

# YEAR-ROUND FITNESS PROGRAMMING

## Principles of Training

Several principles are vital to successful and safe fitness training programs:

- ❖ Overload – increase in demand to force bodily adaptation. Three factors can be altered to overload the body – frequency (how often), duration (how long), and intensity (how hard). It is safest to alter one factor at a time.
- ❖ Progression – the load (frequency, duration or intensity) should be changed in a slow, systematic manner to allow gradual adaptation of the body.
- ❖ Variation – alternation of stress is a necessary part of Progression. A weekly and monthly schedule should contain alternating periods of hard and easy work. Work should alternate with periods of rest to allow the body to adapt to the changes that have occurred. These recovery periods occur routinely every 3-4 weeks.
- ❖ Readiness – the body must be physiologically ready for training.
  - Prepubescent athletes respond to strength training by exerting more force, but have no change in mass of muscle.
  - Prepubescent athletes respond to anaerobic conditioning by developing better systems to handle the buildup of lactic acid.
  - The development of neuromuscular skill is related to practice, not age, so any athlete can respond to skill training.
  - Post-pubescent athletes respond to training of all systems (aerobic and anaerobic, muscle strength and endurance, and power).
  - Maturity improves the athlete's ability to follow instruction and schedules.
- ❖ Commitment – improvement in overall fitness requires long-term commitment. The gains that are made slowly and steadily are the most lasting. Additionally, training and **fitness gains will only remain intact if fitness programming is continuous** – if you do not use it, you lose it in as little as several weeks.
- ❖ Individuality – each athlete responds in his/her own individual way to fitness activities. Heredity determines many physiological factors such as heart and lung size, characteristics of muscle fiber, physique and balance. The amount of rest and sleep, as well as responses to the environment (heat/cold, pollution, stress, and altitude), vary from one person to the next. Nutrition and past or current illness or injury will likewise have any influence on ability to perform. Finally, level of fitness affects response; initial gains are greatest in the unfit, while the fitter individual has to work harder to effect a change.
- ❖ Specificity – if an individual decides to link their fitness plan to a training program for sport(s), the training program must be specific to not only the type of training, but the specific systems trained. For example, a sprinter should train for anaerobic condition whereas the distance runner trains more aerobically. The cyclist should train on the cycle, whereas the swimmer should swim. The runner should develop strength in the legs and trunk, while the swimmer focuses on strength and endurance in the shoulders, trunk and legs.

The fitness program can and should include cross training of similar muscles in a similar manner (i.e. interval cycling for the short distance runner is helpful for variety and for reduction of stress on the body, but should not substitute for specific training).

## Periods of Training

Improvements in performance are not linear, but occur at different rates in the physiological systems. For these reasons, fitness and/or sports training should be divided into useful periods with varying goals depending on the time relation to the actual athletic event. A well-designed fitness

plan not only changes its focus from period to period, but also varies from hard to easy, and from activity to rest within each seasonal period.

The most logical division of the year for the person who is involved in one or more athletic activity is into periods related to the athletic event:

- Pre-season = that 8-12 week period prior to the initiation of competition. The goals of the pre-season period include: development of sports-specific muscle strength and endurance; development of appropriate aerobic (endurance) vs. anaerobic (high intensity) conditioning; development of muscle power (as needed for activity); and development of sports-specific skills and team play.
- In-season = the weeks of the competitive season. The training program during the actual season has two primary goals: maintenance of the gains of pre-season training; and continued specific attention to areas of the body at risk either from past injury, or the particular risks of the sport.
- Post-season = the short period of 3-4 weeks or less following the end of competition. The goal of this period is rest, and physical and mental recovery of the athlete.
- Off-season = the period of longest time between post and pre-seasons. The focus of the off-season is recovery and rehabilitation of injuries; overall aerobic conditioning; development of general, balanced muscle endurance and strength; and development of neuromuscular balance and coordination.

If the athlete is involved in more than one athletic event, these periods must be tailored around the various athletic pursuits.

## **Systems Training**

Two primary systems of the body have to become fit for activity: the energy system and the muscular system.

### Energy System

Several physiological components - the cardio respiratory system (heart and lungs), the muscular system, the circulatory system, and the endocrine glands – can affect the storage and efficient use of fuels when exercising. Various forms of exercise use different fuels via different pathways depending on the intensity and duration of the activity, and the level of fitness of the individual. The goal of effective training is to make the appropriate systems most efficient when the activity is performed.

- Aerobic (with oxygen) energy production means an activity that is of low enough intensity that oxygen is available for the task. This is a very efficient use of fuels, as oxygen is readily available with minimal development of waste products. Examples of aerobic activities include jogging or cycling.
- Anaerobic (without oxygen) activities are of such high intensity or speed that adequate oxygen is not available, and the body must burn glycogen (carbohydrate stored in muscle). This system is less efficient, and builds up lactic acid that hastens muscle fatigue. This acidic result must be removed and glycogen replaced for further activity to occur. Examples of anaerobic activities include power lifting, sprinting and jumping.

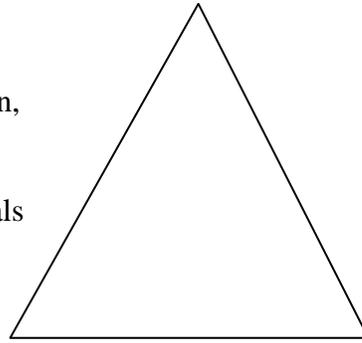
Energy training should develop in a pyramid design:

All activities require an aerobic base of fitness to take in, transport and utilize oxygen. The types of activities that demand aerobic efficiency include long, slow distance activities, or natural activities that have intervals such as dancing or over-land jogging.

As aerobic endurance improves, you can make the task more challenging by increasing duration, distance, or effort (like adding gentle hills). The

level of intensity of aerobic exercise is usually 50-70% estimated maximal heart rate.

Development of this aerobic base will take at least 4-6 weeks. This training usually occurs during the OFF-SEASON.



Estimation of MAXIMAL Heart Rate = 220-AGE

Estimation of RESTING Heart Rate = HEART RATE UPON WAKING

Estimation of TARGET HEART RATE RANGE for Exercise:

$(\text{MAXIMAL Heart Rate} - \text{RESTING Heart Rate}) \times (\text{PERCENTAGE OF EXERCISE INTENSITY}) + \text{Resting Heart Rate}$

Example: 220-20 yrs = 200 maximal heart rate

Heart rate in AM = 80

$200 - 80 \times 50\% + 80 = 140$  beats per minute

\*\* For individuals with Down Syndrome the formula has been corrected as follows:

Assess heart rate by taking the pulse at the carotid artery (in the valley to the outside of the windpipe) for 10 seconds, then multiply by 6.

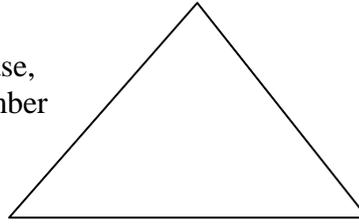
Anaerobic training builds on the aerobic base, and challenges the athlete at the upper level of aerobic capacity, usually at 75-90% estimated maximal heart rate. Several easy indications of anaerobic effort are difficulty with breathing, or difficulty with sustaining effort. Exercise at this level makes the body more efficient, with less production of lactate for the same effort, and more efficient dissipation of the lactate produced. Examples of anaerobic activities include interval training, training at various speeds, or training at a defined pace. Anaerobic training usually commences in the PRE-SEASON.

Once anaerobic efficiency is developed, the athlete who needs speed for performance can begin adding these elements into training. Examples of speed work include sprints, starts, and increased velocity activity. These drills usually occur during EARLY IN-SEASON. The goal is to peak at the correct point in the season for maximum performance.

## Muscular System

Just as with the energy system, the muscular system must also be developed for efficiency of action. The muscular system can be trained for endurance, strength, power, and speed in a similar pyramid design:

Muscular Endurance is the ability of the muscle to perform repetitive contractions. Similar to aerobic base, all activities involve some type of repetition. The number of repetitions needed are dependent on the particular activity, but you should train your athlete for the necessary number of repetitions. This training is usually completed in sets and repetitions (i.e. a pitcher might do 2 sets of 50 repetitions, while an outfielder may do 3 sets of 15 repetitions). Repetition also trains the athlete to perform the activity correctly before any additional load is added.



Muscular Strength is the development of maximal force in a muscle or group of muscles. Once muscular endurance has been developed, the activity can switch to development of more force in specific muscles. The number of sets and repetitions again must be designed with the activity in mind, but usually 5-6 repetitions in 2-3 sets will be effective for most strength activities. Prepubescent athletes should do more repetitions per set because of lower neuromuscular efficiency. The athlete should ultimately be able to lift 2 – 2.5 times more resistance than they will encounter in their activity.

Muscle power is the ability to exert force (strength) over a distance in relation to time, usually quickly. Power cannot be developed until the athlete has first developed strength. This is a common error in training that can lead to injury.

Training for power combines force and speed in a sport-specific activity. For example, instruct the athlete to lift 30-60% of the maximal amount quickly for 15 repetitions in 2 sets. Another example of power activities is plyometrics, or explosive activities that build the strength and elastic recoil necessary for jumping or bounding activities. Any coach who desired to use plyometric activities should consult either a healthcare professional, or a specific text on the subject because this activity can easily cause injury if not performed correctly.

## **Over-training**

Over-training results in unexpected or unexplained decline in performance because training has exceeded the body's ability to adapt. Rest is no longer adequate for recovery.

Common signs of over-training include:

- Irritability and moodiness
- Altered sleep patterns
- Loss of appetite
- Loss of motivation or competitive drive
- Persistent muscle soreness that does not dissipate
- Fatigue not relieved by rest
- Increased incidence of minor illness or injury

The best cure for over-training is prevention through a well-designed fitness and training program. Vigilance by the coach and support staff in the form of observation, dialogue and training logs will assist in prevention of over-training.





arm swing to opposite ankle  
figure 8 with wheelchair  
dance in chair)

**Muscle Endurance (20 Minutes) or Muscle Strength (20 Minutes) depends on the number of sets and repetitions**

Bent-knee or regular push-ups

Or chair push-ups

Chin-ups

Bent-knee sit-ups

Bent-knee diagonal sit-ups, elbow to knee

Partner resistance walking or riding with stretch band

Half-squats or alternate lunges

Or knee straightening

Up on toes – bend one knee and go up and down on the opposite toes.

Or stretch band resisted toe pointing

Hip side lifts – lie on side with lower leg bent at hip and knee.

Lift upper leg out to the side and slightly back, lower slowly

Can also do standing with stretch band.

Hip back lifts – lie upper body on a table or bench, bent at the hips.

Supporting weight on one leg, lift the other leg back and up to level with the body, and lower slowly.

Can also be done with stretch band in the standing position.

Stretch band resisted arm pumping forward and back

Stretch band rowing

Stretch band overhead press

Weight lifting (use weights or milk bottles filled with sand):

Lift arms straight forward

Lift arm straight back either lying on a bench

OR bent forward with knees bent

Bench press

Dips on bars or chairs

**Cool-Down**

Slowly walk or wheel in circles

Trunk twists

Arm circles

Shoulder circles

Head turns

Stretching (insert cool-down stretches for athletics here)

# Sample Off-Season Fitness Program

## Warm-up (15 minutes) 10 repetitions each exercise

Head turns - side to side  
Shoulder shrugs  
Arm circles – with arms elevated to side, elbows straight  
March in place  
Up and down on toes  
Windmills

## Stretching (15 minutes)

Elongation stretch  
Knee to chest stretch  
Seated forward bend  
Chest stretch  
Hip rotation stretch  
Groin stretch  
Hamstring stretch  
Quadriceps stretch  
Standing calf stretch  
Upper back and shoulder stretch

## Aerobic Activity (20 minutes)

Jogging (wheelchair running)  
Jumping jacks  
Jumping up and down  
Hopping from one foot to the other  
Windmills  
Sidestepping in a line  
Dancing  
(Alternate activities for athletes in chairs:    medicine ball toss  
   alternate knee kicks  
   arm swing to opposite ankle  
   figure 8 with wheelchair  
   dance in chair)

## Muscle Endurance (20 Minutes)

Or

## Muscle Strength (20 Minutes) depends on the number of sets and repetitions

Bent-knee or regular push-ups  
    Or chair push-ups  
Bent-knee sit-ups  
Bent-knee diagonal sit-ups, elbow to knee  
Partner resistance walking or riding with stretch band  
Half-squats or alternate lunges  
    Or knee straightening  
Up on toes  
    Or stretch band resisted toe pointing  
Stretch band resisted arm presses forward

Stretch band resisted arm flies from front to side  
Stretch band rowing  
Weight lifting (use weights or milk bottles filled with sand):  
Lift arms straight forward  
Lift arms out to side with elbows straight  
Bend and straighten elbows.

### **Cool-Down**

Slowly walk or wheel in circles  
Trunk twists  
Arm circles  
Shoulder circles  
Head turns  
Stretching (insert cool-down stretches here)

## **COOL-DOWN**

### **Cool-Down**

A cool-down period should be the completion of each training and competition session.

Cooling down has several physiological benefits:

Allows heart and respiratory rates to slowly decrease toward resting rates

Allows circulation to clear metabolic by-products

Reduces the likelihood of stiffness and delayed-onset muscle soreness

Allows circulation to adjust so it does not pool in the legs and lead to lightheadedness

The cool-down period should last at least 10 minutes, and immediately follow the activity. Slow, easy jogging, calisthenics or active movements, and stretching of the major muscles used in the activity should be performed. Stretching after exercise is the most critical element in reduction of delayed-onset muscle soreness.

### **Cool-Down Stretches**

**Knee(s) to Chest** – this is a stretch for the lower back. Lie on the back with both legs straight. Bend one knee toward the chest and place the hands behind the thigh. Pull the thigh toward the chest until you feel a stretch, hold 15-30 seconds, then release. Repeat 5 times. Return the leg to the straight position, then repeat the stretch on the opposite side.

**Seated Forward Bend** – this is an alternative for the Knee to Chest stretch. While seated in a chair, slowly bend forward between the legs. Keep the buttocks on the seat. Dangle arms toward the floor, hold 15 seconds, and slowly roll back to the sitting position. Repeat 5 times.

**Hip Rotation Stretch** – this is a stretch for the muscle on the outside of the hip. Lie on the back with the hips and knees bend, feet on the floor. Cross one leg over the other. Use the leg that is crossed over to pull the other leg toward the floor until you feel a stretch in the outside of the hip or the low back. Hold for 15-30 seconds, release, then repeat 5 times. Uncross legs, and do the same exercise on the opposite side.

**Hamstring Stretch** – this is a stretch for the muscles on the back of the thigh. Sit on the ground or in a chair. Bend one leg at the knee, and place the other leg straight. Keeping the back straight, bend forward at the hip toward the toes of the straight leg. Hold 15-30 seconds, relax. Repeat 5 times. Reverse legs, and repeat the stretch on the other side.

**Standing Calf Muscle Stretch** – this is a stretch for the muscles in the back of the lower leg. Stand facing a firm surface and place your hands on the surface. Place one leg directly behind the other, with both feet pointed straight ahead. Keeping the heel of the back foot flat on the floor, bend the front knee and lean forward until you feel a pull behind the ankle. Hold 15-30 seconds, release and repeat 5 times. Switch the position of the legs, and repeat with the exercise with the other foot in the back position.

**Seated Calf Muscle Stretch** – this is an alternative for the standing calf muscle stretch. Sit with one leg comfortably bent at the knee, foot resting by the opposite thigh. Place the other leg straight in front. Drape a towel or non-elastic cord around the forefoot of the leg that is straight. Gently pull on the towel until you feel a stretch behind the ankle. Hold for 15–30 seconds, relax, then repeat 5 times. Change the positions of the legs, so the other leg is straight, and repeat the exercise on the opposite side.

**Upper Back and Shoulder Stretch** – this is a stretch for muscles of the upper back and back of the shoulder. Sit erect and cup under one arm with the other. Pull the arm that is being held across the chest while you also rotate the trunk, hold 15-30 seconds, relax. Repeat 5 times, then change arms and repeat on the other side.