Jogging

Student Activities 139

PATRICK E. SHANE
About the Author
Patrick Shane

After spending his own high school and college years successfully running cross-country and track, Patrick Shane took his passion of running on to his career. After graduating from Brigham Young University in physical education in the early 1970s, he spent two years working on a master’s degree and working with his mentor, his former BYU coach, Shererald James, where he trained the steeple chase athletes for the BYU men’s track team. He remained in Provo for seven years as the head coach for Provo High School’s boy's and girl's track and cross-country teams. In the early 1980s, he returned to his alma mater as head coach of the women's cross country team and assistant coach of women's track and field.

Coach Shane has a long list of accomplishments and awards that add to his credentials. He has coached five Olympians, has been named coach of the year a number of times by both the NCAA and WAC, and has had twenty-five of his athletes reach all-American status, earning a total of more than sixty awards. He has been the personal coach of the NCAA champion and Olympian Ed Eyestone. He is currently the director of endurance events for the USA Track & Field National Level II Coach’s Education Program. Coach Shane was selected Junior Women’s Coach for the 1995 World Cross-Country Championships held in Durham, England. More than an honor to him, these accomplishments display his love for running and coaching athletes and nonathletes alike to reach their full potential.

Patrick Shane has competed in numerous road races and marathons in the United States and Canada and still enjoys the benefits of a consistent running program.

After devoting himself fully to his athletes and his profession, Patrick finds time to recruit runners for the BYU teams and directs several camps on running each summer. He is a devoted husband and a father of three children, and an avid fly fisherman and falconer.
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How to Succeed in This Course

You have enrolled in a jogging course that will offer many exceptional benefits. Some students taking this course have experienced firsthand these benefits through past involvement in a running program. Others are hoping to learn more about this tremendous activity which seems to have swept the world by storm.

The enthusiasm joggers and runners have has been contagious, positively affecting the lives of millions of people. You can join them by completing the requirements of this course and by carefully and consistently applying the principles you will learn.

Student Activities 139 is a half credit hour course which may be completed in a minimum of six weeks or a maximum of twelve months.

Textbook

Your textbook for this course is this course manual. You will not be required to purchase any additional textbooks.

Learning Outcomes

At the conclusion of the course, students will:

1. Demonstrate an understanding of the scientific principles of exercise and nutrition and their effects on the body by passing a written exam.

2. Demonstrate an understanding of training laws, principles, and theory by applying them when setting up a personal training program.

3. Learn to utilize correct running mechanics, nutritional principles and specific physiological and biomechanical testing to avoid overtraining and injury.
Course Content

- Safety Considerations When Running
- Getting Equipped to Run
- Finding Your Aerobic Training Zone
- Applying Your Aerobic Training Zone
- What Happens to the Body When You Run
- Training Laws, Principles, and Theory
- Setting Up Your Training Program
- Running Mechanics
- Warming Up, Cooling Down, and Stretching
- Overtraining and Running Injuries
- Special Considerations For Female Runners

Requirements

Grading

- This course is graded PASS/FAIL
- Students must meet the following criteria to pass this course.
  1. Pass the attendance part of the course with 80%
  2. Pass the written part of the class with 75% on the written test.
  3. Complete labs and in-class running log.

Attendance/Participation

- Because participation is the primary component of an activity class, attendance is requisite to pass the class.
- Students must attend and participate in 80% of all class sessions to pass the course (Department policy). There is no such thing as an excused absence for University business. The purpose of the allowed absences is to accommodate for possible illness, injury, or University business.
- For twice a week semester classes or 4 times a week block and Spring/Summer term classes, this equals no more than 5 class periods missed.
- For twice a week block or Spring/Summer term classes and once a week semester classes, this equals no more than 2 class periods missed.
- For once a week block classes, this equals no more than 1 class period missed.
- Excessive tardiness is not acceptable. Three (3) incidents of tardiness equal one (1) absence. If a student arrives after class begins, it will count as a tardy. If the student arrives 10 minutes or more after the class begins or leaves early, it will count as an absence.
- Students adding late can make up classes missed prior to adding during a 2 week period following the add/drop deadline. Students adding late should see the instructor for options immediately upon adding.
- A student incurring a prolonged injury or illness resulting in more than the allowed absences can withdraw from the class prior to the withdrawal deadline (see academic calendar). Students with a prolonged illness or injury occurring after the withdrawal deadline can petition to withdraw at the Petitions Office, D155 ASB.
- If a student has any questions about this policy, contact Student Wellness, 203 RB, activity@byu.edu

TEST
Test will be given in the testing center; must pass with 75% or better and be taken prior to the last day of classes.
Lesson 1
Preparing to Run

This lesson will help you evaluate your readiness to begin a jogging or running program. You will follow the steps needed to be cleared for vigorous cardiovascular activity.

Your Objectives

After you have successfully completed this lesson, you should be able to do the following:

1. Complete the Medical Clearance Form. (Lab #1) Submit as directed in your course outline.

2. Complete the participation Medical Questionnaire. (Lab #2) Submit as directed in your course outline.

3. Take the Readiness Pre-Test.

4. Correctly score and interpret your Readiness Pre-Test by using the form found in this lesson of the course manual.

5. Complete the Exercise History Form.
How to Proceed

☐ Step 1: Read and study the discussion material for this lesson.

☐ Step 2: Take the Readiness Pre-Test found in this lesson. Do not submit this to Independent Study.

☐ Step 3: Correctly interpret your Readiness Pre-Test using the chart found after the Pre-Test. Do not submit this to Independent Study.

☐ Step 4: Answer the self-check exercises found in this lesson. Do not submit these questions to Independent Study.

☐ Step 5: Complete the Medical Clearance Form, the Participation Medical Questionnaire, and the Exercise History Form, all found at the end of this lesson. Submit each of these to Independent Study according to the instructions at the end of this lesson.

☐ Step 6: Look back now at the objectives for this lesson. Can you do all that they specify? If not, review the appropriate material before continuing.

☐ Step 7: Proceed to lesson 2.

Discussion Material

Defining Jogging and Running

It is important to clarify the meaning of the words jogging and running. The term jogging can easily be misunderstood. This is primarily because various authors have chosen to define it differently in the abundant printed material on the subject. I am of the opinion that jogging is running.

There is no agreed upon speed at which jogging becomes running. It is easy to understand that an easy jog for one person would be an all-out race for another, if we consider such things as age, present fitness level, percent of body fat, and genetic makeup, to name only a few. Therefore, if you feel you are running, regardless of how slow you are going, you are running. I define jogging as your slower-paced running; in this course manual, the terms will be used interchangeably.
Medical Considerations

If you exhibit any of the following conditions, you must proceed with caution and be advised by a physician.

♦ elevated blood pressure, above 150 over 90 even when medicated
♦ sugar diabetes which is currently controlled by insulin
♦ lung disease which causes difficulty in breathing after light exercise
♦ any chronic infectious disease
♦ a history of internal bleeding
♦ anemia
♦ arthritis in the lower extremities requiring medication for pain
♦ kidney disease

You are prohibited from jogging or running if you exhibit any of the following conditions.

♦ a recent heart attack
♦ high blood pressure which exceeds 180 over 110
♦ sugar diabetes that is not responding to medication
♦ coronary heart disease
♦ severe obesity

Medical Clearance

This lesson will help you evaluate your physical readiness to begin a jogging or running program by completing the steps outline in the “How to Proceed” section fo this lesson. Follow these steps to complete this lesson.

♦ If you are currently enrolled at Brigham Young University as a daytime student, you have already met the medical clearance required for this course.

♦ If you are not currently enrolled at BYU as a daytime student, you must obtain medical clearance for vigorous exercise from your physician before beginning this course.
Readiness Pre-Test

This pre-test has been designed to assess your readiness to begin a jogging or running program. Please answer the questions carefully and honestly, noting the points you earn for each statement. By realistically assessing your readiness and implementing the principles discussed, you will be on your way to a satisfying and rewarding running experience. When you have finished answering the questions, put your total points in the box provided at the end of this pre-test. Interpret your Readiness Pre-Test by comparing your score with the table that follows this pre-test.

Age

Please check your age group.

___ under 20 (20 points)
___ 20 to 29 (15 points)
___ 30 to 39 (10 points)
___ 40 to 49 (5 points)
___ 50 and over (0 points)

Cardiovascular History

Please check the statement that best describes your cardiovascular history.

___ no family history of heart problems including no problems yourself (20 points)
___ a family history of heart problems but no personal history (15 points)
___ no family history but have been treated yourself for heart problems; currently no restrictions (10 points)
___ family history of heart problems and have been treated yourself (5 points)
___ currently being treated for heart problems (0 points)

Injury History

Please check the statement that best describes your injury history.

___ no injuries now and no history of a running injury that required rest (20 points)
___ no injury now, but have been injured due to running (15 points)
___ have experienced pain while running within the last three months (10 points)
___ injured now, but not due to running; can walk without pain (5 points)
___ injured now due to running (0 points)
Running History

Please check the statement that best describes your running history.

____ have had more than a year of running experience and have been running regularly the past year (20 points)
____ have run some during the past year (15 points)
____ have run for a few months at a time but not for at least a year (10 points)
____ have never run but have been involved in a cardiovascular fitness program (5 points)
____ have never run and have never been involved in a cardiovascular fitness program (0 points)

Weight History

Please check the statement that best describes you now.

____ the same as your high school graduation weight (20 points)
____ not more than 10 pounds over your high school graduation weight (15 points)
____ not more than 20 pounds over your high school graduation weight (10 points)
____ not more than 30 pounds over your high school graduation weight (5 points)
____ not more than 40 pounds over your high school graduation weight (0 points)
____ more than 40 pounds over your high school graduation weight (−5 points)

Total Points
## Interpreting Your Readiness Pre-Test

<table>
<thead>
<tr>
<th>Total Points</th>
<th>Readiness</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>85 to 100</td>
<td>Superior</td>
<td>You should be able to run 20 to 30 minutes 3 to 5 times per week in your aerobic training zone.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consider starting in an intermediate or advanced training program.</td>
</tr>
<tr>
<td>65 to 80</td>
<td>Excellent</td>
<td>You may be able to run 20 to 30 minutes 3 or more times per week in your aerobic training zone. You must be careful not to do too much too soon, especially if you have gained 10 pounds or more from your high school graduation weight or if you have not been running regularly for some time.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consider starting out in an intermediate training program or in a beginning phase two program.</td>
</tr>
<tr>
<td>45 to 60</td>
<td>Good</td>
<td>You may want to start with a walking/jogging program. This is especially true if you are 20 pounds or more over your high school graduation weight. You may remain in the beginning training phase while completing this course.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consider starting out in a beginning phase one or two training program.</td>
</tr>
<tr>
<td>25 to 40</td>
<td>Fair</td>
<td>You will probably benefit most from a walking program at first followed by a walking/jogging program, and then a jogging program. You will probably remain in the beginning training phases one or two while completing this course.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consider starting out in a beginning phase one or two training program.</td>
</tr>
<tr>
<td>0 to 20</td>
<td>Poor</td>
<td>You should consider visiting with your doctor before starting. Once your doctor has cleared you for vigorous physical activity you should consider a walking program until you can walk for 40 minutes 4 times a week. This would be followed by a walking/jogging program.</td>
</tr>
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</tr>
</tbody>
</table>
Self-Check Exercises

Read the information below about an individual who signed up for an Independent Study jogging class and answer the following questions using the discussion material above and the Readiness Pre-Test found at the end of this lesson.

Martin is twenty-nine years old and has not been involved in any kind of regular vigorous cardiovascular activity since college, nine years ago, when he completed an aerobics class. He stays active by working in the yard on the weekends and going to the spa three times a week to lift weights. He is in excellent health and at present has no injuries. Martin does not remember ever being hurt other than an occasional sore back from lifting too much at work. Martin has gained about fourteen pounds since his high school senior year. His father’s recent heart attack has convinced him to sign up for an Independent Study jogging class.

1. Does Martin need a medical clearance?
   a. yes
   b. no

2. How many points would Martin score on the cardiovascular history section of the Readiness Pre-Test?
   a. five points
   b. ten points
   c. fifteen points

3. How many points would Martin score on the Readiness Pre-Test weight history section?
   a. five points
   b. ten points
   c. fifteen points

4. Martin’s total score on the Readiness Pre-Test would be
   a. fifty-five points
   b. sixty points
   c. sixty-five points
   d. seventy points
5. It would be a good idea for Martin to start off with what kind of jogging program?
   a. He should be able to run twenty to thirty minutes three times per week in his aerobic training zone.
   b. He may be able to run twenty to thirty minutes three times per week in his aerobic training zone.
   c. He may want to start with a walking/jogging program.
   d. He should consider visiting his doctor before starting because he has a family history of heart disease and he is in a poor readiness state.

6. Martin’s readiness level on the Readiness Pre-Test would be considered
   a. excellent
   b. good
   c. fair
   d. poor

Betty is a twenty-three-year-old high school health teacher and has been running three times a week for about two years. Now she would like to sign up for an Independent Study jogging course. She has no family history of heart disease and received a medical clearance from her doctor fourteen months ago. Betty was considered to be in excellent overall health at that time.

7. Does Betty need further medical clearance to begin an Independent Study jogging course?
   a. no
   b. yes
Lab #1

Participation Medical Questionnaire

Full Name ____________________________

Date ____________________________

Age _______________

Circle one: Male    Female

Height ____________________________

Current Weight ________  Weight at time of High School Graduation ________

Grade Level—circle one: freshman    sophomore    junior    senior    other

On the back of this page you will find a table. Please indicate if you currently have or have ever had any of the following medical conditions by placing a check in the appropriate box.
<table>
<thead>
<tr>
<th>Medical Condition</th>
<th>Experiencing Now</th>
<th>Within the last year</th>
<th>Within the last 3 years</th>
<th>More than 3 years ago</th>
</tr>
</thead>
<tbody>
<tr>
<td>heart problems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>high blood pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>respiratory problems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>asthma</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>allergies</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>chest pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>anemia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>kidney problems</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>diabetes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ulcers</td>
<td></td>
<td></td>
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<tr>
<td>pregnancy (within the last 3 years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ankle problems</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>knee problems</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>other joint problems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>arthritis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>shin splints</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>foot problems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>back problems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>epilepsy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>severe headaches</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>others (please explain)</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Lab #2

**Exercise History Form**

Are you presently exercising regularly? ________________________________

What type of exercise are you now doing? ________________________________

How long have you been doing this exercise? ________________________________

For how many minutes per session? ________________________________

How many days per week do you exercise? ________________________________

If you are not exercising regularly, have you ever done so? ________________________________

How long ago did you stop? ________________________________

How long did you continue this exercise? ________________________________

How many minutes per session did you exercise? ________________________________

How many days per week did you exercise? ________________________________

What type of regular exercise did you do? ________________________________

Do you have a high school or college track available to you? ________________________________

How many total points did you score on the readiness pre-test and what was your readiness category?

Score _______________  Category ________________

Please explain why you are taking this jogging course.

_________________________________________________________________
_________________________________________________________________
Lesson 2
Safety Considerations and Running Equipment

This lesson will help you acquire greater insight regarding your options as you decide where and when to run. You should better understand and appreciate the many safety considerations that must be practiced in order to enjoy running and avoid the potential problems you may encounter as you complete this course. This lesson will also emphasize equipment options needed when running in various weather conditions. One important concept you will learn more about will be shoe construction and what to look for when buying a running shoe to best meet your individual needs.

Your Objectives

After you have successfully completed this lesson, you should be able to do the following:

1. Discuss your options and their implications when deciding where, when, and with whom to run.

2. Identify the safety considerations when running and understand how they apply to you when you are running.

3. Explain how running equipment needs vary depending on the environment and the requirements of each individual runner.
How to Proceed

☐ Step 1: Read and study the discussion material in this lesson.

☐ Step 2: Answer the self-check exercises found in this lesson. Do not submit these to your instructor.

☐ Step 3: Look back now at the objectives for this lesson. Have you successfully completed all they specify? If not, review the appropriate material before continuing.

☐ Step 4: Proceed to lesson 3.

Discussion Material

Where to Run

For some of us, deciding where to run is as simple as walking out the front door and heading off in the direction of our choice. For others, this decision can be complicated by a variety of factors that need to be addressed.

The decision of where to run is affected by the time of day you will be running, how far you will be running, who you will be running with, the weather, traffic patterns, your personal safety concerns, access to transportation, your injury history, and personal preference just to mention a few things. Keeping these things in mind, consider each of the following before deciding where you will be running:

◆ Will you be running from your home, school, or place of work, or will you be driving to a particular destination to begin your run?
◆ Will you be running in the city, suburbs, or country?
◆ Are you going to run on the sidewalk or street?
◆ Will you be running off road, such as on trails, bike paths, in parks, grass playing fields, a track, or perhaps on a treadmill?

There are many types of running surfaces available to train on. It would be difficult to say which surface is best for all runners. A fairly smooth, even surface which is not too hard or too soft may be the best option when available. The following lists running surfaces from hard to soft:

◆ concrete
◆ asphalt
◆ hard-packed dirt
◆ rubberized tracks
◆ dirt and wood chip trails
◆ grass
◆ sand
When to Run

There does not seem to be a best time of day to run because we are all unique in our habits, schedules, and personal preferences. However, studies examining exercise and time of day suggest that morning exercisers have a lower quitting rate than individuals who exercise at other times during the day. You will ultimately need to discover what time works best for you.

Running in the mornings works best for individuals who like to get up early in the morning. We sometimes call these individuals morning people. They usually go to bed early and don’t mind getting up early. The advantage with this schedule is that the workout is done before the rest of the day becomes hectic and demanding.

Running in the late afternoon or evening works best for the individual who finds it difficult to get up early in the morning. This type of individual usually stays up late and finds it easy to be productive in the evening. When such people attempt to implement an early morning running schedule, they often feel as though they are dragging themselves out of bed and they soon stop running because they are not enjoying it.

Some runners find that their schedules do not easily allow fitting in a workout in the morning or in the evening. These people often have to travel a considerable distance to and from work or school, so they set a daily schedule that allows them to run during their lunch break.

Running Partners

Sharing a run with others can be as rewarding emotionally as the running benefits are physically. There seems to be a synergistic effect on our motivation when we are on a run with others who share our feelings about running. Finding the right training partner can make the difference between staying with a running program and quitting, because it is harder to stay in bed in the morning when you have committed to meet someone for a morning run.

Running alone has its advantages though, and even the most gregarious individuals will find it necessary to train alone at times. While looking for the right running partner, keep in mind that there are situations when our social nature can be a disadvantage as we try to improve our fitness levels. If your fitness level is at a substantially different point than your partner’s, two unacceptable outcomes can occur. First, the runner with the higher physical fitness base could slow down and run at the correct training intensity for the slower runner. Second, the slower runner could be forced to train far too hard for his or her present fitness level. In either case, one or both of the runners would not be training to benefit their own level of fitness. By far the worst outcome would be for the less fit individual to become discouraged and quit because the intensity level was too high to enjoy the run.

One of the most appealing aspects favoring running as an exercise is that you do not need anyone else to make it work. Unlike many other exercise activities that require other participants, a court reservation, or special equipment or facilities, your training requirements can be as close as
stepping out your front door. If you are traveling, you almost never need to miss a workout because you can run just about anywhere and under just about any conditions and usually any time.

Perhaps the most compelling reason for having a running companion is safety. This applies to all of us, regardless of our experience, our gender, or our age.

**Safety Considerations when Running**

The following are safety tips for running on the roads:

- Try to avoid training routes that have heavy automobile traffic.
- Try to avoid training routes that have lots of intersections. Long, unbroken stretches are best.
- When running on streets, *always* run facing traffic so you can see what is coming.
- Understand that running on the pavement is not as safe as running on the shoulder, or when possible, the sidewalk. The farther away from traffic you run, the less likely it is that there will be an accident.
- Running through intersections can be dangerous! Always obey traffic lights. When running in front of traffic stopped at a light or a stop sign, be sure to make eye contact before proceeding into the intersection. This becomes especially true if the driver intends to make a right turn. How many times do we as drivers pull up to an intersection intending to make a right turn, and while we are looking left notice that we can go; then we take our feet off the brakes before looking to the right for pedestrians. Under no circumstances should you challenge an automobile. You will lose the confrontation every time, so run defensively.
- Try not to run after dark. If you must run in the dark, wear reflective and light-colored clothing so drivers will see you. Reflective tape can be purchased at any running equipment store. It is best attached to the lower legs because an approaching vehicle’s headlights will pick up an object at its lower point first. That is why many shoe companies are incorporating reflective materials in their shoes. If you feel it is necessary to regularly run at night, consider purchasing a reflective vest at your local running store. If it does not carry vests, you may order one from one of the popular running magazines available at the magazine stand.
- Avoid running with a headset. You need to be alert and aware of your surroundings. Your sense of hearing can be an important factor in avoiding danger when running.
Runner’s Rights

The next topic of safety involves our right to run unmolested. Verbal harassment is getting to be all too common when running these days. Unfortunately, there are few places in this country where it is safe for a runner, particularly a female runner, to run without fear of being confronted by someone wishing to take away that right.

The following is a list of precautions to consider for personal safety when running:

♦ Vary your routes. Don’t be too predictable. Inform family and friends of your intended route and when they can expect your return.
♦ Run with a partner, especially after dark.
♦ Carry an ID with your name, phone number, and blood type.
♦ Carry money for a telephone call.
♦ You may want to consider carrying a light-weight noise-making device, which when activated will sound a high, piercing alarm.
♦ Do not wear jewelry while running.
♦ Avoid isolated areas while running.
♦ Avoid trails near dense shrubs or trees.
♦ When confronting a stranger on a run, or anytime someone or something causes you to feel uncomfortable, trust your instincts. Act defensively and keep your distance. Don’t hesitate to turn around and run the other way.
♦ When passing other persons on a run, look directly at them. Be alert and demonstrate by your body language that you are confident and assertive.
♦ If you are ever harassed in any way, report the incident to the police immediately. Remember, no one has the right to interfere with your right to the roads, parks, and trails. By reporting harassment you will be helping to make the area safe, not only for yourself, but for everyone else too.
Running in Hot or Humid Conditions

Your skeletal muscles produce heat, which causes your body temperature to increase. The body regulates its temperature using a combination of physiological mechanisms. A better understanding of how these physiological mechanisms work and what factors influence them in a positive as well as a negative way will be helpful.

As you begin to run, your heart rate increases, causing your blood to circulate more rapidly. This is a physiological response to the skeletal muscles’ demand for oxygen and glycogen, two essentials needed by the muscle cells to produce energy. This muscle energy, or burning of calories, produces heat which is transported by the blood from the muscles to the skin, where it can be cooled before returning to repeat the cycle. In an effort to facilitate the removal of heat during exercise, the blood vessels and capillaries near the skin dilate, causing an increased blood flow. This beneficial physiological mechanism is called vasodilation.

The physiological mechanisms mentioned so far would do little to cool the body by themselves. The sweating mechanism, which is a function of our endocrine system, is essential to complete the body’s heat regulatory system.

As you run, you sweat, and the rate of sweating depends on the conditions in which you are running, such as wind, direct sun, heat, humidity, clothing, your fitness level, the intensity of your run, and your body’s current adaptation to running in the heat which is called heat acclimatization.

As you run, sweat must evaporate from the surface of the skin for your body to keep itself cool. If this surface evaporation did not occur, you would be unable to rid yourself of the excess heat, which, depending on environmental conditions, may cause your body temperature to increase to a dangerous level.

It is extremely important for all runners to drink plenty of water after workouts, even on cool or cold days. It’s absolutely necessary to hydrate well on hot days and, when possible, during the run itself. The higher the temperature and longer the run, the more important this practice becomes.

If body fluids lost through sweating are not replaced, blood volume will decrease. If this process is allowed to continue, the sweating rate will decrease, negatively affecting the body’s ability to cool itself. Take this process one step further and the entire sweating mechanism shuts off in an effort to maintain sufficient blood volume. If this should happen, heat stroke, a serious medical emergency, is imminent.
Exercising in hot or humid weather requires a little more planning and some good common sense. You do not have to give up your training runs when the weather warms up, but you do need to be smart and follow these important warm-weather training principles:

- Choose a training time that avoids the hottest time of the day (noon to 4:00 p.m.). The coolest part of the day is just before the sun comes up.
- Remember to drink at least six to eight 8-ounce glasses of water each day. Realize that the body could lose between one and three quarts of fluid per hour in hot conditions during vigorous aerobic exercise.
- Be sure to replace the electrolytes and body salts lost through sweating.
- Wear loose-fitting, light-colored clothing. Try netting or mesh-type clothing. Remember that the more skin surface exposed to the air, the greater the evaporation rate, and the cooler you stay.
- Give yourself time to adapt to the warm weather by starting gradually and not overdoing it. Reduce your intensity as well as your duration. Heat acclimatization takes about eight days, and you must exercise in the heat in order to adapt. Simply living in a hot environment without exercising does little to facilitate heat acclimatization.

Three heat-related problems, heat cramps, heat exhaustion, and heat stroke, can occur when the body is unable to successfully handle excessive heat. Each of these conditions is discussed below in ascending order of seriousness, heat exhaustion being more serious than heat cramps, and heat stroke constituting a potentially fatal result if not treated immediately.

**Heat Cramps**
During exercise in hot conditions, excessive sweating helps the body’s cooling mechanism, but it also leaches body salts, called electrolytes, out of the blood. This loss of body salts is the main cause of heat cramps. This process usually develops over several days, and eventually if body salts are not replaced, heat cramps will develop. If your muscles cramp on a run, stop running and gently stretch the cramping muscle to allow better circulation and to relieve pain. Drink fluids with electrolytes. Many ready-to-use formulas are available, such as Gatorade or Powerade. Be sure to get at least 7 to 14 grams of salt each day. This is easily accomplished by salting your food or eating food with added salt, such as pretzels.

**Heat Exhaustion**
If body fluids are lost too quickly during exercise in hot conditions and replacement of these fluids is inadequate, a decrease in blood volume will occur, causing heat exhaustion. The symptoms are pale, cool, clammy skin, a weak, rapid pulse, nausea, dizziness, and even fainting. If this happens, treat the victim as you would treat someone for shock. Remove the victim from the sun to a cool environment, lie the victim down, elevate the feet, cover the victim, and allow the victim to drink fluids gradually until he or she has recovered. People who suffer from heat exhaustion should rest for a day or two and reevaluate their fluid intake habits, as well as any other situations that might have led to this condition.

**Heat Stroke**
We have already mentioned that heat stroke is caused by the sweating mechanisms shutting down during exercise in the heat. This is a serious emergency, requiring immediate medical attention. Failing to treat heat stroke has been reported to result in death in 80 percent of the cases. The symptoms of heat stroke are hot, red, dry skin, high body temperature, incoherence, disorientation, and even unconsciousness. If this happens, call 911 for emergency medical help. Treat the victim by trying to reduce the body temperature by using water from a hose, a cold shower, a cool bath, sponging, fanning, or applying ice water. Do not attempt to give the victim fluids.

Running in Cold or Windy Conditions

Running in cold or windy conditions does not present as great a challenge as heat and humidity. The following are the main reasons:

♦ Excessive heat generated through strenuous physical activity can be dissipated easily in cool or cold conditions.
♦ Protection from cold or windy weather can be obtained for all but the most extreme conditions by selecting the right types of clothing and layering them in a way that creates a comfortable micro-climate around the body. Extreme conditions could be temperatures below five degrees Fahrenheit (−15 degrees Celcius) and wind speeds of over five miles an hour. The combination of the cold and wind create what is known as a windchill index. For example, an ambient temperature of five degrees combined with a wind speed of five miles per hour would produce a windchill index of one degree. On calm days with no wind present, the ambient temperature and the windchill index would be identical.

There seems to be considerable variation from individual to individual in tolerance to cold. People with a very low percent body fat are particularly sensitive to cold.

Frostbite
One concern when running cold or windy conditions is the risk of frostbite. Frostbite occurs when the flesh is exposed to freezing conditions. Careful attention should be paid to areas of the body that get less circulation, such as the extremities. Toes, fingers, and ears should be carefully protected during cold weather.

Staying Dry
Another concern when running in the cold and wind is staying dry. Most runners are surprised at the amount of sweat the body produces while running in cool or cold conditions. If this moisture is allowed to accumulate, you may be in for a very uncomfortable run.

When running in cold weather, remember to check the wind before you decide which direction to run. It is best to run into the wind when starting out; this usually allows the wind to be at your back on the return trip. The reason for this may not be apparent, so let me explain by use of an example. It’s Saturday morning and you are preparing to go out for your usual one-hour run.
Weather conditions are cold and windy. You are doing an out-and-back course, and begin by running with the wind. After warming up, you feel especially strong, so you press your pace a bit. This produces a substantial amount of sweat that will not completely evaporate under the weather conditions. On your return trip, the wind seems to have picked up even more, and combined with the wind generated by your own forward movement, this greatly increases the windchill index. Your wet clothing will quickly lose their ability to keep you warm, and your comfort level will diminish rapidly. By running into the wind to begin your run, you would have minimized the likelihood of this happening.

**What You Need to Know about Running and Dogs**

When runners think about dogs as they relate to running, they will usually come up with two very different responses, depending whether they visualize themselves running with a dog or away from a dog.

Let’s examine the first possibility. Running with your dog can be a sensible approach to improving your personal protection when running. If you are going to run with your dog, it is important to be fully aware of your responsibilities. Before taking your dog with you as a regular training partner, you should first get a medical clearance from your veterinarian. Dogs are a lot like people when it comes to running readiness. Many of the questions found in the Participation Medical Questionnaire and the Exercise History Form you completed for lesson 1 would certainly apply to your dog when you determine its running readiness.

Keeping your dog on a leash is one important consideration to which you should give careful thought. First of all, in the city limits, a leash law usually requires that all dogs be kept on a leash in public places. Second, consider the effect your dog may have on other runners. Being considerate of others is your responsibility. Finally, think of your dog’s safety. A leash will better insure your dog’s protection from cars and other hazards. Your dog’s obedience to fundamental commands like stay, come, sit, and heel will determine the level of restraint necessary when running in different situations.

Dogs, like people, are affected by such things as heat, cold, humidity, wind chill, hydration, terrain, and over-training injuries. The need to gradually adapt to stress, and correct application of training principles applies to dogs as well as to humans. Remember, your dog cannot use words to let you know how he or she is feeling, so learn to pay attention to his or her nonverbal communication. Since this course is on running, not on dogs, we will only briefly discuss what to look for.

Most dogs are friendly. They are not going to attack you and are generally more fearful of you than you are of them. If a dog approaches with a wagging tail, its intentions are friendly. If a dog’s tail is not wagging, but is held down low between its hind legs, it is apprehensive. A dog that growls, shows its teeth, and pulls its ears flat against its head is demonstrating aggression, and you are at great risk of being bitten.
Many dogs develop a territorial attitude toward the property they instinctively feel is their responsibility to protect. These dogs will often bark and chase after anyone or anything that appears to threaten their territory. If this protective display is handled correctly, there is little chance of being bitten. Instinctively, dogs like to chase moving objects. If you try to run from a dog, you may actually elicit a dog’s instinct to chase.

Dogs do not like to be stared at. Staring at a dog makes it feel uneasy and threatened. Avoid making direct eye contact when dealing with an unfamiliar or an unfriendly dog.

Avoid screaming. This may startle the dog, or it may trigger an instinctive response that could increase your risk of being bitten.

The following is a list of things to do and things not to do if you are confronted by a dog on a run:

♦ Pay careful attention to the dog’s body language.
♦ Do not try to outrun a dog.
♦ Do not pick up a rock or a stick to protect yourself or scare the dog away. If the dog can be scared away by a rock or stick, you do not need one anyway.
♦ Do not look directly at the dog. Eye contact will threaten it.
♦ Try crossing the street to remove yourself from the dog’s territory.
♦ If the dog is very close, stop running; try speaking to it in a confident yet assuring tone. Tell the dog to leave you alone and to go home. Move slowly away from it without turning your back.

Getting Equipped to Run

What do you need to start running? Surprisingly, very little. In fact, you probably already have most, if not all, of the essential equipment needed. Simplicity is one of the significant benefits you will discover and appreciate about jogging and running. The following sections will discuss some of the options available for today’s runner in clothing, shoes, and accessories.

Clothing

As you consider your clothing requirements, let’s address three basic concerns: function, comfort, and style. Better understanding of these three concerns will improve your understanding of this subject, allowing you to make wise choices when shopping for running apparel.

The main function of clothing is to provide protection from exposure to various environmental conditions, such as cold temperatures, moisture, direct exposure to the sun, etc. The clothing options available for runners to deal with cool to cold weather conditions have benefited tremendously from new research, manufacturing techniques, and designs. With the development of high-tech fibers, the layering approach has become extremely effective. The first layer is designed to be worn snugly next to the skin. This fabric should be very effective in moving the
moisture away from the skin in a wicking action to an outer layer where it can evaporate. You benefit from this process by staying dry, which helps you stay warm. You can find clothing designed specifically for this purpose at your local sporting goods store or at an outdoor specialty store. Look for labels bearing trademark names such as CoolMax, Capilene, or Thermax. Remember, this layer needs to fit snugly but not be binding, and should be as lightweight as possible. Most of these fabrics come in two or three thicknesses to provide the level of insulation you will need, depending on the outdoor temperature. The colder it is outside, the thicker the fabric needs to be to provide insulation you will need, depending on the outdoor temperature. The colder it is outside, the thicker the fabric needs to be to provide sufficient insulation for you. An outer layer is used when external conditions demand additional protection from wind, rain, and snow. This outer layer should be loose fitting, thin, and as lightweight as possible. The best material for an outer garment will be both water resistant and breathable. Look for outer-layer fabric such as Gortex, Supplex, or Ultrex.

**Clothing for Warm Weather**
When you run in warm weather, your main clothing concerns center on strategies to keep from overheating. It’s very important to clearly understand the relationship between evaporation of sweat from the skin surface and the body’s ability to cool itself during exercise. The best approach to use when running in warm or hot weather is to wear light-colored and mesh-type fabric tank tops that allow the maximum amount of ventilation in order to facilitate evaporation.

**Socks**
The best running socks are thin, soft, and comfortable. Cotton is the most common fabric used by runners; however, the best ones are made of a synthetic material that will wick the moisture away from the surface of the skin, allowing the sock to stay as dry as possible. Any sock that is too loose might bunch up or wrinkle which will cause blistering. The main function of the sock is to provide protection to the foot at the various friction points. A poor sock selection can cause blistering in a perfectly fitted pair of shoes.

**Accessories for Cold Weather Running**
Hats, gloves, mittens, and tubes are needed for running in the cold. Gloves offer protection from cold temperatures and wind chill. Any type of glove will provide protection to some extent; however, the very best gloves are made of material that blocks the wind yet allows moisture to evaporate from the hand. Mittens made of the same material can provide further warmth for people with sensitive hands or who run in a particularly cold climate. A significant amount of body heat can be lost through the head if it is left uncovered. By covering the head, body heat can be preserved to circulate to the areas of the body that need it most. Hats and tubes are useful when running in cold, windy conditions. Studies show that a considerable amount of heat is lost through the head, and a knit hat that can be pulled down over the ears will protect the head and face as well as retain heat. The new hood called a tube is being used successfully by many individuals in cold, windy running conditions to retain heat and protect the head and face from wind chill. The best material would be one that allows moisture to move from the surface of the skin to the outside air so that it can evaporate. Tubes are worn in several styles to protect the head, ears, neck, and even the face. The tube can be bunched together to cover only the ears or
only the head, or it can be pulled all the way down to protect just the neck. It can be wrapped around the head, neck, and face in such a way that allows only the eyes to be exposed to the cold and wind.

Running tights have become extremely popular. They are made of synthetic materials, Thermax or Lycra, that fit tightly yet stretch with movement. They do not bind, and they are made of material that facilitates wicking moisture from the skin to the air. They come in various weights for different comfort requirements.

For obvious reasons, the choices of fashion in running wear will be left to each individual. If these choices were simple, there would be one or two colors available in one or two styles. The desire humans have to express themselves through fashion have generated millions of dollars in the running-apparel industry. My only word of caution is to analyze fashion as it affects function and comfort. In some cases a new style may improve function and comfort; in others, it decreases the effectiveness. A good example would be the popular trend of wearing one’s baseball cap backwards. The bill of the baseball cap evolved from a short one inch in its beginnings to the current four or five inches for a very good reason: it protects your eyes from the sun, providing benefits in comfort, protection, and improved performance, most of which, if not all, are sacrificed when the cap is worn backwards.

No matter what your choices are in running clothes, the most important feature is that they be comfortable. In some areas of the body, a snug fit is preferred, while other areas benefit more from a slightly freer cut. If an outfit is functional but not comfortable, you will eventually bury it in a drawer and go back to your old shorts and T-shirts.

Running Shoes

Without question, your running shoe is the most important piece of equipment you need before you begin. Selecting the best shoe for your particular needs will impact your training in many ways. It is important to know that while you are running you are striking the ground with a force three to five times your body weight.

Because of this, for this class it is extremely important to select a running shoe that was designed for training, not for racing. The most significant design function of a good training shoe is to absorb shock. A racing shoe’s most significant design function is to improve speed. This is done by making the shoe lighter by removing most of the shock-absorbing material. Anyone attempting to train in racing shoes would run a high risk of injury.

If you have any doubts about whether a particular shoe is designed exclusively for training or is appropriate for your needs in this class, consult me or an expert at your local running shoe store. If you live in an area that does not have knowledgeable individuals to advise you, call the shoe manufacturer’s toll free number and ask to speak with someone who can give you the technical design specifications for your shoe.
When buying a new pair of running shoes, beware of salespersons who do not begin by asking you a series of specific questions designed to give them the important information needed to put you in the right shoe. You may not have all the answers to their questions, but what feedback you do have can make a big difference. The following is a list of important questions that could be asked:

- What type of training will you be using the shoe for?
- How many times a week do you run?
- How many miles a week do you run?
- How long (months or years) have you been running?
- What type of surface do you run on?
- Do you have an old pair of running shoes we can look at?
- What type of running shoes have you used in the past?
- Do you wear corrective orthotics?
- What is your shoe budget?

How to Get a Good Fit when Buying a Running Shoe

Before you buy your next pair of running shoes, be sure to carefully review the chart on page 39 of this course manual, titled finding the “Right Shoe: Foot Biomechanics,” as well as the sections titled, “Running Style” and “Running Injuries” in the discussion material for lesson 5. When you shop for a running shoe, it is important that you know as much as you can about your particular needs, such as your foot type, your running mechanics, your history of injury, the number of miles you run per week, etc. The more you know about these particular areas, the more you will be able to help the salesperson make the best selection for you.

Take into consideration that your feet enlarge a little as the day wears on. This happens because your feet swell slightly as you move around and walk on them. With this in mind, shop for running shoes in the afternoon when your feet are at their largest size. In my experience, I have found after testing people’s shoe size that most runners have purchased running shoes ½ size smaller than their feet require. This causes the toes to push up against the front of the toe box of the shoe, often times resulting in blisters on the front of the toes and occasionally causing the toenails to become black and eventually fall off. The toe box portion of a running shoe should be wide enough to allow the forefoot to spread out when bearing your full weight. The rule of thumb for length in a running shoe is to have ½ to one full thumb width between the end of the shoe and your longest toe, while the foot is bearing the body’s full weight. Bring a thin sock with you so that you can get a better idea of the true fit of the shoe you are trying on.

If you have a pair of old running shoes, it’s a good idea to put them in a sack and bring them with you when you buy new ones. Your old shoes will give a knowledgeable salesperson some idea of your wear patterns and foot mechanics.

The major shoe companies have recognized the differences between men’s and women’s foot shapes, and have constructed separate shoes accordingly. Women generally have a narrower heel, making a correct fit in men’s shoes very difficult. It is important that the heel of your shoe fits
snugly but not tightly, because if the heel slips, it will cause a blister to develop.

It’s always a good idea to put the running shoe on and walk or jog around in the running store, out on the sidewalk in front of the store, or the corridors of the mall to get a better feel for the shoe’s comfort and fit. As you narrow your selection down to the two or three shoes that feel the best, put one on one foot and another on the other foot, then go out and run around a little more. A shoe that is not comfortable in the beginning probably will not become comfortable later. (This is not to say that a comfortable shoe will automatically be the best shoe for your foot mechanics or running style.) After you have found one or two pairs that are comfortable, make your final selection based on the technical aspects of the shoe that best meets your foot mechanics using the recommendations of a knowledgeable shoe salesperson.

Never base your decision solely on the color or style of the shoe or the recommendation of someone else who has found that a particular shoe works for them. Another individual may have a completely different foot type, making their requirements drastically different from your own.

Cost

The cost of a good quality pair of running shoes can vary from around $50 to well over $100. Be very careful when tempted to buy a bargain shoe or the most expensive shoe. Neither is necessarily the best shoe for you and may not meet your particular needs. Some of the major shoe companies will change the color and cosmetics of a successful and popular running shoe every six months or year in order to improve sales. The performance qualities of these shoes do not change with the slight cosmetic makeover. Knowing this, you can purchase last year’s style at a substantial savings.

If you can afford it, there are some advantages to alternating your training runs between two different pairs of shoes that are made by two different shoe companies, if both are comfortable, but feel slightly different. Each shoe offers some subtle changes and these slight variations seem to reduce injuries. By alternating shoes, you also improve the durability of each shoe by allowing them to thoroughly dry out and return to their original shape before the next run.

When you add up all the major shoe companies and the many different running shoes each company makes, there are, without exaggeration, more than 100 choices. Have you ever wondered why there are so many different running shoes? Each of us has a different genetic blueprint, and this makes running shoe needs vary from individual to individual. Your challenge when choosing running shoes is to find a pair that meets your needs.

When should you replace an old running shoe? The answer to this question depends on several factors, such as the number of miles you have run in the shoe, your particular running foot mechanics, your body weight, design characteristics of the shoe, the material used in its construction, and the shoe’s exposure to heat, moisture, and especially direct sunlight. Most individuals with normal running foot mechanics can expect to get about 500 to 800 miles out of a quality running shoe. A small percentage of the running population over-pronate or over-supinate, and these individuals will wear out a pair of shoes in about half that number of miles.
Anatomy of a Running Shoe

Below is a design separation chart of a running shoe.

Upper
- internal fit system
- synthetic leather toe cap and outside heel counter
- 3M Scotchlite® material on heel and forefoot
- slip last
- injection molded TPU heel counter

Insole
- molded EVA

Midsole
- medially posted compression mold EVA (rim and core)

Outsole
- MC 5000 (solid rubber)
- Diamond Stud™ design

Let’s take a look at the construction and components of running shoes.

Upper—The outer top portion of a running shoe, called an upper, is usually made of a synthetic material or combination of synthetic and leather. The advantages of synthetics are that they are breathable and tolerate moisture well. They are also relatively inexpensive and lightweight. The primary advantage of leather is durability. The upper of the shoe includes the lacing system. Over the years, shoe companies have experimented with several innovative methods to secure the shoe to the foot, such as Velcro attachments, air pressure, and elastic sock-type devices, all with varying degrees of success. Most running shoes today use a variable lacing technique that accommodates the individual differences in foot width and shape.

Insole—All shoes come equipped with an insole that provides a smooth, soft surface for the bottom of the foot. Some insoles are glued in place, others are removable. They offer very little shock-absorbing qualities, contrary to what is often advertised.

Arch—Most running shoes come with an arch support that is usually made of a rubber or synthetic foam material, either glued in place or removable. These arch supports are widely believed to
benefit the foot by giving support to the arch. In spite of the advertising hype, these arch supports are of very little benefit to the runner. They are not made of a sturdy enough material and their design is not adequate to support the arch area. Individuals with very high arches will notice no difference whether these arch supports are in or out. Individuals with flat or low arches often find the insert annoying and even a source of blistering as it rubs on their arch.

Midsole—The midsole is the part of the shoe that lies between the upper and the outsole. Its main function is to absorb shock and cushion the foot. When the midsole loses its ability to retain its shape and a large amount of the shock-absorbing quality is lost, the shoe needs to be replaced. The midsole is most commonly made of an ethylene vinyl acetate (EVA) and a polyurethane material or a combination of the two. Research has shown EVA to lose nearly half of its shock-absorbing qualities after about 500 miles. Polyurethane will retain its ability to return to its original shock-absorbing capacities slightly longer, but it possesses the unwanted attribute of being heavier. Shoe companies currently use some rather innovative techniques, such as air or gel material, enclosed in the EVA midsole of the shoe to compensate.

Outsole—The outsole is the thinnest part of the sole, the part that comes in contact with the ground. Its main function is traction and durability. The outsole is made of either a carbon-added rubber or a blown air-added rubber. The carbon-added rubber resists wear much better. The disadvantage is that it tends to be heavier. The air-blown rubber has the advantages of being much lighter and having more shock-absorbing qualities than the carbon added rubber. The disadvantage is that it tends to wear out very quickly. Shoe companies employ a combination of the two, putting the carbon-added rubber in the areas of the outsole that most frequently come in contact with the ground, and using air-injected rubber in areas of less wear.

Toe Box—The forefoot portion of a running shoe is called the toe box. It must be wide enough to allow the foot to spread out naturally when bearing the body’s weight. It is very important that this forefoot portion of the shoe be extremely flexible. You can test the flexibility by holding the heel portion in one hand and placing the toe in the extended palm of the other hand and pushing the palm toward the heel. What you are looking for is ease of flexibility in the toe-box area. As you experiment with different shoes available, you will quickly notice shoes that have easy flex and those that do not. Avoid purchasing any shoe that does not flex easily in the forefoot portion when you apply this test.

Heel—The heeled portion of most running shoes is constructed from a molded plastic material with synthetic coverings to provide a padded and nonabrasive surface for the inside of the shoe, and durability for the outside. The main function of this type of heel is to provide support and resist excessive medial or lateral movement. Some shoes have an additional strip of strong plastic material around the outside portion of the heel to further control rear foot motion. This device is know as a heel counter.

Shoe Last—It is helpful to know something about what is called the shoe last. The word last in a running shoe refers to two things: 1) the shape of the sole of the shoe, and 2) to the method of construction. Original lasts were made of wood and shaped like a foot. Today, lasts are made
of more reliable materials, such as plastic and metal. Lasts are used to form the shoe shape during construction. In the early days of shoe construction, the soles of all shoes were straight, meaning that you could put the shoe on either foot because you simply had a straight shape that made no allowance for the left or right foot. As improvements were added to the shape of the sole, one of the first benefits was the left and right shape, followed by benefits from different shapes. Most running shoes today have a curved or semi-curved last to the sole. This curvature of the sole of the shoe can be easily seen by looking at the bottom of the shoe and noticing how much the inside edge of the shoe curves. Usually individuals who run on their midfoot or forefoot and those that run faster tend to benefit from a curve-lasted sole, while individuals who tend to be rear-foot strikers and run more slowly find a straighter curve works better for them.

The word last can also refer to the construction technique used in attaching the upper portion of the shoe to the midsole. By removing the insole and examining the bottom inside portion of the shoe, we can observe the two most commonly used techniques. The first is a full-slip last, which pulls the upper portion of the shoe together and is stitched to the midsole, moccasin style. The stitching can be either around the outer portion of the midsole, or down the middle of the midsole, or a combination of the two. The other alternative is a partial-slip last in front of the shoe and what is called a board last in the rear portion of the shoe. The board lasting looks like a table top; it’s flat, and the material used is a dense, hard fiber material. The advantages of the board last in the rear portion are that this technique tends to control motion, while the slip last tends to allow more motion. The last technique is called a combination-lasted shoe. This works particularly well for individuals who require orthotics, because it provides a flat, stable place for orthotics to rest on. Refer to the following chart for more information.

The following chart can be helpful when purchasing a pair of running shoes. The areas listed under shoe properties can be reviewed on pages 34 through 38. Overpronation, normal, and supination foot biomechanics can be referred to on page 96.
### Finding the Right Shoe: Foot Biomechanics

<table>
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<th>Overpronation</th>
<th>Normal</th>
<th>Supination</th>
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<td>soft midsole</td>
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Self-Check Exercises

Answer the following questions using the discussion material. You may check your answers in appendix A of this course manual.

Multiple Choice

1. What time of the day is best for running?
   a. morning
   b. afternoon
   c. evening
   d. There is no best time to run because we all have different needs and preferences.

2. What type of running surface absorbs the most shock when you run?
   a. a rubberized all-weather track
   b. a grass park or playing field
   c. an asphalt road

3. There are many shoe companies making hundreds of different running shoes. Why is this good for you?
   a. You will always be able to find a running shoe on sale because the color or style did not appeal to most consumers.
   b. With so many companies designing running shoes you are going to be able to find one you like that feels great and will last for at least a year before it should be replaced.
   c. Each of us has a different genetic blueprint which causes our running shoe needs to vary. The more choices we have, the better our chances of finding a shoe that meets our needs.

4. Running shoes are primarily designed to do which of the following?
   a. minimize pronation
   b. absorb shock
   c. control motion
   d. protect the feet
5. A well-designed running shoe needs to have which of the following?

   a. a waffle outer-sole that will grip on different surfaces in different weather conditions
   b. a flexible toe box
   c. a snug fit in the heel and toe areas to avoid blisters from friction

6. The term *combination last* refers to a shoe with

   a. a semi-curved or curved sole with a slip-lasted upper
   b. a semi-curved or curved sole with a board-lasted upper
   c. a slip-lasted upper in the forefoot and a board-lasted upper in the rearfoot
Lesson 3
Getting Started

This lesson is where the rubber meets the road. You will complete two activities and their corresponding worksheets, designed to help you get started by assessing your current fitness level and finding your aerobic training zone. You will learn the principles and concepts needed to correct, administer, and interpret each activity.

It's time to run, no excuses; get your shoes on and get out the door!

Your Objectives

After you have successfully completed this lesson, you should be able to do the following:

1. Discuss the principles and concepts in this lesson.

2. Complete the worksheets for this lesson.

3. Correctly interpret the concluding results of each worksheet and how your running program will benefit from their application.
How to Proceed

☐ Step 1: Read and study the discussion material for this lesson.

☐ Step 2: Complete the activities found in this lesson.

☐ Step 3: You will not submit your activities, but they are essential for your safety and success in completing this course and in your jogging program.

☐ Step 4: Look back now at the objectives for this lesson. Can you do all they specify? If not, review the appropriate material before continuing.

☐ Step 5: Proceed to lesson 4.

Discussion Material

Running is easy. You have been doing it almost from the time you first began to walk. Some experts have described running as *controlled falling*. This is a pretty good explanation of the complicated set of biomechanical movement patterns in running. Although running may be complex when viewed biomechanically, it is an instinctive activity. The next opportunity you get, watch a small child in the process of learning to walk. It will become apparent that the skills needed to be competent at walking and running are learned from a very young age, and with few exceptions we all learn them well.

To succeed in obtaining the benefits of running, you must value them enough to set a specific time aside for training, and you must be motivated to train consistently. The people who say, “I don’t have time to exercise” are the same people who seem to take the time to watch television regularly. Not surprisingly, studies have shown that the individuals who are the most unfit and overweight are the same folks that watch the most television. Be consistent by running at least every other day. If you should miss a day or even a few days, do not be discouraged. Just get back to your schedule as soon as you can. Even if you need to shorten the duration of your workout to fit it into your schedule, you will be forming an important habit that becomes easier to continue the longer you do it.

One very appealing aspect of running is its accessibility and flexibility in meeting individual needs. There are very few places where you will live, work, go to school, or travel to that will not offer a suitable place to run. You do not need teammates or lots of equipment to participate in running. This flexibility offers many more opportunities to fit a workout into your schedule.

Commitment

Before setting up your training program, it is important to answer these two questions...
honestly:  1) Are you really ready to start a running or jogging program?  2) Are you truly committed to staying with your program? Many are ready to start an exercise program. Few, however, are truly committed to staying with their program long enough to fully realize the long-term benefits. Studies show that most people stop exercising within the first six months. It takes twelve weeks to gain significant aerobic changes and four months to significantly affect body composition. Fortunately, noticeable changes are produced in six weeks, depending on the following variables:

♦ appropriate application of training laws, principles and theories  
♦ genetic factors  
♦ gender  
♦ current age  
♦ training background  
♦ current fitness level  
♦ physical health  
♦ injury status

The point to all of this is to help you clearly see which variables influence every training program. Armed with a realistic view of the time frame needed to influence your training program positively, you can improve the potential for success.

The table on the following page is a list of the most important criteria to consider when you set up your training program. Evaluate each step carefully, realizing that the success of your training hinges on how effectively you follow each step.
### Training Logs

It is important to keep accurate records of your training volume and intensity. There are a number of elaborate training logs available commercially which help you record a detailed history of your training. For this course we will keep things simple by utilizing the one-page Daily Training Log and the one-page Weekly Mileage Log found in appendix B. By keeping up-to-date records of your progress, you will be developing important patterns which tend to keep you focused on your training goals. The following examples of a daily training log and a weekly mileage log let you see how you should fill out your own training logs.

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<tr>
<th>Step</th>
<th>Activity</th>
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<tbody>
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<td>Step 1</td>
<td>Make a firm commitment.</td>
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<td>Step 2</td>
<td>Assess your readiness.</td>
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<td>Step 3</td>
<td>Select an appropriate training level.</td>
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<td>Step 4</td>
<td>Develop an individualized schedule.</td>
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<td>Step 5</td>
<td>Set realistic, short term goals.</td>
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<td>Step 6</td>
<td>Start slowly.</td>
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<td>Step 7</td>
<td>Be consistent.</td>
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<td>Step 8</td>
<td>Keep a training log.</td>
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<td>Step 9</td>
<td>Find a training partner or training group.</td>
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<td>Step 10</td>
<td>Have fun.</td>
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<td>Step 11</td>
<td>Keep the big picture in mind.</td>
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<td>Step 12</td>
<td>Evaluate your progress regularly.</td>
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Daily Training Log

Name: Mark J.  Age: 22  Year: 1996

| month | day | <20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | >60 | exercise heart rate | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-------|-----|-----|----|----|----|----|----|----|----|-----|-------------------|---|---|---|---|---|---|---|---|---|---|---|
| 9     | 4   | 19  |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 7     | 20  |     |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 9     | 21  |     |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 11    | 19  |     |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 14    | 31  |     |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 16    | 21  |     |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 18    | 30  |     |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 21    | 31  |     |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 23    | 35  |     |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 25    | 36  |     |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 28    | 30  |     |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 30    | 35  |     |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 10    | 2   |     |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 5     |     | 40  |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 7     |     | 39  |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
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| 16    |     | 36  |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 18    |     | 41  |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 19    |     | 40  |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 21    |     | 46  |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 23    |     | 35  |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 24    |     | 45  |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 26    |     | 50  |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 28    |     | 35  |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 30    |     | 46  |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 31    |     | 36  |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
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| 4     |     | 51  |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 6     |     | 40  |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
| 7     |     | 35  |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
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| 19    |     | 52  |    |    |    |    |    |    |    |     |                   |   |   |   |   |   |   |   |   |   |   |
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Total Miles: 100.5
### Weekly Mileage Log

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</table>

Total Miles: 193
Motivation

The relationship between our level of motivation and our values is interesting. I have noticed that we take time to do those things we value most. We spend money on that which we value most. We seem to be motivated by that which we value most.

Let me give an example. If you were to ask a casual acquaintance to help paint your home on Saturday, that person would probably look at you in disbelief, replying to your request with, “I’m busy doing something else on Saturday.” Your friend was not motivated to give up Saturday because he or she did not value painting your home. If you were to offer $1,000 cash, it’s quite likely your friend would give a very different reply. The difference is clearly one of motivation. Your friend may no longer value whatever was planned on Saturday as much as the opportunity to earn $1,000. It’s interesting to note that $1,000 is worth very little by itself. The value is realized in what can be obtained in exchange for the $1,000.

If I were to offer you a chance to give up your Saturday mornings to sweat in the heat of summer or expose yourself to the freezing winds of winter, you might look at me in disbelief, replying that you were busy doing something else on your Saturdays. If I were to offer you an increased heart stroke volume, a higher metabolic rate, and less upper respiratory infections for your efforts, you might still look at me in disbelief. However, if you valued 1) a stronger, more efficient heart that could do a better job and save you about five million heart beats a year; 2) increased energy levels with less daily fatigue and reduced body fat; and 3) a chance to cut in half your upper respiratory infections from viruses, your reply might be far more encouraging. A stronger, more efficient heart, increased energy levels, less daily fatigue, less body fat, and a reduction in colds have very little value by themselves. The value is realized in what can be obtained from each—a longer, more enjoyable, satisfying life.

Taking Your Pulse

To complete the worksheets for this lesson, you will need to know how to take your resting and exercise heart rates. The easiest way is to use a heart-rate monitor. Good ones start at about $100, which is out of the price range for most of us. If you are fortunate enough to have one, it can make your feedback more accurate. Accuracy when monitoring your resting or exercise heart rate is an important issue which can be improved through practice and using correct techniques. If you don't have access to a heart monitor, a digital wrist watch is better than a watch with a sweeping second hand. It is important to realize that when attempting to get an accurate exercise heart rate without a heart rate monitor, you need to stop exercising. As soon as you do this, your heart rate begins to drop. The better shape you are in, the quicker it will return to normal.

Besides using a heart monitor, there are two easy ways to check your resting or exercise heart rate. One involves checking your pulse on your wrist, the other on your neck. When using your pulse on your wrist to determine your heart rate, place your index and middle finger
lightly on either side of the radial artery. The radial artery can be found on the under side of the wrist (thumb side), in the hollow next to the tendons running into the hand from the under side of the forearm. When locating your pulse in the neck, use the carotid artery that runs up either side of the neck below and slightly in front of the back corner of the jaw. This is also an excellent area to locate your heart’s pulse. The best way to get an accurate resting or exercise heart rate is to take your pulse for ten seconds and multiply the result by six. It is important to begin counting with zero on the first beat. Taking your exercise heart rate in less than two seconds simply magnifies any errors; taking it for a longer period of time will introduce inaccuracy by allowing the heart rate to slow down. This is particularly true for very fit individuals. It’s important to monitor your exercise heart rate immediately after completing your exercise in order to determine if you were training in your aerobic training zone. You could stop briefly to monitor your heart rate after about thirty minutes to help you stay in the correct training zone. Remember not to pick up the pace at the end in order to get a correct assessment of your effort on training sessions of about thirty minutes. After doing this for some time you will be able to assess your effort by paying attention to your registration rate.

**Finding Your Most Efficient Aerobic Training Zone**

This zone can be easily determined in an exercise physiology lab, or it can be closely approximated using a standard, rule-of-thumb formula. Since most of us do not have easy access to an exercise physiology lab, we calculate most aerobic training zones using the standard formula and fine tune it from there. The percentages used to calculate training zone thresholds (60 percent and 70 percent) are based on estimated percentages of the difference between your exercise heart rate and your lowest resting heart rate. Correctly completing the worksheets for this lesson will help you determine your current aerobic training zone. As you gradually progress in this course, it will change, and you will need to repeat this worksheet in order to better individualize your training. On the next page is an example of the most efficient aerobic training zone calculated for an eighteen year old with a resting heart rate of 50 beats per minute.

| 220 | heart rate at birth |
| -18 | age |
| 202 | maximum heart rate now |
| -50 | resting heart rate |
| 152 | beats per minute |
| × .60 | % |
| 91 | beats per minute |
| +50 | resting heart rate |
| 141 | beats per minute |
The most effective aerobic training zone for the person in the preceding example would require an exercise heart rate of between 141 and 156 beats per minute.

Following is an example of training zones calculated for an eighteen year old with a resting HR of 50 BPM.

### Training Zones and Specific Energy Systems

<table>
<thead>
<tr>
<th>Resting Heart Rate</th>
<th>Light Activity</th>
<th>Increased Activity</th>
<th>Most Efficient Aerobic Training Zone</th>
<th>Approximate Lactate Threshold</th>
<th>Anaerobic Training Zone (Accumulation of high blood lactate, resulting in rapid fatigue)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 ---------------</td>
<td>120+</td>
<td>125</td>
<td>141 ------ 156</td>
<td>179</td>
<td>180 --------------------------- 190+</td>
</tr>
<tr>
<td></td>
<td>50%</td>
<td>60%</td>
<td>70%</td>
<td>85%</td>
<td></td>
</tr>
</tbody>
</table>

**Energy Systems**

- Aerobic System
- Anaerobic System

### Activity 1: Calculating Your Most Efficient Aerobic Training Zone

You will be calculating your aerobic training zone utilizing your theoretical maximum heart rate at birth, present age, morning resting heart rate, and a percent of your VO2 max.

1. Record your morning resting heart rate at least three different mornings while resting comfortably on your back before getting out of bed. Review pages 55 and 56 of this course manual for more technical information regarding pulse taking if further clarification is needed.

2. Study the examples in the “Finding Your Most Efficient Aerobic Training Zone” section, beginning on page 56 of this course manual.

3. Using the Activity 1 worksheet found on the next page, answer the questions and calculate your aerobic training zone. Be sure to show all your mathematical calculations on the worksheet.
4. Study the boxed example in the “Finding You Most Efficient Aerobic Training Zone” section of your discussion material for this lesson.
Activity 1: Worksheet

Calculate Your Most Efficient Aerobic Training Zone

<table>
<thead>
<tr>
<th>60% of VO2 Max</th>
<th>70% of VO2 Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>220 heart rate at birth</td>
<td>220 heart rate at birth</td>
</tr>
<tr>
<td>___ age</td>
<td>___ age</td>
</tr>
<tr>
<td>___ maximum heart rate now</td>
<td>___ maximum heart rate now</td>
</tr>
<tr>
<td>___ resting heart rate</td>
<td>___ resting heart rate</td>
</tr>
<tr>
<td>___ beats per minute</td>
<td>___ beats per minute</td>
</tr>
<tr>
<td>× .60</td>
<td>× .70</td>
</tr>
<tr>
<td>___ beats per minute</td>
<td>___ beats per minute</td>
</tr>
<tr>
<td>___ resting heart rate</td>
<td>___ resting heart rate</td>
</tr>
<tr>
<td>___ beats per minute</td>
<td>___ beats per minute</td>
</tr>
</tbody>
</table>

Now, answer the following questions.

1. What is your current morning resting heart rate? __________________________

2. What is your exercise heart rate range for your current most efficient aerobic training zone? __________________________
Activity 2: Understanding Your Training Zones and Specific Energy Systems

1. To complete activity 2 you will need to calculate the percent of VO2 max for yourself at 50%, 60%, 70%, and 85%. You have already calculated the percent of VO2 max for 60% and 70% on the Activity 1 worksheet for this lesson.

2. Record your calculations in the appropriate blank spaces of the worksheet on the chart for activity 2. Be sure to record your exercise heart rate range for your anaerobic training zone.

3. Submit the work to your instructor as directed on the last page of your course outline.
Activity 2: Worksheet

Training Zones and Specific Energy Systems

<table>
<thead>
<tr>
<th>Resting Heart Rate</th>
<th>Light Activity</th>
<th>Increased Activity</th>
<th>Most Efficient Aerobic Training Zone</th>
<th>Approximate Lactate Threshold</th>
<th>Anaerobic Training Zone (Accumulation of high blood lactate, resulting in rapid fatigue)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-120+</td>
<td>___</td>
<td>------</td>
<td>_______</td>
<td>___</td>
<td>___________________________190+</td>
</tr>
<tr>
<td>50%</td>
<td>60%------70%</td>
<td>85%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Energy Systems

Aerobic System

Anaerobic System

Now answer the following questions.

1. What is your approximate lactate threshold?

2. What percent of VO2 max would be considered too high to train at for this class if you are interested in training the aerobic system?
Applying Your Training Zones

Your aerobic training zone is the exercise heart rate range that will effect the greatest improvement in aerobic cardiovascular fitness. Some studies have indicated a V02 Max effort of 70 percent to be the best intensity level for aerobic efficiency.

Intensity levels below 60 percent are beneficial but less efficient. Intensity levels below 50 percent do not work the aerobic energy system hard enough to affect a significant level of improvement. Intensity levels above 85 percent use primarily the anaerobic energy system. Training above 85 percent will produce high levels of blood lactate, causing rapid fatigue. Lesson 4 will review energy systems in greater detail.

If aerobic fitness is our goal, we must keep our exercise heart rate in the most effective aerobic training zone during most of our run. The rule-of-thumb formula used to calculate the most efficient aerobic training zone works for both genders and is designed to be an easily obtainable estimate for most people. Please keep in mind that not everyone’s heart rate declines at the same rate. As we age, our resting heart rates vary greatly from individual to individual. Resting heart rates are a function of lifetime exercise patterns, current fitness levels, and perhaps most important, genetics.

Correctly completing activity 3 for this lesson will help you determine how it feels to run in your aerobic training zone. Most inexperienced runners tend to select a pace that is too fast, causing their exercise heart rate to move out of the most efficient aerobic training zone toward the end of the test. You can improve your chances of avoiding this mistake by applying the following suggestions:

♦ Warm up first.
♦ Complete the test by running alone. Your aerobic training zone pace may be different from someone else’s. Start out slower than you think you should on the first mile.
♦ Pay close attention to your breathing. If your breathing becomes labored, your intensity level is too high.
♦ Don’t pick the pace up at the end. This is not a test to see how fast you can run a mile.
♦ Be sure to take your heart rate correctly immediately upon finishing.
♦ Record the results before you forget.
Activity 3: Applying Your Most Efficient Aerobic Training Zone

You will be running two separate miles at a pace that feels comfortable. You will record your time and exercise heart rate at the completion of each separate one-mile run. The objective of this activity is to see how close you can come to running each mile in your most efficient aerobic training zone.

1. Locate an outdoor track at a school near your home.

2. Determine how you will be timed during this exercise (self-timed or timed by another person), and what type of timing device you will use (stop watch, sports wrist watch, etc.).

3. Warm up before you start by walking or jogging a short distance, followed by some stretching to obtain a feeling of readiness.

4. Run one mile (four laps on an outdoor 400 meter or 440 yard track) at a pace that you feel very comfortable with. This is best done by monitoring your breathing. When you finish, note your time and quickly (within ten seconds) take your exercise heart rate. Review the instructions in your discussion material on taking your pulse.

5. After walking one lap to recover, repeat step 4 above. Be sure to record your time and your exercise heart rate as soon as possible. You will need this heart rate below for steps 6 and 7.

6. Compare your exercise heart rate for each mile to the calculations you made in activity 1.

7. Record your time and exercise heart rate for each mile on the activity 3 worksheet found at the end of this lesson.

8. Finish answering the remaining questions on the activity 3 worksheet.
Activity 3: Worksheet

Apply Your Aerobic Training Zone

1. time of day ____________________________
2. temperature ____________________________
3. wind ____________________________
4. Did you run on a track? ________________ What size of track? ________
5. What problems did you have taking this test? ____________________________

<table>
<thead>
<tr>
<th>First Mile</th>
<th>Second Mile</th>
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<tbody>
<tr>
<td>Time</td>
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<tr>
<td>Exercise Heart Rate</td>
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<tr>
<td>How did you feel after this test?</td>
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</tr>
<tr>
<td>Yes/No</td>
<td>Do you think you did this test correctly?</td>
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<td>If yes, why?</td>
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</tr>
<tr>
<td>If not, why?</td>
<td></td>
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<tr>
<td>What did you learn from this test?</td>
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</table>
Lesson 4
Your Body When You Run:
Setting Up Your Training Program

This lesson will help you realize what adaptations your body makes when you train. You will better understand the energy systems used by your body at different intensity levels. This lesson will emphasize the training laws, principles, and theories used in all successful training programs. You will gain a better understanding of the requirements for setting up your training program.

Your Objectives

After you have successfully completed this lesson, you should be able to do the following:

1. Describe the physical adaptations developed by the heart, lungs, blood, muscles, bones, and connective tissue resulting from consistent walking, jogging, and running.

2. Identify the energy systems used by the body when you walk, jog, and run. Apply your knowledge of these energy systems as you set up your training program.

3. Discuss the law of specificity, the law of overload and adaptation, and the law of reversibility as they apply to correctly written training programs.

4. Set up your own training program using the concepts learned in this lesson.

5. Describe the following as they apply to writing correct training programs: training principles of volume, intensity, and density, restoration, the training principles of gradual adaptation to stress, and the training principles of variations.
How to Proceed

☐ Step 1: Read and study the discussion material for this lesson.

☐ Step 2: Complete the self-check exercises for this lesson. Do not submit these questions to Independent Study.

☐ Step 3: Complete the Speedback assignment for this lesson using the Speedback form provided. You may use this course manual as you complete this assignment.

☐ Step 4: Submit your Speedback assignment to Independent Study following the instructions on the first page of the assignment.

☐ Step 5: Review the section on setting up your training program. Write your own training load program and personalized training program. Do not submit these to Independent Study.

☐ Step 6: Look back now at the objectives for this lesson. Can you do all they specify? If not, review the appropriate material before continuing.

☐ Step 7: Proceed to lesson 5.

Discussion Material

What Happens to Your Body When You Run

Your body develops many positive adaptations to the stress placed on it when you run regularly. Some of the adaptation benefits you will enjoy as a result of instituting your own running program are discussed below.

Bigger, Stronger Heart
One of the greatest benefits from running is the development of a bigger, stronger heart. It will pump more blood with each stroke, a phenomenon which we call increased stroke volume. This increase in stroke volume enables the heart to rest longer between beats. A stronger, more efficient heart does not need to work as much, which means the resting heart rate decreases. Studies have shown running to increase stroke volume by as much as two times. Some elite distance runners can have a morning resting heart rate as low as 35 beats per minute. When you realize that an untrained person’s morning resting heart rate may be around 70 beats per minute, you begin to see some impressive improvements.

It has been estimated that a decreased resting heart rate of 10 beats per minute will save your heart 5 million heartbeats per year.
Decreased Respiration Rate
Running decreases your respiration rate by making the lungs more efficient. At rest we use less than half of our vital lung capacity. When we run, our lungs are forced to become stronger and more efficient by adapting to the demands placed on them to supply red blood cells with oxygen and remove waste products in the form of carbon dioxide.

Increased Red Blood Cells, Increased Hemoglobin, Increased Blood Volume
Running increases your red blood cells, hemoglobin, and blood volume. An increase in red blood cells and hemoglobin without an increase in blood volume would cause too great a concentration of red blood cells, reducing their efficiency in picking up oxygen and transporting it to the needed cells.

Increased VO2 Max
Running increases your VO2 Max, an abbreviation for your aerobic capacity. VO2 Max is the maximum amount of oxygen which can be used by the body when exercising. You benefit by being able to run longer with less effort as your VO2 Max increases.

Increased Energy Levels, Less Fatigue
Running causes the body to become better at making fuel available for energy, resulting in a greater energy capacity. You benefit by having more energy to complete daily tasks, due to an increase in your overall fitness. Research has shown that exercise increases your metabolic rate, and this elevated metabolic rate stays elevated for some time after you have finished exercising. One study found that walking for as little as ten minutes in your aerobic training zone can increase energy levels measurably and for a relatively long period of time.

Stronger Muscles, Stronger Connective Tissue, Stronger Bones
Running can generate forces three to five times your body weight, which places tremendous demands on your muscles, connective tissue (tendons and ligaments), and bones. Your body responds to this stress (training stimulus), by developing stronger muscles, tendons, ligaments, and bones. This is called an adaptive response, and it lessens your chance of becoming injured.

Efficient Metabolism, Controlled Body Fat
Running develops a more efficient metabolism, which helps control your body fat. Besides the obvious benefit of expending calories while running, plenty of evidence shows improved metabolic efficiency resulting from running in your aerobic training zone. This metabolic efficiency enables you to better utilize fat for energy and regulates hormones that help control your body fat.

Coping With Daily Stress
Studies have shown that even short-term exercise may be a beneficial stress-management tool by creating a more positive mental disposition. In some studies individuals engaged in an exercise program showed a greater basic sense of optimism which also seemed to reduce the apparent seriousness of personal problems.
Although still not a scientifically established fact, many believe that running may increase your brain’s production of endorphins, which make you feel better when you are running and for a short time afterwards. This feeling has been described as a “runner’s high.” This feeling of euphoria or sense of well being can provide you with a coping mechanism useful for dealing with daily stress.

**Training Laws, Principles, and Theories**

*The Training Law of Specificity*
When you repeatedly practice an activity, you become very good at that specific activity. This law implies that improvements made in training are specific to the type of training you do. For example, hitting a golf ball will do very little to improve your tennis stroke. A weight-training program to develop strength would not be expected to improve cardiovascular endurance. In other words, running is learned primarily by running. For example, if you want to run a marathon in under four hours, at some point in your training program you need to be running one and two-hour training sessions at close to a four-hour marathon pace.

*The Training Law of Overload and Adaptation*
You must train a little more this week than last week in order to improve. Another way to say it: you run, you become fatigued, you recover, and you adapt. You adapt by becoming a little stronger than before, and you are now ready to repeat the process.

To improve your level of aerobic cardiovascular fitness, you must correctly apply the law of overload and adaptation. This law has three important components: 1) a training stimulus, 2) a recovery period, and 3) an adaptation response. Many individuals wrongly focus on the training stimulus, believing in the old adage “No pain, no gain.” In running, more is not always better. The key to success is not just hard work. There are many factors, each an important component to success. Determinants such as easy running or jogging, total rest, good nutrition, and adequate sleep all facilitate recovery from hard work. Successfully applying the law of overload and adaptation involves the careful manipulation of all these three above mentioned components. Next is a diagram of Yakovlev’s Model. Reviewing this diagram will help you develop a better understanding of this important training law.
The Training Law of Reversibility
This law simply means that when you do not train, there is no need for adaptation, and your fitness will drop to the level needed to maintain your present lifestyle. In other words, you slowly get out of shape. For example, if you have been training for a number of weeks or months, and are forced to stop training because of illness or injury, you will not de-train quickly. If you can resume training gradually, you will return to your original fitness level in approximately the same number of days you were unable to train.

The Training Principles of Volume, Intensity, and Density
These three training principles influence the focus and method of every workout. It is important to understand each of these principles and how they should be applied to best meet your goals.

When you go for a run, you cover a given distance; this distance is called volume. The pace or speed at which you cover the distance is called intensity, which can be expressed as a percentage of your V02 Max. The intensity will reflect your perceived effort and is best monitored by checking your exercise heart rate. After every run, there is a period of time for recovery and rest before you train again. This period of time between training represents density. Density can be defined as the number of days you train each week.

Training Load
Volume and intensity combine to represent the training load. It is important for every runner to understand the inverse relationship between volume and intensity. When volume is high,
intensity must be low; when intensity is high, volume must be low. You need to understand that volume and intensity are inseparably connected in that one always influences the other. A training program that attempts to maintain high volume and high intensity will eventually result in an overuse injury.

**The Training Principle of Progressive Overload**

This principle implies that we must work progressively harder to continue improving. This works only if you allow time to recover from the previous training session. If you cannot adapt quickly enough to the increased work load, you will become injured. A review of the principle of progressive overload chart below will help you develop a better understanding of this important training principle.

---

**The Principle of Progressive Overload**

---

**The Training Principle of Gradual Adaptation to Stress**

This principle is the application of training principles of progression overload and the training principle of restoration. Misapplication of this principle will most certainly lead to an overuse injury. The ability to adapt is a function of our individual capacity to handle volume, intensity, and density. By beginning your exercise program at a realistic level of volume, intensity, and density, then gradually increasing the training load until you are at the level you feel good at, will help keep you from exercise injuries.

**The Training Principle of Restoration**

When the neuro-muscular system and the central nervous system are stressed from high training loads, they must rest in order to recover. This process is a normal and even necessary part of a good training program.

Examples of restoration are total rest, easy jogging or walking, hot or cold whirlpools, and massage.
The loss of work capacity (defined as your present level of fitness), due to undertraining does not happen quickly. However, overtraining will cause a rapid loss of work capacity.

**The Training Principle of Variation**

The purpose of this principle is twofold: to avoid boredom and to remain enthusiastic. We are all creatures of habit; we tend to find things we like and keep doing them because they work. To maintain enthusiasm and keep our running exciting, we need to look for new places to run. Try some cross-training workouts. Long hikes are a great addition to any training program.

**Training Theory and Energy Systems**

In order to understand training theory and apply it to your own personal training program, you need to know something about energy systems. The three energy systems you use in running are the anaerobic phosphagen energy system, the anaerobic lactate energy system, and the aerobic energy system. The **anaerobic phosphagen energy system** is part of the anaerobic energy system and has a seven to nine second reserve. It is the primary energy system used when sprinting. We will not emphasize this system within this course. This system is developed best in training zone level 6 with a 100 percent maximum effort. When training at this level, the perceived effort is all out. The **anaerobic lactate energy system** is also part of the anaerobic energy system and called upon when the perceived effort is very hard. A VO2 Max near 95 percent and a training zone level of 5 will develop this energy system best. We will not emphasize the development of this system within this course.

The **aerobic energy system** is the primary energy system that concerns us in this course. The perceived effort ideally ranges from very easy to moderate, with a VO2 Max between 55 percent and 75 percent. The best training zone levels are between 1 and 3. Refer the table in the section “Setting Up Your Training Program” on the following page of your discussion material for this lesson.

Once you understand which energy system is required for your type of training, you can take advantage of the law of specificity by structuring your workouts to the exact demands needed in your particular situation. It's important to realize that all energy systems are turned on at about the same time. This means that while one energy system may be primarily used at a given intensity, all contribute to some degree.
Setting Up Your Training Program

This section will help you better understand the adaptations made by the body when you run. You will learn the relationship between the various energy systems and the intensity levels used in training. You will set up your own training program, emphasizing the correct training laws, principles, and theories learned in this lesson. You will write and follow your own training program, applying the principles and concepts learned in this lesson. Carefully review the twelve steps found on page 52 of lesson 3 and review the personalized training program examples found on the following pages.

## Training Zones

<table>
<thead>
<tr>
<th>Training Zone Levels</th>
<th>Percent of VO2 Max</th>
<th>Perceived Effort</th>
<th>Actual Exercise Heart Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Age 20</td>
</tr>
<tr>
<td>6</td>
<td>100%</td>
<td>all out</td>
<td>200+</td>
</tr>
<tr>
<td>5</td>
<td>95%</td>
<td>very hard</td>
<td>195</td>
</tr>
<tr>
<td>4</td>
<td>85%</td>
<td>hard</td>
<td>180</td>
</tr>
<tr>
<td>3</td>
<td>75%</td>
<td>moderate</td>
<td>165</td>
</tr>
<tr>
<td>2</td>
<td>65%</td>
<td>easy</td>
<td>150</td>
</tr>
<tr>
<td>1</td>
<td>55%</td>
<td>very easy</td>
<td>135</td>
</tr>
</tbody>
</table>
Lesson 5
Running Mechanics and Dealing with Injuries

This lesson will help you understand the relationships that exist between running mechanics and your running style. You will study your own movement patterns when you are running to see if they are in line with correct running mechanics. You will study correct techniques used to warm up, cool down, and stretch. You will review the causes of the most common running injuries, how to avoid them, and how to treat them.

Your Objectives

After you have successfully completed this lesson, you should be able to do the following:

1. Describe the ten areas you should watch to improve your running style listed in the discussion material for this lesson.
2. Discuss the value of warming up and cooling down as it relates to your training.
3. Identify the correct techniques used in effective stretching.
4. Identify the most important muscles to stretch and understand why it is important to stretch them.
5. Explain the signs of overtraining.
6. Identify the most common running injuries, what causes them, and how to treat them.
How to Proceed

☐ Step 1: Read and study the discussion material for this lesson.

☐ Step 2: Answer the self-check exercises found in this lesson. Do not submit these questions to Independent Study.

☐ Step 3: Complete the Speedback assignment for this lesson using the Speedback form provided. You may use the discussion material to answer these questions.

☐ Step 4: Submit your Speedback assignment to Independent Study according to the directions found on the first page of the assignment.

☐ Step 5: Look back now at the objectives for this lesson. Can you do all they specify? If not, review the appropriate material before continuing.

☐ Step 6: Proceed to lesson 6.

Discussion Material

Have you ever asked yourself why we don't all look the same when we walk and run? We don't look the same because we are all unique individuals with our own special genetic blueprint. This blueprint results in slightly different foot, ankle, leg, knee, and hip structure, and hence slightly different walking and running movement patterns that we call biomechanics. The bones in our feet, ankles, legs, and hips are held together with ligaments that allow the various joints to move. Our skeletal muscles are attached to our bones by very strong fibers called tendons. Electrical signals carried by our nerves stimulate our muscles and cause contractions which, in turn, cause our joints to move. When these nerve impulses are coordinated by the brain, we are able to perform complex movement patterns like walking and running. When we realize that our ligaments and tendons can attach themselves in slightly different ways, and that our muscles may also vary somewhat in total mass and flexibility, it is easy to see why we do not all look the same when we walk or run. All of this can be further complicated when there are structural difficulties such as scoliosis (a curved spine), or a true leg-length discrepancy (one leg is distinctly longer than the other). Correct running mechanics begin with relaxation. Relaxing is one of the keys to running economy. An experienced coach observing runners in order to help improve their running style would notice the areas on the following page.
There are two schools of thought regarding the issue of running style and the need to change certain aspects of it to improve the efficiency of the runner. These are the natural school and the scientific school.

The Natural School

Coaches of this school believe that as individuals grow, mature, and train over time, they will develop a particular style of running based on feedback the brain receives from the body. Some feel the individual is wired to run a certain way, and this style is best for them and should not be changed. These coaches feel that attempts to modify the individual’s natural wiring may lessen the efficiency of the runner, and that any modifications will most likely revert to the original style when the runner becomes fatigued or stressed in a racing or hard training situation.

The Scientific School

Coaches of this school believe that as individuals grow, mature, and train over time, they will develop a particular style of running based on feedback the brain receives from the body. However, they believe that the wiring can be changed to bring the individual closer in line with the ideal biomechanical movement patterns, thereby creating a more efficient runner. They believe that mechanical faults can be corrected and will not return even when a runner becomes fatigued and comes under considerable stress.

In my opinion, there is truth to both schools of thought, and any coach attempting to modify an individual’s natural running style should have a complete and thorough understanding of running biomechanics and the application of biomechanical principles as they relate to running. I also believe that a thorough understanding of biomechanical principles as they relate to distance running is greatly misunderstood by many of today’s coaches. Before anyone decides it is best to modify an individual’s running style to conform to the perfect model, it is important to look for the cause of the perceived problem. To illustrate this point, let us look at the asymmetrical arm swing of Bill Rogers, one of our country’s most successful marathoners in the late 1970’s. Many coaches and fans alike noticed that one of
Bill’s arms came across the midline of his body in what some considered to be a wasteful motion. Further examination disclosed that one of Bill’s legs was shorter than the other. Over the years of running, Bill’s brain picked up signals from his joint receptors that over time helped Bill’s nervous system adapt (asymmetrical arm action) so that his leg action would be symmetrical, thereby improving his running efficiency. The alternative, perfect arm action and asymmetrical leg action, would prove disastrous to Bill’s running time. It must be remembered that arms are used mostly for balance, and the legs are what propel the runner along the ground. The lesson to be learned from all this is that coaches need to understand running mechanics as well as the cause and effect relationships created by applying adjustments that may change a runner’s efficiency. These adjustments may be made by motor skill training, improving strength, increasing flexibility and mobility, or corrective devices such as orthodics.

**Running Style**

The following is meant as a general guide to proper running form or style. It must be remembered that we are not made out of the same mold. Great runners come packaged a little differently. It must also be recognized that some biomechanical principles are true for all of us and must be followed as closely as possible if we are to maximize our potential as runners. Finally, it is important to remember that most of us are not now nor ever will be and may never want to be professional, world-class distance runners. We are just hoping to enjoy running for the health benefits it has to offer and the way it makes us feel when we do it regularly.

**Hands, Arms, and Shoulders**

The hands are held in a loose, slightly cupped position, the thumbs on top and sometimes touching the first joint of the index finger or sometimes the second joint of the middle finger. At times, the thumbs may not touch any part of the hand. The important thing to keep in mind is relaxation. A tight fist will cause the lower arms to become tight, which will cause the shoulders and neck to tighten. The hands should never flop about during their front and back swing. Hand floppers should turn their thumbs upward. This will eliminate the fault of hand flopping.

The arms are held loose at the shoulder, bent approximately 90 degrees at the elbow, and elbow swing may vary somewhat, depending on the individual runner. Running speed, running uphill, and running downhill will all affect the arm action. Running downhill requires the arms to move farther away from the body for increased balance, and depending on the terrain, may be required to swing in a somewhat erratic motion in order to maintain balance.

**Face, Head, and Neck**

Many runners show a good bit of stress in their face when they run. This can most often be seen in the individual’s forehead where the muscles under the skin are tense, causing the forehead to wrinkle. This by itself may not have serious effects on the performance unless the
rest of the face becomes involved. If the jaw becomes rigid, it will most likely cause the neck to also tighten. This loss of relaxation could have a tightening effect on the shoulders, which will probably have a negative outcome on the runner’s ability to be efficient during the run.

The head is a heavy piece of anatomy which must be properly positioned above the shoulders in line with the rest of the body and should be held stable by the neck. This balancing act by the neck should be carried out at all times in a state of relaxation. If the head is allowed to move too far back or too far forward, it will not only increase fatigue, but will cause pain in the neck, shoulders, and back. The head should not have side to side or turning (back and forth) movement. The most famous runner ever to magnify this flaw was Jim Ryan, one of America’s greatest milers of all time. Ryan was the first high school runner to break the first sub-four minute barrier and went on to run world class records in the mile run and represent the United States in the Olympics. An interesting thing to note is that Ryan had severe hearing loss in one ear, and adapted the side-to-side head movement to compensate for this loss.

**Trunk and Hips**
During running, the trunk should be held steady and mostly erect, with a slight forward lean. Those runners exhibiting a pronounced forward lean of the trunk are either accelerating (the runner must lean forward, forcing the center of gravity forward to accelerate), or may suffer from a lack of flexibility and strength, or may be running into a strong head-wind. The best way to determine forward lean is to observe the runner when the knees are closest together during the running stride pattern. Another form error associated with the trunk is over rotation often caused by improper arm and shoulder movement pattern. This form may negatively affect the runner by wasting energy. Over rotation of the trunk means that the trunk is rotating too far to the left and too far to the right during the running movement patterns.

Some runners have a higher degree of vertical oscillation (up and down movement) than others. The greater the runner’s vertical oscillation, the less economical the runner. Young runners tend to have more vertical oscillation than older runners, and this running error usually improves as the runner gains more practice and experience.
Legs and Feet
The distance runner’s strike pattern should be relaxed and smooth with a natural stride length that emphasizes economy rather than power.

The foot should land as close to a point directly under the center of gravity as possible. Overstraining is more common in young and beginning runners and tends to find its own solution as runners develop their own natural running stride. This will happen automatically for almost every runner, without a conscious effort on behalf of the runner.

Over Striding
One of the most disastrous running flaws is for the runner to make a conscious effort to increase the stride length in an unnatural way. This causes the foot to land in front of the center of gravity, resulting in a breaking force that has a negative effect on running economy. Having said this, it is important to understand that increasing stride length is an asset which more mature runners attain naturally and which all runners can obtain by increasing abdominal, hip, and leg strength. Increasing back, hip, and leg flexibility can also increase stride length.

Pronation
The problem with excessive pronation is that the leg rotates too far inward as the foot and leg accept the runner’s weight. This inward rotation is the cause of the most common running injuries, not because overpronation itself causes injuries, but because overpronation is associated with injuries.

All runners pronate after landing, and some pronation is desirable, even essential. Excessive pronation may cause lower extremity injuries. For those runners who demonstrate excessive pronation, there is an entire generation of running shoes on the market designed with antipronation technology to minimize this habit.

Supination (under pronation)
This is the opposite of pronation. The foot’s alignment is skewed to the lateral or outside of the heel and foot. Only about 1 percent of the population are rigid supinators; under pronation is more common and these people are still less than 5 percent of the population. Supinators or under pronators will show excessive wear patterns on the outside edges of their shoes.

Foot Strike
There has been much misinformation on the correct running mechanics for the foot. Many coaches and books say that the correct technique is to land on the heel and then rock forward to the ball of the foot. They seem to uniformly recommend not landing on the forward part of the foot. Although this seems like sound advice for individuals who run this way (rear-foot strikers), it is poor advice indeed for those individuals who naturally land in a midfoot or forefoot position.

One study indicates that among talented endurance athletes, 60 percent land on the forefoot, 30 percent on the midfoot, and 10 percent on the rearfoot.
For distance runners it is best not to worry on which of these three positions the foot is landing. Just relax and run naturally. Whatever you are doing is probably right for you. The foot is usually placed on the outer edge as it hits the ground. As it begins to bear the runner’s weight, it will articulate to one of three (over pronation, normal pronation, or supination) positions. Here again, much misinformation has been written regarding the harmful effects of pronation and the need of orthodics to correct this condition. Not everyone who seems to overpronate needs corrective orthodics, and their use has been unnecessary in some cases. This is not to say that orthodics do not have a useful benefit for many runners; in some cases they have been a tremendous aid in lessening the chance of injury from poor wiring. I say wiring, because a small population of runners have inherited a high-risk foot structure and movement pattern. These individuals usually fall into one of two categories, over pronators and under pronators.

Breathing
The most common myth regarding breathing is to breathe through the nose rather than the mouth while running. This bit of misinformation is unrealistic and outdated. Breathing through the nose and mouth is the correct technique, the contribution of the mouth being the more important of the two. A runner should not attempt to employ any set pattern of breathing during exercise. Breathing should be natural. The depth and frequency of respiration will in most cases automatically fit the level of intensity and running speed. There are two types of breathing: chest and abdominal. Some experts refer to the abdominal as belly breathing. As running speeds increase, we shift somewhat more towards chest which, when overdone, has been known to cause the diaphragm to cramp resulting in a runners stitch or side ache. This painful problem can be avoided by employing a predominately belly-breathing technique.

An example of belly breathing can be easily seen by putting your hand on your stomach below the ribs and breathing in and out a few times. If you were using a good diaphragm belly-breathing technique, your hand will move out as you inhale and out as you exhale. Occasionally, a diaphragm side ache will be caused when a runner begins running downhill and shifts from belly breathing to chest breathing or when a runner begins to fatigue and accelerates the pace near the end of a workout or race. The resulting side ache can be quite painful, causing the runner to slow down to regain control of their breathing. Oftentimes the area of pain can be felt the day after. What is really happening is that the diaphragm muscle is cramping similar to a cramp in the arch muscle of the foot or the calf muscle. This results in a muscle spasm which takes a day or so to loosen up.

Warming Up, Cooling Down, and Stretching

Warm-up
Before we begin to run hard or do any activity that requires the muscles to contract vigorously, we need to increase the core temperature of our muscles. Most runners do this by simply starting out slow and after a mile or so, increasing the pace until they have reached their
desired tempo or training zone. If you have a tight muscle or potential problem that needs stretching, stretch lightly before starting out and more after a few minutes of easy jogging.

Cooling Down
Stopping immediately after you have been running hard can cause you to become light headed, dizzy, and even pass out. Running requires the leg muscles to work hard and circulate a lot of blood in order to supply oxygen and carry away waste products. If you stop after running hard, the blood will pool in your legs resulting in a decreased supply of blood to the brain. When this happens, the brain does not get the oxygen it needs and you end up feeling light-headed or faint. For this reason, you should always slow down gradually at the end of each run or walk. Cooling down also helps remove the build up of folic acid in the blood caused by running at faster than lactate threshold pace.

Stretching
Running causes some of your muscles, from the region of the lower back on down, to tighten and lose flexibility, thus reducing joint range of motion. This decreased range of motion negatively affects your connective tissue, muscles, bones, and joints. Running also has a tendency to cause muscle imbalances as well as tight calf, hamstring, and gluteal muscles. Inflexibility, reduced range of motion, and muscle imbalances will greatly increase your risk of injury. Your flexibility, therefore, is a very good predictor of potential injury. Stretching, when done properly, counteracts these negative tendencies that result from running.

The best time to counter the tightening effects of running is after your run. Stretching for 20 to 30 minutes after you cool down will pay tremendous dividends by allowing you to run more efficiently and with fewer injuries. Stretching before a workout is best done after a brief warm-up run that elevates the muscle temperature. If you don't have time to stretch for 20 to 30 minutes after you run, remember, any time spent stretching priority muscles, even if it's just one or two minutes, will be beneficial.

We are all wired a little differently, which means we are more or less flexible in various muscles than others. Try not to compare yourself with anyone else. Just realize that your flexibility can improve if you are willing to work at it consistently. Even if you have never stretched before, you can learn to isolate the muscles that need the most work, and thus improve your flexibility, allowing a greater range of motion, more efficient running, and less chance of injury.

In the following chart, “A Stretching Program for Runners,” the stretches are done from a standing position, kneeling position, seated position, and a lying on your back position.

The following pictures are a guide to help you visualize the correct position of each stretch. Individual variation is common due to genetic differences in muscle, tendon, and ligament connections, making some people naturally more flexible than others. A good example of this can be seen in picture “VI. Hamstring stretch: both legs,” found on page 105.
A Stretching Program for Runners

| I.   | Upper and Lower Calf Stretch      | upper calf (side view) |
|      |                                   | upper calf (rear view) |
|      |                                   | lower calf (side view) |
| II.  | Quad Stretch                      | standing (side view)   |
|      |                                   | standing (rear view)   |
|      |                                   | kneeling (side view)   |
|      |                                   | side (side view)       |
|      |                                   | lying on stomach (side view) |
|      |                                   | lying on stomach (rear view) |
| III. | I.T. Band Stretch                 | standing (rear view)   |
| IV.  | Hamstring and Back Stretch        | legs overhead and straight |
| V.   | Back Stretch                      | legs overhead and knees bent |
| VI.  | Hamstring Stretch                 | both legs (side view)  |
|      |                                   | single leg (front view) |
|      |                                   | single leg (using towel) |
| VII. | Groin Stretch                     | lying on back (side view) |
|      |                                   | sitting (front view)   |
|      |                                   | sitting (side view)    |
| VIII.| Hip and Upper Hamstring Stretch   | sitting (front view)   |
|      |                                   | lying on back (side view) |
| IX.  | Hip and Lower Back Stretch        | lying on back (front view) |
| X.   | Hip, Upper and Lower Back Stretch | sitting (side view)    |
| XI.  | Hip Flexer Stretch                | kneeling (side view)   |
Lesson 6
Nutrition and Special Considerations

This lesson will help you understand the relationship between correct nutrition principles, your overall health, and your running. It will dispel some common myths associated with nutrition and running and help you make wise and healthy choices about what you put in your body. This lesson will help you gain a better understanding about the relationship between eating, exercise, and body fat. It will help you understand what you can and cannot do about this relationship. You will also gain insight regarding special considerations for women runners.

Your Objectives

After you have successfully completed this lesson, you should be able to do the following:

1. Discuss the nutrition principles needed for good health and continued success as a runner.

2. Discuss the facts concerning gaining and losing body fat and how your running program effects this process.

3. Explain the special considerations existing for female runners concerning injuries, anemia, amenorrhea, osteoporosis, and pregnancy.
How to Proceed

☐ Step 1: Study the discussion material for this lesson.

☐ Step 2: Complete the self-check exercises found in this lesson. Do not submit these questions to Independent Study. Check your answers in appendix A of this course manual.

☐ Step 3: Look back now at the objectives for this lesson. Can you do all they specify? If not, review the appropriate material before continuing.

☐ Step 4: Proceed to lesson 7.

Discussion Material

Managing Body Fat

There comes a time in life when almost everyone begins to gain unwanted pounds of fat. For a few, this happens in childhood and is mainly due to inactivity and improper eating habits or to a genetic malfunction of some kind, although the latter is rare. For others, it happens during their teens, and for still others, in the twenties or thirties. This onset of fat accumulation is usually a slow process that takes place over many years.

It is a fact that excess fat cannot be cured, it can only be controlled. In light of this principle, and the realization that the excess weight did not happen over night, the slower the weight is taken off, the more likely it is that it will stay off.

Genetics plays a major role in how much fat we will carry during our lives. For the most part, genetics determines when we will start putting on fat, at what rate, and how much. I am not saying that exercise habits and eating habits do not play an important role, but we tend to be like our parents and grandparents. For some, fat is not a problem no matter what we seem to eat; others struggle with excessive fat gains much of their lives. Consistent aerobic exercise and correct nutrition are the keys to good health. Far too often, however, we fail to correctly manage either of these important areas. We typically consume too many calories of sugar and fat and not enough complex carbohydrates and fiber; we simply eat too much of the wrong types of food. When these habits are combined with an inactive lifestyle, it is easy to see why more than half of the top ten leading causes of death in America are linked to poor nutrition and a sedentary lifestyle.

Along with exercise, controlling your fat and sugar intake is the key to maintaining the right weight. It is important to understand that in limiting your fat and sugar calories, you will limit your total caloric intake and you should reach and maintain a healthy weight as long as you exercise.
If you are occupying more space than you should and want to do something about it, you must start exercising correctly and be aware of how many fat and sugar calories you consume each day. My advice is to count the grams of fat and sugar you consume each day, but never count the calories of the food you eat. This simplifies the process of keeping track of the calories that are doing most of the harm. Our bodies do not process fifty grams of fat the way they do fifty grams of complex carbohydrates. Our bodies are able to convert at a 97 percent efficiency rate the fat we eat to fat we store. Complex carbohydrates convert to fat at a less efficient rate of 77 percent. From this example, you can see that fifty grams of complex carbohydrates produce less fat stored than fifty grams of fat. If you eat simple carbohydrates along with fat, you are making it difficult for yourself because then the rate of fat moving from blood to cell storage is greatly increased.

You will never permanently control your weight by restricting your food intake alone, primarily because it is not much fun to be hungry all the time. Studies show that of all the overweight people that go on diets and lose weight, 98 percent gain it all back! When comparing them with the 2 percent who keep the lost weight off, the one difference is always the same, exercise. A new study was recently released showing that about thirty minutes of aerobic exercise three to four times per week will develop cardiovascular fitness to a beneficial level. However, if metabolic fitness is the goal, it becomes necessary to exercise about thirty minutes almost everyday, as well as decrease the daily fat and sugar intake.

Let’s take a look at some of the things you can do that will control your weight, give you more energy, help you look and feel better, and improve your self-image.

♦ Exercise regularly. The goal is to train for thirty minutes three to four times a week. Jogging or running are excellent ways to burn a lot of calories in a short amount of time. If your program requires you to walk, the calories burned are the same for each mile covered, except it will take longer. Just get out the door! If you have been inactive for a long time, be sure to work up gradually to it by starting slow and moderately increasing in volume, intensity, and density.

♦ Greatly restrict the fat and sugar you consume each day. Remember to keep things simple by only counting grams and calories from fat and sugar, not calories from other foods. Keep a record of calories on a note card or in your daily planner of your fat and sugar. To do this you need to read labels and keep a food calorie chart handy.

♦ Increase the amount of complex carbohydrates and fiber you consume each day by eating a variety of breads, cereals, pasta, rice, legumes, vegetables, and fruits.

♦ Use portion control. Most of us are not very good at estimating how much we are eating. Use a good kitchen scale that weighs in grams and ounces. In time you will become better at judging realistic portions. If you consistently take smaller portions and do not go back for seconds, even if you stop eating before you are full, you will usually find that an hour after you eat you are no longer hungry.
Drink a large glass of water before each meal and eat more slowly. Put your fork or spoon down between each bite. By taking longer to eat each meal, you will be less likely to overeat.

Never skip breakfast. In a study comparing obese people and eating habits, the one common denominator in all subjects was that they skipped breakfast. You have all heard the saying “Breakfast is the most important meal of the day.” If we are eating right, this statement is true, because we have just fasted for eight to twelve hours, and our bodies need the fuel to maintain our blood sugar levels and maintain a high metabolic rate.

People who skip breakfast often think that a quick glass of juice will help them reduce their calories for the day, thus helping them to lose weight. What really happens is that at some point their blood sugar level becomes so low that they must eat something, and it is often the wrong kind of food, high in sugar and fat. After skipping meals, they become so hungry that they often eat too much of the wrong kind of food. I call this a “feeding frenzy,” and it becomes a habit-forming cycle that is difficult to break.

Eat less, more often. It is better to eat four or five smaller meals a day rather than two or three big ones. Breakfast should be the largest. In order to do this you will need to take a look at your daily schedule and then plan accordingly. If you are a student, for instance, and you are in class most of the day, you may want to get up early in order to prepare a few healthy snacks to put in your backpack and take to school. You can easily do this by using the plastic or rubber type containers available in a variety of sizes, found in most supermarkets. By placing a small frozen packet in with the food to keep it fresh, you can enjoy a nice, inexpensive, low-fat, high complex-carbohydrate snack at timely intervals during the day. These frozen packets are available in several sizes and can be purchased at reasonable prices at sporting goods stores and supermarkets.

Not everyone taking this class is concerned about their weight, but everyone should be concerned about their daily fat and sugar intake. Americans consume far too much fat and sugar, far too few complex carbohydrates, and not enough fiber. For most of us, by the time we realize we have a problem with too much body fat, we are older, and our eating habits are well entrenched in patterns that are, at such a late date, very hard to change. This predicament is further complicated when you realize that obesity is a multi-faceted problem involving such things such as genetics, gender, culture, emotions, social, and economic patterns. Each one by itself may be manageable, but when combined they become a very difficult problem indeed.

After graduating from college, I was hired as a health teacher at a high school with an enrollment of about 1800 students. I taught sixteen and seventeen year olds in a classroom setting and coached cross country and track after school. It was my habit to administer a health survey each new semester. One of the questions on the survey dealt with perceived body weight and dietary habits. You may be surprised to learn that when questioned about diets, 20 percent of the sixteen-and seventeen-year-old girls had been on a diet to lose weight at least once and some had been on several. Interesting, though, almost none of the boys, less than 3 percent, had been on diets to lose weight. The contrast was surprising and becomes even more dramatic when after several of
the most enjoyable teaching and coaching years of my life, I was hired by Brigham Young University to coach cross country and track, and teach in the college of Physical Education. I administered the same survey in my jogging classes with interesting results. The dieters were up from 20 percent to a surprising 70 percent for the young women at an average age of 20. However, the young men, at an average age of 22, were still less than 10 percent.

The reason for this discrepancy could fill this entire course manual, so I will not attempt to elaborate on any except the obvious—biological differences between men and women. Clearly, there are some very important and very necessary factors that explain the results of my health survey. Girls reach puberty on the average about two years earlier than their male counterparts. At this point and continuing for several years, we see the greatest variance in body fat between the sexes. With few exceptions, I have noticed that the male distance runners at our university seem to eat everything they see and don't seem to gain a pound, while their female counterparts, in many cases, carefully watch their diets. On many occasions, I have heard members of my women's cross-country team complain after watching the men eat large amounts of food high in fat exclaim, “Life is not fair!” If it is any consolation, I have observed that very few of the young men running in high school or college ten or fifteen years ago occupy the same amount of space today. For most of you young men taking this class, understand that the eating habits you are developing today will tend to stay with you for the rest of your life. Although life may not be fair, it has a way of catching up with us. Once unwanted fat has accumulated, the key to occupying the right amount of space is embracing behavior changes that increase our exercise patterns and reduce our fat and sugar consumption. Showing determination to lose weight slowly while modifying the needed behavior will, by the time you reach your new weight, set the behavior needed to keep the weight off permanently.

Exercise by itself isn't a fast way to lose fat. The amount of exercise, let’s say running, needed to affect rapid change would, in most cases, cause an overuse injury. Exercise is, however, a great way to lose fat over a long period of time, as we see in the following example:
Fat Loss from Consistently Walking, Jogging, or Running
Thirty Minutes, Four Times per Week for One Year

♦ The loss of one pound of fat requires a deficit expenditure of about 3600 calories.
♦ Walking, jogging, or running about thirty-six miles will burn one pound of fat.
♦ If you jogged or ran at a 10 miles per hour pace you would cover 12 miles per week.
♦ If you only missed seven weeks of training each year due to injury, illness, travel, or other commitments, you would train for forty-five weeks per year.
♦ By covering 12 miles per week for forty-five weeks and by not increasing your average calorie consumption, you will lose 15 pounds of fat a year.

\[
\begin{align*}
45 \text{ weeks} \\
\times 12 \text{ miles} \\
540 \text{ miles per year} \\
\div 36 \\
15.0 \text{ pounds per year}
\end{align*}
\]

The real secret to losing fat is to consume fewer calories and expend more energy through vigorous aerobic exercise. It is the combination of these two concepts over time that really works.

Nutrition Principles

It is important to understand that food is not the most important factor in improving your running performance. According to correct training laws, principles and theory, you do not need large amounts of protein to run better. You do need an adequate amount of protein for muscle growth and development; however, you also need to eat the right amount of complex carbohydrates and other vitamins and minerals. This is best achieved by eating a variety of nutritious foods that are low in fat and sugar. If you cut too far back on your food intake to lose weight, you will not have enough nutrients to maintain the high energy levels needed to successfully carry out your training program. We all are different and our individual needs will vary significantly. There are, however, over fifty nutrients that your body must have every day in order to maintain good health and improve your running. If your diet lacks even one of these important nutrients, over time, your health and running performance will suffer.

Limiting the fat we consume is a major concern as we age. It is true that we need some fat in our diets for optimal health, but it is also true that in our society we can not help getting plenty of fat in an average diet. It takes a compulsive individual, usually one with some form of eating disorder to suffer from poor health due to insufficient fat in the diet.

All parents should realize the importance of teaching their children to eat a healthy, low fat, high complex carbohydrate diet from a very early age. Our choice of foods as we get older is often a
result of eating habits acquired when we were younger. The type of food we eat, how much, how often, and for what reason are often formed at a young age, and modifying this behavior is very difficult when we are older.

The recommended running diet includes 65 percent carbohydrates, 15 percent protein, and 20 percent fat.

♦ Carbohydrates (4 cal/g)—50 percent complex and 15 percent simple

♦ Protein (4 cal/g)—endurance athletes need 1.5 g/kg of body weight; strength training athletes need 1.5g/kg of body weight; the RDA for sedentary individuals is .8g/kg of body weight. No one should consume above 1.8g/kg of body weight in proteins.

♦ Fats (9 cal/g)—5 percent animal fat; 15 percent vegetable fat

Pre-exercise meals should be eaten two to four hours before exercise and should include 2-4 grams of complex carbohydrates/kg of body weight.

Post exercise meals should be eaten immediately after exercise and should include 100 to 150 calories of simple carbohydrates. Then, two hours after exercise you should eat 100 to 150 calories of simple carbohydrates, especially on high-load days. Complex carbohydrates and proteins should be eaten three or four hours after exercise.

When and how many times a day should you eat? You should always eat breakfast, even if it’s just something small like a cup of yogurt or a piece of fruit and a slice of toast. This gets your metabolism going and gives you the blood sugar you need to perk up. Eat a midmorning snack. Eat a medium-sized lunch. Eat a midafternoon snack. Eat a light dinner. Eat an evening snack.

When planning your meals and snacks, always start with a complex carbohydrate base. The following are some good examples of complex carbohydrates:

♦ cereals
♦ fruits
♦ vegetables
♦ rice
♦ beans
♦ potatoes
♦ pasta

Planning is the key. Active people on the go need to pack their lunches and snacks in order to make the five meals/snacks a day program work.
How to Increase the Fiber in Your Diet

♦ Select whole-grain bakery products.
♦ Eat more fresh fruit.
♦ Eat more fresh vegetables.
♦ Add bran or wheat germ to your cereals and casseroles. Eat more bean dishes. Eat more brown rice dishes.

How to Decrease the Fat in Your Diet

♦ Use nonstick pans rather than oil when frying foods.
♦ Choose low-fat or cooking-light recipes when cooking your favorite foods.
♦ Choose skim milk and other low-fat dairy products.
♦ Use mustard rather than butter or mayonnaise. Use lemon or herbs on your salads.
♦ Read labels carefully and avoid foods that list fat and oil near the top of the list of ingredients.

Hydration

Hydration is one of the most important and one of the most overlooked areas in running. Although water has no nutritional value in the sense that it provides no energy from calories, without it we could only survive a couple of days. Our bodies are approximately 60 to 70 percent water, and without enough of it, performance will be adversely affected in only a few minutes. The first symptoms of water loss or dehydration is fatigue. If you feel unexplainably fatigued or sluggish, you may well be showing the first signs of dehydration.

If you wait until you are thirsty to drink, you have waited too long. When you exercise intensely, the thirst mechanism will not be able to keep up with the body’s need for water. If you wait until you feel thirsty, your body is already a quart low. Drink before you are thirsty. It takes several hours to undo a water deficit once you become thirsty. Before hard training runs and competition, my advise is to force yourself to drink water even if you are not thirsty. This will reduce a potential water deficit and improve performance as well as delay the onset of fatigue caused by dehydration. All runners need to drink water before, during, and after all workouts and competitions.

The body does not just lose water by sweating. Breathing, urination, and feces are all part of the total fluid loss. You should be drinking at least eight ten-ounce glasses of water a day. Increased activity or time spent outdoors in dry or hot conditions requires more than this. Runners can lose as much as four quarts or twenty glasses each hour when running hard during warm or hot weather.

During hot weather it is a good idea to weigh yourself before and after exercise to know how much fluid has been lost. This should be done on the same scale with as little clothing on as possible. It may surprise you how much water is needed to replace the loss from one vigorous run on a hot day. Remember each pound of weight loss equals two glasses of water. Because you need to run about thirty-six miles to lose one pound of fat, your weight loss after a run is almost all water.
One way to check to see if you are hydrating sufficiently is to observe your urination habits. Less than five times every twenty-four hours means you may need to increase your fluid intake. Also, if your urine is a dark amber color, you are not hydrating sufficiently.

Sports drinks are mostly water with glucose or sucrose (forms of carbohydrate), and some electrolytes, like potassium and sodium. Studies show that sports drinks with electrolytes do not replenish body fluids during exercise any more effectively than water, and are of no benefit for runs under one hour. In some cases the high sugar content found in some of the drinks may even slow the rate of absorption by the body. Caution needs to be used in regard to sports drinks or any high sugar drink, fruit juice included, when consumed before running or competition, as it may trigger the release of insulin, causing an insulin peak followed by a pronounced drop in blood insulin levels. Sports drinks are better utilized after hard training or competition. Studies show that by drinking 100 to 150 calories of sugar water within fifteen minutes of completion of a hard training run or competition and again an hour and a half later, the glycogen levels in the legs were replaced more fully the next day. It seems that on very hard training or competition days, the glycogen or muscle fuel in the legs are nearly exhausted. There are two windows of opportunity to replace these stores. The body needs about 100 to 150 calories of simple carbohydrates during each of these two windows for best results.
Special Considerations for Female Runners

In lesson 2 we discussed the safety considerations when running. Unfortunately, we live in a world where women have more safety considerations than men and for these reasons must always be careful when running alone. This is especially true early in the morning and after dark.

Biological Differences
Women have more essential body fat and, on average, are shorter in stature than men. Some research indicates that women expend more energy in endurance running, while other researchers have found no significant differences.

Running Mechanics
Most aspects of running mechanics are very similar between female and male runners. Some research indicates that female runners have greater hip flexion, lower vertical oscillation (up and down movement) and longer stride lengths relative to leg length than male runners. Pelvic width has often been suggested as a factor causing female runners to be at greater risk for knee injury than male runners. However, research has shown pelvic width to be similar (less than 1/4 inch difference) to that found in male runners.

Anemia
Active women runners often place a high value on a lean body type and do not consume enough iron in their diets, thus putting themselves at risk for anemia. Anemia is common among women runners and clearly diminishes physical performance by decreasing VO2 Max, which diminishes work capacity.

Serum Ferritin
The body’s iron stores are very important to all endurance runners. A serum ferritin test can be an important tool to predict the body’s iron shortages. Normal ferritin levels are above 20 mg/ml for women and 30 mg/ml for men. Men average 10 mg/ml higher than women on this test. The extremely wide range of norms for this test (20 mg/ml to 200 mg/ml) makes this test a little confusing to some.

It has been my experience that women below 20 mg/ml are in serious trouble from an endurance performance perspective. I like to see my female athletes in the 40 to 60 range. Menstruating women will always be at a higher risk of low ferritin levels because menstruation is the primary source of iron loss in females.

When we have an athlete with low ferritin levels, we supplement with a liquid iron treatment that has proven to work far better than the tablet supplementation prescribed by most doctors. The liquid iron not only works, it does not cause stomach irritation and constipation associated with tablet iron supplements. It’s important to stress that a serum ferritin test will be taken along with one consultation with a doctor before undertaking iron supplementation.
Amenorrhea
This is the cessation of menstrual cycles or periods. It is also the absence of menstrual periods by the age of sixteen. Secondary amenorrhea is the absence of menstrual periods for three consecutive cycles after a woman has had two or more normal periods. Regularly menstruating women have twelve periods each year. Approximately 5 percent of the female population in the United States has three or less periods each year. When looking at endurance athletes however, the figure jumps to 66 percent. This is called exercise associated amenorrhea. The real problem with amenorrhea that all women need to be aware of is the danger of osteoporosis and its potentially devastating long term effects. Amenorrhea should never be considered a convenience, but it need not cause panic either. Early medical evaluation and treatment will bring about significant improvements which can positively effect long range health benefits.

The exact cause of amenorrhea is not clear. There are many factors that influence amenorrhea such as the following:

♦ high stress
♦ low body weight
♦ hard physical exercise
♦ diet and nutrition

Osteoporosis
This is a disease which causes the bones to demineralize. This demineralization causes a decrease in bone mass and an increase in bone fragility. The result of these two influences can greatly increase the risk of bone fractures. Strong bones depend on the balance of calcium and estrogen levels as well as the adaptation stimulus caused by regular weight-bearing exercise.

In the past, osteoporosis has been considered a disease for post menopausal women. We now know that osteoporosis begins at a young age and can be greatly accelerated by the lack of sufficient calcium, estrogen, and exercise.

Disordered Eating
The term eating disorder has historically been associated with anorexia nervosa and bulimia nervosa, two prevalent eating disorders. I like to use the term disordered eating when discussing the subject because there is such a wide spectrum of unusual eating patterns. Some of these patterns do not pose a serious health threat. Others are clearly abnormal, unhealthy, and if continued, present serious health problems, even the risk of death.

Over a period of time, some of these unhealthy nutritional and behavioral patterns, of which anorexia and bulimia are two, can be seen in what has come to be known as the female triad. The female triad is composed of eating disorders, amenorrhea, and osteoporosis. There are many reasons why our country and most first world countries are finding an increasing number of adolescent females suffering from disordered eating. Our cultures seem to place considerable pressure on our adolescent females to be thin. For some reason our television, movie, and magazine media are depicting an unrealistically thin appearance as a symbol of successfully
achieving personal beauty and the perfect body. This feeling is all too often encouraged by family members, friends, and others in a position to influence behavior. As a womens’ endurance running coach for over twenty-five years, I have seen many forms of disordered eating. Some of the individuals, when confronted and encouraged to seek professional help, remained in denial, refusing help while others seemed willing to accept counseling and the love and support of family, coach, and teammates.

From my experience, if you suspect a friend is suffering from disordered eating, you should do the following:

♦ Remain supportive.
♦ Confront them with your observations in a sincere and concerned manner.
♦ Encourage them to seek professional help.
♦ If they are unable to accept the possibility that they may have a problem, refer them to a physician or counselor.

**Pregnancy**

As with all training programs, exercise for pregnant women needs to be carefully planned and individualized. All pregnant women need to modify the volume, intensity, and density of their training program. If you have been jogging or running regularly, there is no reason why you cannot continue to do so provided you have your doctor’s approval, modify your program, and pay close and careful attention to how you feel as your pregnancy progresses.

I have had many former athletes that have continued to run, then jog, and finally walk vigorously right up to the day they delivered. One former All American and USA National Team member, Nicole Keller Birk, has run and jogged regularly up to the last day or so before delivery. She has done this for three pregnancies. It is important to keep in mind that although this example may not be particularly unusual for women with running backgrounds, it may not work for others. Many pregnant women find walking, swimming, muscle toning, and relaxation exercises work very well for them throughout their pregnancy.

The American College of Obstetricians and Gynecologists’ guidelines for exercise during pregnancy and postpartum are the following:

♦ Regular exercise is preferable to intermittent activity. Competitive activities should be discouraged.
♦ Vigorous exercise should not be performed in hot, humid weather or during a period of febrile illness.
♦ Ballistic movements should be avoided. Exercises should be done on a wooden floor or a securely fastened carpeted surface to reduce shock and provide a sure footing.
♦ Deep flexion or extension of joints should be avoided because of connective tissue laxity. Activities that require jumping, jarring motions, or rapid changes in direction should be avoided because of joint instability.
Vigorous exercise should be followed by a period of gradually declining activity that includes gentle stationary stretching. Because connective tissue laxity increases the risk of joint injury, stretches should not be taken to the point of maximum resistance.

Vigorous exercise should be preceded by a five-minute period of muscle warm up. This can be accomplished by slow walking or by using a stationary cycle with low resistance.

Heart rate should be measured at times of peak activity. Target heart rates and limits should be established in consultation with the physician and should not be exceeded.

Care should be taken to gradually rise from the floor to avoid orthostatic hypertension. Some form of activity involving the legs should be continued for a brief period.

Liquids should be taken liberally before and after exercise to prevent dehydration. If necessary, activity should be interrupted to replenish fluids.

Women who have led sedentary lifestyles should begin with physical activity of very low intensity and advance activity levels very gradually.

Activity should be stopped and a physician consulted if any unusual symptoms appear.

Maternal heart rate should not exceed 140 beats per minute.

Strenuous activities should be performed in the supine position after the fourth month of gestation is completed.

Exercises that employ the Valsalva maneuver should be avoided.

Calorie intake should be adequate to meet not only the extra energy needs of pregnancy, but also of the exercise performed.

Breast Feeding and Running

Nursing mothers have found no problem jogging and running, provided they realize the need for adequate hydration and proper breast support.

Jogging Strollers

Once the baby has arrived, jogging strollers can be a useful aid, allowing you the flexibility of running without needing your spouse to be home or getting a sitter while you get your run in.

For safety reasons, it is important to purchase a bike helmet for the baby and always use it for every outing. I once saw a nasty spill involving two children in a double jogger. The situation could not have been foreseen and unfortunately, neither children were wearing a helmet. Spills are very rare and when using good judgment, almost never happen. Using a baby jogger is probably safer for the baby than traveling in a car.

When buying a jogging stroller, there are several things to consider. Safety should be first on the list. Price may be a limiting factor when considering such things as weight, collapsibility, and other conveniences. There is a huge variation in price between the many companies that manufacture and sell the different models. You can save money by calling the company that makes them. Some bike stores are cheaper than mail order, you may even try a discount baby store. Bike shops that rent baby joggers over the summer will often sell them at a bargain during
the fall. For some reason, it’s difficult to find someone dissatisfied with a jogger and willing to sell it used, and this keeps the price for a used jogger very high. So, if you can afford a nice one, it may be worth it in the long run. If you are going to spend the extra money, I highly recommend one with ball bearing quick release wheels that collapses quickly for transport in your car. Before you purchase a jogging stroller, it pays to shop and compare. Try looking in the advertisement section found in the back of *Runner’s World Magazine* for toll free numbers to receive free price lists.

The companies offering jogging strollers at both ends of the price scale are the Motiv Joggett or the Super Jogger.

If I wanted to save money and was not overly concerned with putting the stroller in the car, I would purchase the Motiv Joggett/Jog’R Cycle. The phone number for this company is (714) 731-6011. It sells for around $80 to $100, weighs 30 pounds, has basic 20” wheels, takes about ten minutes to take down and ten minutes to set up using a screw driver and wrench. This may be the best deal for the money. This stroller performs surprisingly well, rolls smoothly, and turns well. It is made in Mexico. It does not have a brake, and it comes with a canopy and pouch/pocket.

If I could afford it, I would purchase the Super Jogger or Super Trainer by Racing Strollers, Inc. The phone number for this company is (800) 241-1848. The cost on this stroller is higher, between $200 to $550. The weight varies, depending on the model. The wheels are 12 to 20 inches, depending on the model. Some models are collapsible. These strollers are a bit expensive. Factory seconds, when you can find them, are a better bargain. The top end, the Super Twinner, has locking pins allowing it to be easily folded to fit in the trunk. Not all models do this, so check before you buy, if portability is important to you. The strollers perform well. Canopies are available, sometimes at extra cost.

I have also heard good things about the Burley bike trailer/jogger. It costs a lot, $450, weighs 16 pounds, carries two children, has an aircraft aluminum frame, quick release hubs, graphite components, breaks down in less than five minutes, and looks like a tent on wheels.

**Baby’s Comfort**

It is important to remember that the baby will need more clothing than you, even in warm conditions. This becomes very important when there is wind or the temperature is below 50 degrees. Remember, you are burning calories and increasing your body temperature as you jog; the baby only needs to lie there and enjoy the ride. Mittens, a thin hat worn under the helmet to keep the head and ears warm along with an oversized polar-type suit should take care of the baby’s comfort.
Self-Check Exercises

Answer the following questions. You may use your course manual as needed.

1. If a female runner eats a balanced diet she will have the same iron levels as a male who eats a balanced diet.
   a. true
   b. false

2. Amenorrhea in female runners is primarily caused by a lower than normal percent of body fat.
   a. true
   b. false

3. Osteoporosis in female runners has an important relationship to amenorrhea.
   a. true
   b. false

4. Female runners seem to have the same types of overuse injuries as male runners.
   a. true
   b. false

5. Female runners seem to have a greater risk of stress fractures than male runners.
   a. true
   b. false

6. The most important factor influencing the gain or loss of body fat in most people is exercise.
   a. true
   b. false

7. An important factor influencing the gain or loss of body fat in runners is the total number of calories consumed over time.
   a. true
   b. false
8. If you are able to run four to five times a week for at least thirty minutes in your aerobic training zone, you will become aerobically fit and not have a problem with excess body fat.
   a. true
   b. false

9. Hydration is a very important part of your running program, especially during warm weather. Your longer, harder runs would benefit most from drinking only water before running and a carbohydrate drink with a high caloric content when you finish.
   a. true
   b. false

10. If you eat a late dinner and get up early the next morning with no appetite for breakfast, it is not important to eat a good quality breakfast before going about your normal daily activities as long as you hydrate well and eat a good quality lunch on time.
    a. true
    b. false
Lesson 7
Log Check

This lesson will help you chart your mileage progress throughout this course. You will be able to see your daily training volume in both minutes and miles walked, jogged, or run. You will be able to observe your training patterns on volume, intensity, and density.

Your Objectives

After you have successfully completed this lesson, you should be able to do the following:

1. Discuss the importance of diligently recording your daily workout minutes, heart rate, and miles on your Daily Training Volume Log, and of diligently recording your total mileage each week on your Weekly Mileage Log. These logs are found in appendix B of this course manual.

2. Regularly review both logs to see if you are making acceptable volume progress towards your goals for the completion of this course.

3. Remember to take your exercise heart rate immediately after some of your runs to be sure you are exercising in your training zone.

4. Quickly recognize training errors if they occur in your running program regarding the principles of volume, intensity, and density.

5. Complete the mileage requirements for this course.
How to Proceed

☐ Step 1: Review the requirements for turning in your correctly completed Daily Training Volume Logs. The requirements are found in lesson 4 and the logs are found in appendix B of this course manual.

☐ Step 2: Review the requirements for turning in your correctly completed Weekly Mileage Log. Again, the requirements are found in lesson 4 of this course manual and the logs are found in appendix B. Tally your total miles run during the course at the bottom of this log.

☐ Step 3: Complete the assignment for this lesson by completely filling out all portions of your Daily Training Volume Log and Weekly Mileage Log. Be sure to add up all of your miles and total them at the bottom of the page.

☐ Step 4: Submit your assignment to Independent Study according to the instructions below.

☐ Step 5: Look back now at the objectives for this lesson. Can you do all they specify? If not, review the appropriate material before continuing.

☐ Step 6: Proceed to the section titled “How to Prepare for the Final Examination.”
How to Prepare for the Final Examination

The final examination consists of fifty questions, a few more multiple choice than true or false. Many of the questions test your comprehension of the facts of the course, while others test your ability to apply those facts. Thus, the questions are similar to what you have encountered in the lesson self-check exercises and the Speedback assignments you have submitted. You will have a time limit of three hours in which to complete the final exam. Remember, you must pass the final exam with a score of 60 percent or higher in order to pass this course.

To prepare for the examination, I suggest you do the following:

1. Review the general course objectives and then the specific objectives in each lesson. Make sure you feel that you can achieve these objectives at a superior level.

2. Review the self-check exercises. Try taking them again as a quiz, covering up your previous answers. Note any questions you’re unsure of and review the material about those topics.

3. Rework the Speedback assignments. Do this in a test-like atmosphere where there is no noise or other distractions and without looking at the course manual or notes you may have made.

When you feel prepared to do well on the final examination, complete an Examination Request form and submit it to Independent Study.
Evaluation

At the same time you submit your assignment, please include the course evaluation form you received when you enrolled in this course. It is important that you respond to each statement on the form. This will permit us continually to improve our courses and our service. *Be sure to use a soft-lead (#2) pencil so that the form can be scanned.*

Thank you for your assistance.

Notice of Course Completion

When you have completed this course, you will receive a notice of completion that includes your grade for the course. You should receive this notice within two weeks of completing the course.

For university-level courses, grades are automatically posted on an official BYU transcript. You may request a transcript, after you have received your Notice of Course Completion, from the BYU Records Office (B-150 ASB, Provo, UT  84602) for a $2 fee per copy.
# Appendix A

## Answers to Self-Check Questions

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**Scoring Key**

- 7 correct = excellent
- 6 correct = very good
- 5 correct = good
- 4 or less correct = review needed

- 6 correct = excellent
- 5 correct = very good
- 4 correct = good
- 3 or less correct = review needed

- 8 correct = excellent
- 7 correct = very good
- 6 correct = good
- 5 or less correct = review needed
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Appendix B
Daily Training Logs
and Weekly Mileage Logs
Daily Training Log

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Total Miles ________________
## Daily Training Log

Name ____________________________  Age ______________  Year ____________

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Total Miles ______________
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Total Miles ______________


# Daily Training Log

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# Daily Training Log

Name ___________________________ Age _______________ Year _______________

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Total Miles ___________________
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Name _________________________  Age ______________  Year ______________

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Total Miles __________________
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Total Miles _________________
# Weekly Mileage Log

Name ____________________________  Age _______________  Year ____________

| month | day | <5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | >22 | miles |
|-------|-----|----|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|------|
|       |     |    |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |     |
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|       |     |    |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |     |
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|       |     |    |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |     |
|       |     |    |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |     |
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|       |     |    |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |     |
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|       |     |    |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |     |
|       |     |    |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |     |

Total Miles _________________
### Weekly Extended Mileage Log
(for individuals covering more than 22 miles per week)

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Total Miles ________________
Weekly Extended Mileage Log  
(for individuals covering more than 22 miles per week)

<table>
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<th>Name</th>
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<th>Year</th>
<th>week’s total</th>
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| month day | <6 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | >40 miles |
|-----------|----|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|           |

Total Miles ________________