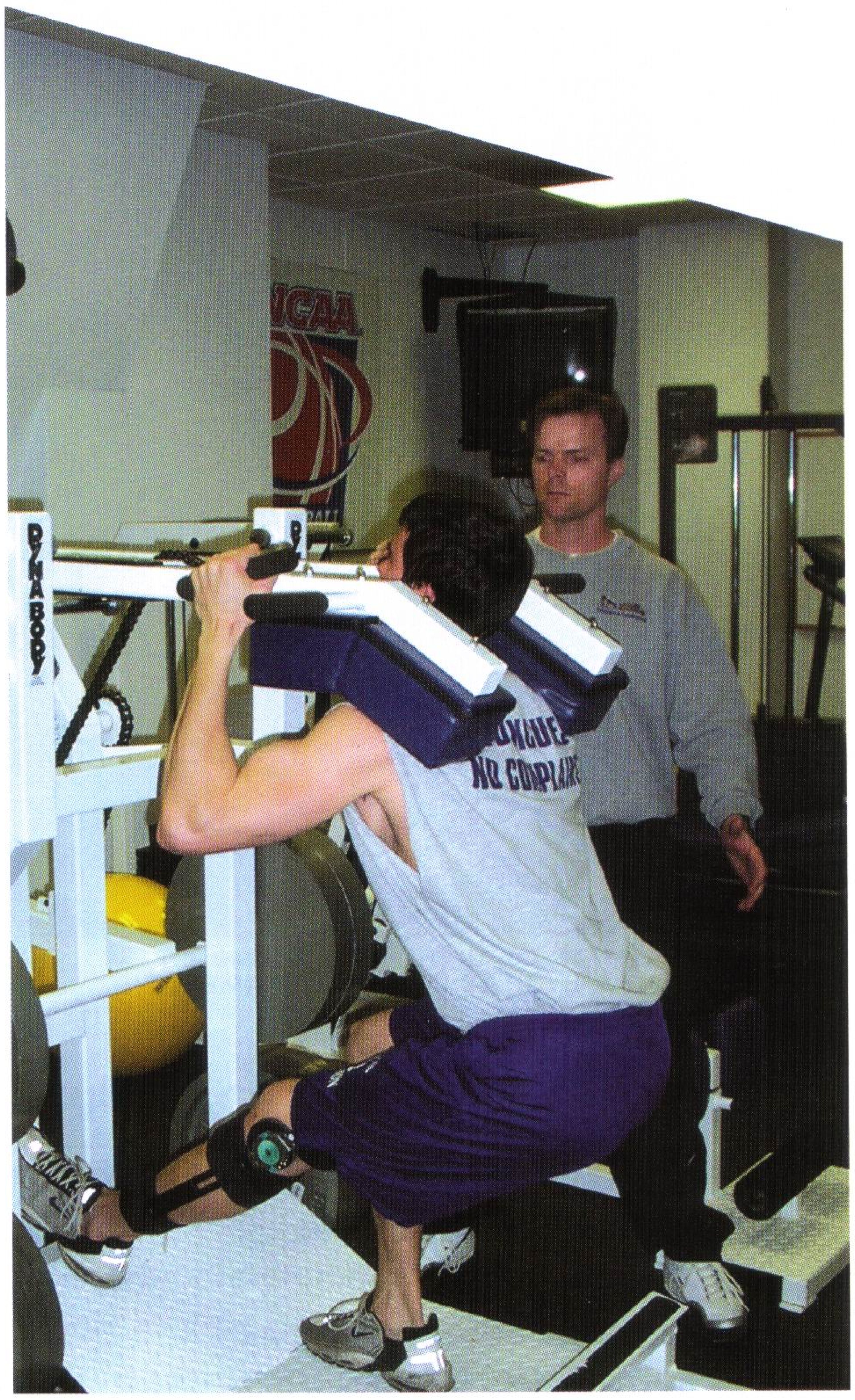
There are ample benefits to training while you're injured, so you should definitely continue with your strength and conditioning program, albeit with certain changes due to your injury. But the most fundamental requirement is that you understand what your responsibilities are while injured. Following the advice of your sports medicine practitioner is an absolute must. This will ensure a successful and timely return to practice and competition.[1] Try to consult as many of the following professionals as possible for your situation:

- A physician to diagnose, treat, and repair your injury and to prescribe medications
- A physical therapist and/or certified athletic trainer (ATC) to prescribe and administer your recovery modalities (electrostimulation, ultrasound, hydrotherapy, cryotherapy, etc.) and your functional recovery exercise protocols, and to test your readiness to resume activity and relay results to the physician
- A certified strength and conditioning specialist (CSCS) to teach you proper exercise technique, to prescribe exercises to continue your strength development in uninjured areas, and, after your rehabilitation, to prescribe a training program specifically for the affected area
- The sport coach to evaluate your performance and communicate upward with the sports medicine team.

In the final analysis, it's your physician who will be responsible for deciding that you're ready to return to practice and/or competition.[1] But that decision should be based on collective input from your sports medicine team and yourself. You must communicate openly and honestly with everyone involved in your recovery. Jeff Konin, MEd, ATC, MPT, assistant professor of health sciences and clinical coordinator of athletic training at James Madison University in Virginia, puts it this way: "Performance is ultimately the responsibility of the athlete. Certified athletic trainers, strength and conditioning specialists, and others who contribute to the rehabilitation of an athlete serve supportive roles to assist athletes in their quest to achieve optimal levels of performance. Regardless of how much we each do to facilitate an athlete's success, our efforts can only be maximized when the athlete



THE LEAD AUTHOR CHECKS ON RANGE OF MOTION



UNILATERAL MACHINE SQUAT

communicates openly with us and when we work collaboratively as a team. Each athlete plays a vital role in sharing information with the support team and has a responsibility to keep everyone informed."

PUMPING IRON

Your quick return to sport is obviously your primary concern. And here's where engaging in the strength training and conditioning process must be immediate.[2, 6] Ed Lochrie, MS, ATC, head athletic trainer for football at the University of Kansas, Lawrence, explains: "The strength and conditioning coach plays a critical role in the rehabilitation of an injured athlete. As athletic trainers, we attempt to return the injured athlete to the weight room immediately following the acute phase of the injury. The athlete is returned to reconditioning and strength exercises limited only by the rehabilitation protocols of the injury. I have found that this results in a quicker and more successful rehabilitation of the athlete." One of the reasons that you can't afford to miss out on training is that a time lapse can create a deconditioning effect and muscle atrophy.[1, 2] So to optimize your return to play, you must continue training.[5, 6] Speaking from his personal experience, Ronde Barber, defensive back for the NFL's Tampa Bay Buccaneers, says, "Training through an injury not only aids in the recovery process, but also enables me to maintain the strength and fitness levels necessary to return to play following the injury. Recovery from an injury requires extra effort on the part of the athlete. The treatments and rehabilitation necessary to manage an injury must be done in addition to, not in place of, a normal strength and conditioning program."

TRAINING WHILE INJURED

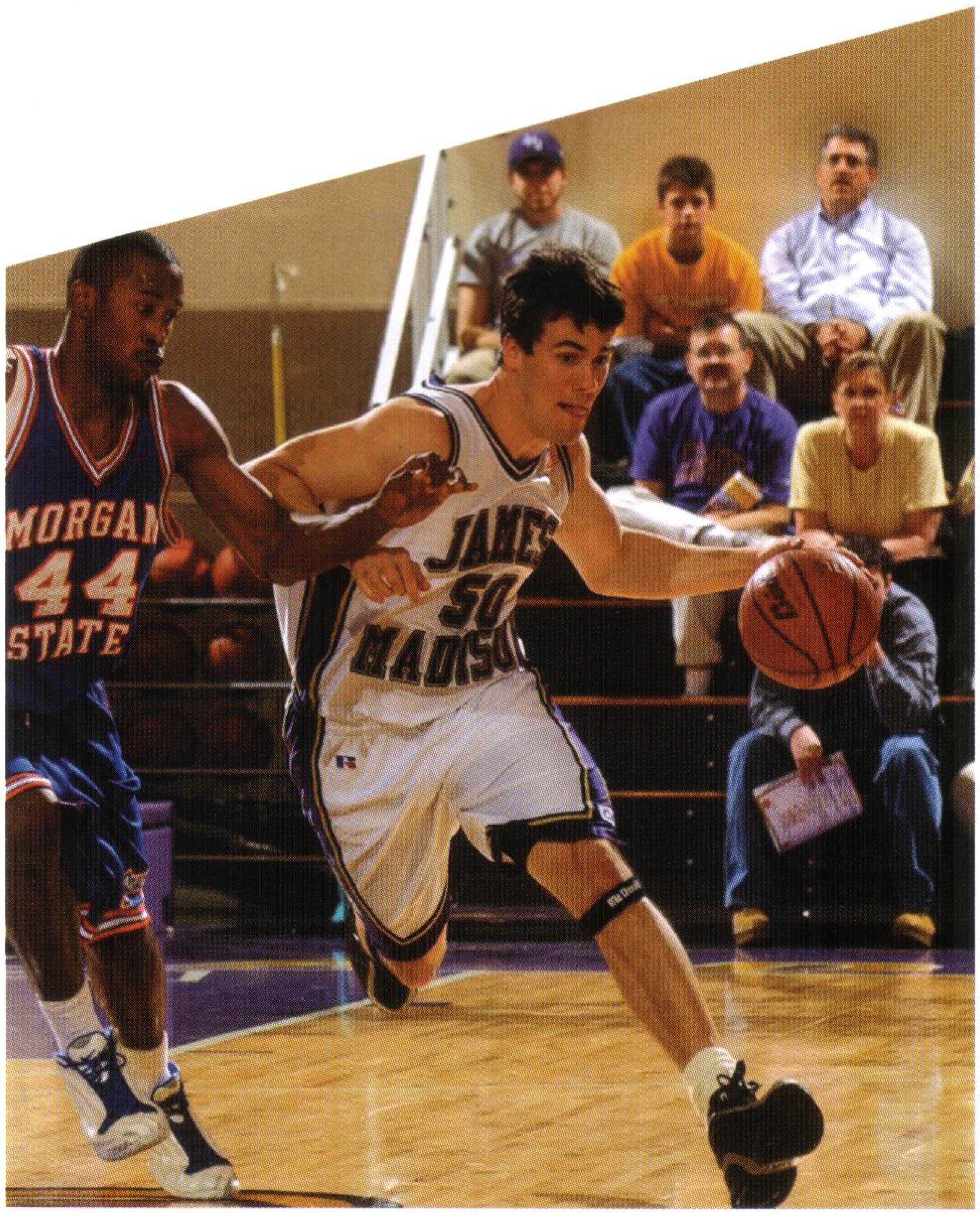
So if you're injured, here are the major areas that you need to address in your strength training and conditioning program:

General Total Body Conditioning

When the injured body part is rehabilitated, the rest of the body must be ready to compete; and there's some indication that conditioning the body in general, in addition to reconditioning the specific injured part, assists in the rehabilitation of the injured part through neural irradiation.[9]

Maintain Sport-Specific Cardiorespiratory Fitness

Maintaining cardiorespiratory fitness is perhaps the single most neglected component of a rehabilitation program.[6] But research indicates that if you return to your sport without the appropriate cardiorespiratory fitness, you face not only early fatigue, but also the risk of reinjury.[5] So you should modify your cardio approach and equipment or, if available, use specialized equipment, such as an upper body ergometer (UBE), that allows you to use uninjured limbs.[6]



Maintain, gain, and regain muscle strength, power, and endurance

Muscular strength is one of the most essential factors in restoring the function of a body part to pre-injury status. Therefore, you want to minimize your strength loss through weight training during your rehabilitation.[1, 2, 5-7] Your first step is to modify the weight training exercises to accommodate your injury.[1, 2, 5-7] First, eliminate the affected joint or muscle from the exercise. You'll then have to resort to unilateral (single limb) exercises and/or utilize manual resistance from a partner. Here are some examples:

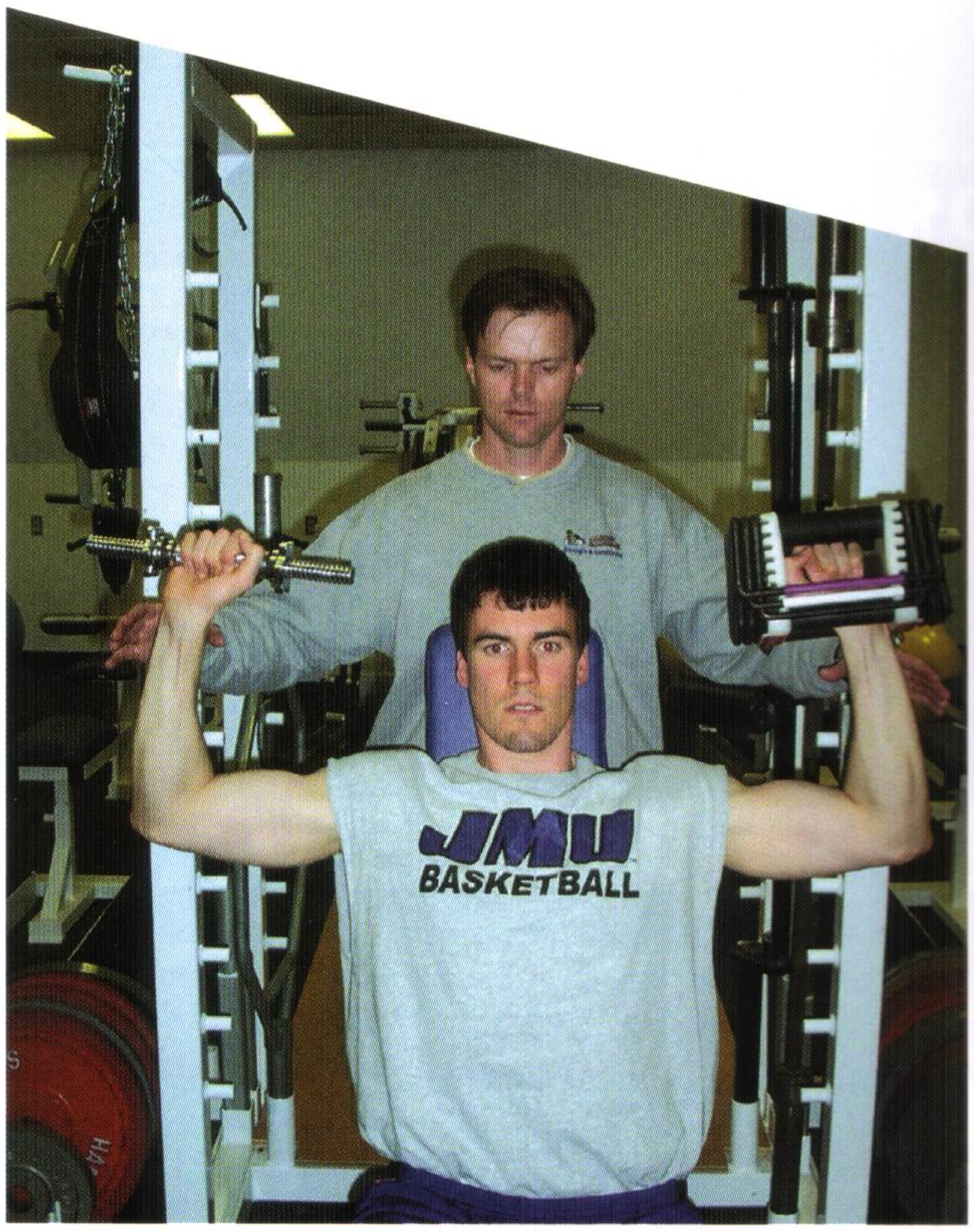
INJURY	INSTEAD OF THIS EXERCISE	DO THIS EXERCISE
Wrist	**Bench press**	**Unilateral DB bench press** **Manual resistance unilateral bench press**
Elbow	**Lat pull-down**	**Unilateral lat pull-down** **Manual resistance unilateral pull-down**
Shoulder	**Barbell squat**	**Leg press or squat machine**
Knee	**Barbell squat**	**Unilateral squat on machine** **Single leg balance squat**

Maintain/regain proprioception and balance

Reestablishing proprioception, kinesthesia, and neuromuscular control should be of primary concern to the athlete and the sports medicine team.[1, 2, 6] Proprioception (the ability to determine the position of a joint in space) and kinesthesia (the ability to detect movement) combine to provide the feedback necessary for the body to exhibit neuromuscular control, or the ability of the body to produce coordinated movements.[1] After an injury, your body temporarily loses some or all of the ability to process this information, resulting in a loss of functional ability. Skills such as balance, body control, and fine movement patterns that are critical to sport performance must be retaught. Reestablishing proprioception, kinesthesia, and neuromuscular control should be of primary concern to you and your sports medicine team, especially in the early stages of rehabilitation, in order to avoid reinjury.[1, 2, 6]

Prevent new tissue disruption

Though you are training and though you certainly will be using the injured body part, you should avoid any sort of impact or trauma to that area. You'd be well advised to wear protective padding or braces.[6]



BE SMART AND TRAIN YOUR INJURY. BE SMART AND BACK OFF IN WEIGHT.

APPROACH

Creativity and cross-training are the keys to fitness success when you're injured. Ideally, you should progress from general, nonimpact exercises to more sport-specific, functional exercises with the goal of returning to full activity at or near 100 percent of your pre-injury conditioning level.[1, 5] By rationally employing the suggested conditioning alternatives below, you should never need to totally halt your cardiorespiratory fitness development.

Upper extremity injury (can't run):

Use a stationary bike, stepping machine, elliptical runner, or pool

Upper extremity injury (can run):

Use your natural sports surface or, if needed, a treadmill or elliptical runner

Lower extremity injury (can't run):

Use your arms and your uninjured leg to operate a UBE or an Airdyne bike, or use a pool

As far as strength training is concerned, let the trainers and therapists deal with your injured area while you and your strength coach work with the rest of your body. "As an athlete progresses through the rehabilitation of an injury, the athlete is allowed to begin more functional strength and conditioning work. The athletic trainer and strength and conditioning coach must work closely together to determine how much an athlete can do in the weight room without compromising the healing process," says Lochrie.

In sum, the design and implementation of a rehabilitation program following injury or surgery require communication between your entire sports medicine team and your coach, and complete cooperation and communication from you. Ultimately, you must make the decision to do what's necessary to rebuild your body. If you don't, you'll likely increase your healing time, decrease your performance, and increase the time it takes you to reach your previous levels of performance. PP

Greg Werner, MS, CSCS, CHFI, CSNC, is the director of strength and conditioning at James Madison University and the coordinator of JMU's Sports Performance and Technology Team. Werner is a National Strength and Conditioning Association Certified Strength and Conditioning Specialist, an American College of Sports Medicine Certified Health and Fitness Instructor, and an International Sports Medicine Association Certified Sports Nutrition Consultant. He's also the Virginia state director for the National Strength and Conditioning Association.

Matthew Link, CSCS, a graduate of the University of Virginia, is the assistant director of strength and conditioning at the University of Kansas. He has also served in similar capacities at James Madison University and the University of Virginia.

REFERENCES

1. Arnheim, D., and W. Prentice. *Principles of Athletic Training*. Boston: McGraw-Hill, 2000.
2. Baechle, T. (Ed.). *Essentials of Strength Training and Conditioning*. 2nd ed. Champaign, IL: Human Kinetics, 2000.
3. Enoka, R. Muscle strength and its development: New perspectives. *Sports Medicine* 6:146-168, 1988.
4. Enoka, R. *Neuromechanical Basis of Kinesiology*. 2nd ed. Champaign, IL: Human Kinetics, 1994.
5. Foran, B. (Ed.). *High-Performance Sports Conditioning*. Champaign, IL: Human Kinetics, 2001.
6. Gatorade Sports Science Institute. Roundtable: Sports injuries—When to return to training and competition. *Roundtable* #33, 9(3):2-5, 1998.
7. Laurent, T. Minor adjustments. *Training and Conditioning* 12(2):33-39, 2002.
8. Shaver, L. Effects of training on relative muscular endurance in ipsilateral and contralateral arms. *Medicine and Science in Sports* 2:165-171, 1970.
9. Yuza M., K. Ishida, and M. Miyamura. Cross transfer effects of muscular endurance during training and detraining. *Journal of Sports Medicine and Physical Fitness* 40:110, 2000.

CROSSING OVER

Your body is constantly seeking bilateral symmetry, meaning balance between the left and right side, and will adapt according to the training stimuli, or lack thereof, it's exposed to. What that means is if you continue weight training with your uninjured areas they'll maintain or gain strength, and your body will send signals to your injured area in an attempt to balance the strength gains. A common observation in rehabilitation and in strength training is that chronic manipulation of one side of the body can cause changes in the other side.[8, 9] This is referred to as cross-education or the cross-over effect.[4, 8, 9] The cross-over effect has been shown to cause adaptation in motor capabilities and increases in muscular strength and endurance of the injured limb.[3, 4, 7, 9] For the abovementioned reasons, when one limb is injured you should train unilaterally, using dumbbells or machines, with the uninjured limb.

Below are some guidelines to follow during unilateral training of uninjured limbs:

Upper extremities:

Use the assistance of a spotter to get the weight (dumbbell or machine) into the starting position.[2]

If possible, move the injured limb through the active range of motion, either unloaded or with a very light load, while the uninjured limb performs the exercise with a substantial load; this will increase neural drive and the cross-over effect to the injured limb[9]

When possible, utilize manual resistance from a partner to spot load the injured limb in a pain-free range of motion (i.e., with a wrist injury you can manually apply resistance at the forearm, and with an elbow injury you can apply resistance at the upper arm for chest, shoulder, back, and arm exercises)

Torso: (abdominal region and low back):

Train within your tolerance, paying attention to weight-bearing activities; it is extremely important to maintain strength in the torso to allow for faster progress once weight-bearing activities are resumed[1]

Lower extremity:

Generally, isolate the unaffected leg with single-leg, multi-joint movements, particularly exercises that target single-leg hip extension (i.e., squats, leg presses, or step-ups)

If multi-joint movements are not possible, then isolate the unaffected leg with single-joint exercises (i.e., leg extensions and/or leg curls)

When adjusting your training to unilateral exercises, you'll need to decrease your training loads appreciably and pay close attention to proper exercise technique.