An Intelligent Person’s Guide to Fitness

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Preface

This book is written for everyone who minds his body.

During my tenure as DIG (Training) in Special Protection Group (SPG) I utilized the opportunity to study the science of fitness, consult the experts and experiment a lot on ground. The results were quite heartening.

This book is based on those studies and experiments. I have frequently consulted the books and other materials brought out by the National Strength and Conditioning Association (NSCA), American College of Sports Medicine (ACSM) and other books published by Human Kinetics. The book deals with all relevant whys and how’s of exercise, nutrition and weight management which will be immensely helpful to an intelligent reader to design his/other’s exercise programme. It will also be equally useful for professional trainers in various fields, e.g., police, armed forces, schools, gyms, etc. who will grasp the subject of fitness and gain confidence in experimenting with their trainees.

The science of fitness is highly technical. However, I have tried to present the subject in a simpler way. You will enjoy learning those frequently used fitness jargons like VO$_2$ max, ROM, HRR, etc. Use of these jargons in your conversation will make you smarter.

Finally, by reading this book you will ensure that nobody misguides you on the subject of fitness, and vice versa.

This book is strictly for internal use only.

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BASICS OF EXERCISE

I. INTRODUCTION

A healthy lifestyle is an intelligent combination of exercise, nutrition and positive mind-set. Being healthy and fit is often a matter of our own choice. If you are smart, you will take an elevator to reach the 10th floor; if you are smarter, you will take the stairs. The choice is yours!

Your choice of a lifestyle mainly depends on how you perceive your body. Do you identify yourself with your body? Or, treat it as a sacred tool to achieve something worthwhile in your life? As ancient Sanskrit poet Kalidasa wrote, shariramadyam khalu dharma sadhanam (Our body is the tool to perform our dharma (duty). If you treat your body as a sacred tool, you will not abuse it. Rather, you will train it hard and feed it on right nutrition. On the other hand, if you identify yourself with your body, you will tend to be comfort-loving; you will detest hard work and indulge in immediate sensual gratification e.g., sitting in front of TV for hours and binging on pizza! The choice is always yours!

10 Mantras to Remember

Before you undertake an exercise programme, remember these ten Mantras –

(i) Human body is a complex machine. Two individuals would not respond alike to the same exercise or nutrition because of their peculiarities of genetics, age, sex, medical history, body composition, Resting Metabolic Rate (RMR), emotional well being, etc. Therefore, you have to experiment with your body and find the best exercise and nutrition solutions that suit you.

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1. Resting Metabolic Rate (RMR) is the amount of calories required for maintenance of normal body functions.
(ii) Look around to find ‘real’ people who are healthy and fit. Study their pattern of exercise, nutrition and lifestyle and see if something can work for you also. You may get many small but useful tips from them, e.g., wearing underwear one size smaller or shoes one size larger than your regular size can make your long runs more comfortable; or, a banana before or during your exercise may provide a wonderful fuel throughout your exercise session.

(iii) The subject of health and fitness is quite vast. Therefore, other aspects should also be taken care of. For example, you may never realize that chronic sleep debt or mental stress might be restraining you from reaching your peak performance despite having excellent exercise regimen and balanced diet.

(iv) Know the basics of exercise and nutrition, but be bold enough to experiment with what you see around – without any prejudice. Many of the top world sports persons are vegetarian and practice Yoga, Tai Chi, meditation to enhance their performance.

(v) Mind and body influence each other. Without focus of mind you cannot reach your peak training potential. ‘My mind is everything. My muscles are pieces of rubber’ – Paavo Nurmi (all time great distance runner, holder of 22 world records.) Similarly, the state of your body also affects your state of mind. Try this next time – when you are depressed – put on your running shoes, run slowly for 40-60 minutes and your depression would vanish!

(vi) Give your body its proper place in your overall scheme of things. Don’t extol your body beyond what it deserves. A body-centric approach may lead you to disgusting obsession with your body and you may end up taking power performance drugs like steroids. A healthy body with a healthy mind should be our objective.
(vii) Don’t expect miracles overnight. Beware of all those books, machines and miracle foods claiming to give you muscular body with six-pack abs within a week or month without any workout. Fortunately, there is no alternative to intelligent and hard (and harder) work (outs)! Keep patience. Take no short cuts. Generally, one reaches one’s peak potentiality after 40-42 weeks of persistent and scientific training, though benefits of exercise start to appear from the first week itself.

(viii) Be an intelligent investor. Invest more time and money for your health and fitness. Take out daily at least half an hour for vigorous exercise. This is the best Life Insurance Policy ever invented!

(ix) Never compete with others. Compete against yourself. By competing against others you may get into too much too soon trap and end up injuring yourself – physically, mentally and emotionally!

(x) Aim for fitness with health. You must understand that health and fitness are two different things. Physical health can be described as smooth functioning of all our systems including nervous, energy, skeletal, endocrine, cardiovascular systems; it is not merely absence of any disease. Mental and emotional well being is the other important aspect of health. Fitness, on the other hand, is one’s ability to meet certain measurable physical standards for a particular job, e.g., fitness for army, college football team, etc. You may be an impressive body builder but in the process if you have overburdened your kidneys with high-protein diet, that is not a fitness with health. An intelligent person will never pursue fitness at the cost of his health.

**Draw a bigger line**

Once you have realized the importance of healthy lifestyle, the next challenge is to keep yourself constantly on the track. For this you require a positive approach towards exercise. Sometimes exercise and nutrition is
'prescribed’ as a complementary preventive, regulatory or curative medicine for certain diseases. Many persons start exercise only after they are detected with some disease, e.g., diabetes or heart disease. They take exercise as a bitter pill. This is not a right approach to start exercise and like most of the New Year resolutions this also will not take you very far. I laugh at the ways suggested sometimes by health magazines and articles in newspapers for fat loss e.g., how to control your cravings for ‘good’ food. Even Gastric Bypass surgery is suggested!

Don’t take up exercise ‘just to be fit’. Adopt healthy lifestyle as celebration of life. Aim BIG. For example, aim to run half marathon next year. Once you start training for the half marathon, automatically junk foods, late night parties or late morning sleeps will fast lose their attraction for you. Nutritious food and regular training sessions will replace your lethargic routine. Remember, aiming big is the only way to steer clear of small temptations in life.

It’s for everyone, everywhere

The scope of this book has been deliberately kept limited to free hands exercises which can be performed anywhere. You may like to do them with your partner. Once you have mastered the basics of exercise, you may also like to invest in a few sets of free weights. Buy dumb bells, bench, chin up bar. That’s all. Do exercise with whatever is available. But do start. Use stairs of hotels, do skipping in the room, do circuit training in your room. A space of 6' x 6' is big enough for exercise.

Knowledge is for action

Learn the basics of exercise and nutrition. Learn more than the basics. And, apply the knowledge. “Knowing is not enough; we must apply.” -Goethe. Maintain a log book to keep record of your daily exercise regimen, nutrition and monitor your progress in fitness and well-being. Experiment with
yourself. And see for yourself what really works for you. For example, you may observe after some time that your body requires a little longer recovery period. Or, your body system is not comfortable with dairy products.

Finally, set your focus right. Focus on fitness and health, not on the shape or weight of your body. As long as you have steady progress in health and fitness, you should not worry about your shape or weight. Genetically very few persons have been endowed with the potentiality of building a model’s physique. However, this should not disappoint you. Look at the top sportspersons in any field of sports to realize this truth. You will find that very few of them have a model’s physique, though all of them are supremely fit! If you are constantly worried about your weight, I must tell you that ironically, weighing machine is the most used though most useless equipment in a gym. This issue will be discussed in detail in the chapter on Weight Management.

II. BENEFITS OF EXERCISE

These are the major benefits of exercise –

(i) It delays biological aging. Your aging process is influenced by your genetics, environment and lifestyle. Let me explain that chronological aging is different from biological aging. For instance, all persons born on 05\(^{th}\) February 1966 will inevitably turn 45 on 05\(^{th}\) February 2011 (this is chronological age). But not two of these persons will be of the same biological age at any given point of time! Interesting? This is because biological aging is the aging of our biological systems, i.e., cardiovascular, skeletal system, etc. Thus it is quite possible that heart of a trained athlete of 60 may be biologically younger than that of a sedentary person of 30. Next time when someone asks your age, ask him back – chronological or biological one?
Regular exercise delays aging process in the following ways –

(a) As you age, there is decline in efficiency of your cardiovascular system. By regular exercise, especially aerobic exercise, your VO₂ max (V – Volume; O₂ – Oxygen; max – Maximum.) improves. VO₂ max refers to uptake of maximal oxygen and its utilization by your body. A higher VO₂ max means – (a) your heart’s capacity to pump blood is increased; (b) your lungs’ capacity to fill themselves with larger volume of oxygen is increased; (c) your arteries and blood vessels can deliver more oxygen; (d) your muscles will utilize oxygen more efficiently. The net result of all these will be that you will tire less even at a higher intensity of activity.

(b) We lose about 0.2 kg of muscle per year during our 30s and 40s. This process of muscle loss is called sarcopenia. The rate of muscle loss may double up to 0.45 kg per year in people past 50 years². Regular exercise, especially strength training, decreases the rate of muscle loss. Strength training contributes to strength gain at any age.

(i) It helps to prevent cardiovascular diseases, stroke, type II diabetes, cancer of colon.
(ii) Low-intensity endurance training has a lowering effect in cases of high blood pressure.
(iii) It helps to increase HDL (High density lipoprotein) and decrease LDL (Low density lipoprotein). Lower LDL and higher HDL means a decreased risk of coronary heart disease.
(iv) It reduces total body fat and makes you leaner.
(v) It increases bone strength and is helpful in preventing those nasty bathroom hip fractures in advanced age.
(vi) It also strengthens cartilage, tendons and ligaments makes them more flexible and thus prevents injury.
(vii) It improves immunity against various diseases.
(viii) It improves overall strength, endurance, flexibility, agility, motor coordination and balance.

² NSCA’s Essentials of Personal Training p.468.
(ix) Regular exercise improves brain power, gives lightness of body, decreases anxiety and depression, makes you confident and enhances the feeling of well-being. It gives you sufficient energy reserve to excel in your day to day life whether at home or at work place.

III. PRINCIPLES OF EXERCISE

To design an effective exercise programme, certain basic principles of exercise must be followed. These principles are equally important for everyone, whether one is an elite athlete or a common exerciser.

The basic principles of exercise are–

(i) **Regularity** – Regularity means that all exercises for cardiovascular endurance, muscle strength and flexibility should be done at least 3-5 times a week at *regular intervals*. Regularity in exercise promotes better performance by allowing regular load and then adequate rest to exercised muscles. Long gap between two exercise sessions may cause *de-conditioning* of muscles during which gains in strength, endurance or flexibility, etc. are considerably reduced or lost. Moreover, injuries are frequent results of irregular exercise sessions because de-conditioned muscles are mindlessly subjected to the same (previous) training load despite their decreased strength in the meantime.

(ii) **Progression** – Progression means that there should be *gradual increase* in intensity and volume of exercise. Increase in intensity means an increase in weight (in weight/resistance training) or an increase in heart rate (in endurance training). Similarly, increase in volume means an increase in number of repetitions (reps)/sets (in weight/resistance training) or an increase in total duration (in endurance training). Stressing your system *too much too soon* may actually harm you. It may cause overtraining and injury. Therefore, first know your existing baseline fitness level and gradually go on increasing the load. (See the section on **Strength Training/Endurance Training** for practical
guidelines on the rate of progression). It is always advisable to start with 2–3 weeks of gradual conditioning by doing light exercises before you graduate to a full-fledged exercise programme.

(iii) **Balance** – Balance means that an exercise programme must address *all* components of fitness, viz., endurance, strength, flexibility, speed, agility, etc. (See the section on **Components of Fitness**). However, there may be specific weightage on a particular component based on one’s training goal. For example, a marathon runner may focus more on endurance training while a football player may train mainly in speed, agility and strength. But irrespective of one’s training goal, one has to maintain certain basic balance among various components of fitness. Secondly, we have to balance between upper body and lower body as well as between opposite muscles. For example, it is necessary to keep balance between strength of quadriceps and hamstrings or between biceps and triceps to avoid injury. I have noticed many gym goers focusing mainly on exercising their upper body (which can be showed off to others) and ignoring their lower body. This is not a balanced approach.

(iv) **Variation** – Variation means (i) introducing different variations of an exercise and (ii) addressing muscle groups from various angles. If you stick to the same type of exercises for the same muscle groups for a period of time, you are bound to neglect certain other muscle groups in the process. This will result into weakness of unaddressed muscle groups. Variation is also helpful for overall development of a particular muscle group. Therefore, once in a while, add variation to your exercise programme for maximal gain. For example, performing push-ups at various hand-widths (narrow, shoulder-width, wide) or in various positions (inclined, declined, flat) will address the related muscles more widely. Variation also helps us to fight monotony.
(v) **Overload** – By overloading we mean frequently crossing the training threshold while maintaining the right form and technique. You cannot gain any further unless you challenge your body beyond its normal capacity. If you can do 20 push-ups today, overload yourself by doing further two more push ups, then one more, and one more … till your muscles fail *totally*. The more you load your system, the greater will be your training gains. If you continue with the same training load over a long period of time, your training gain will decrease due to accommodation of your system to the present load. Therefore, the key to maximal gain is to overload your system. You may overload your system by increasing intensity or volume of the exercise. Here, again, you should avoid ‘too much too soon’ approach.

(vi) **Specificity** – Specificity means designing an exercise programme for a specific group of muscles/specific component of fitness (see the section on **Components of Fitness**) for a *specific goal*. For example, a police officer may have goal of overall fitness, but a weight lifter will train specifically for strength. Similarly, training for a distance runner will be more endurance-focused training. However, one should go for specific training only after a general training on overall fitness. For example, a marathon runner, though specifically training for endurance, also needs strength and flexibility training. There are certain basic exercises which will benefit all the beginners and their overall fitness will improve. It is advisable that you should first do the basic training in strength, endurance and flexibility, and then only go for your goal-specific training.

(vii) **Recovery** — Recovery means allowing your *exercised muscles* sufficient rest between two sets/exercise sessions. The body repairs and strengthens itself during rest. When you exercise a muscle, the stress of exercise causes (i) muscle tissue breakdown and (ii) muscle glycogen depletion (loss of energy store). Recovery time allows replenishment of energy store and repair of broken down muscle tissues. *During rest period muscles grow stronger.* Not allowing sufficient
recovery time may result in overtraining (see section on Overtraining) which may further cause (i) reduction in performance and (ii) injury. Duration of recovery period may vary from 48 to 72 hours depending on the intensity and volume of training. Alternating hard training day and easy training day is also another way of recovery. This has been discussed in detail in the chapter on Exercise Programme Design.

IV. COMPONENTS OF FITNESS

These are the major components of physical fitness —

(i) **Cardiorespiratory Endurance** — Cardiorespiratory system is the interrelated collective system of heart, lungs and blood vessels. Cardiorespiratory fitness or aerobic fitness depends upon heart’s ability to pump oxygen-rich blood to the working muscles and utilization of oxygen by the working muscles. Cardiorespiratory endurance training should always find a proper place in your exercise programme and should be done 3-5 days in a week, depending on your specific goal.

(ii) **Muscular strength** — It is the maximal ability of a muscle (or muscle group) to generate force. In simple words, it means the maximum weight you can lift during a single repetition. It is measured in RM (repetition maximum³). 1 RM bench press or 1 RM squat is a good way to test your upper and lower body strength respectively.

(iii) **Muscular Endurance** — Muscular endurance is the ability of a muscle (or muscle group) to generate force repeatedly for a longer time. Although muscular strength and muscular endurance are related, they are not the same. An example of muscular strength is a person lifting heavy barbell during one maximal effort. In contrast, muscular endurance is illustrated by a person performing

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³ RM is measurement of the maximum weight that can be lifted one time.
**maximum number** of repetitions of Chin ups, abdominal curl ups, push ups etc.

(iv) **Agility** – Agility is one’s ability for quick start, quick stop, and quick change of direction. Agility is very important in games. A more agile boxer would save himself more from his opponent’s punches and land more punches on his opponent.

(v) **Speed** – Speed is one’s ability to ‘explode’ (move fast) from one point to another point within shortest time. This is an all out effort.

(vi) **Flexibility** – Flexibility can be defined as the ability to move joints through their full range of motion (ROM). Lack of flexibility training may shorten tendons and make them tight. Low flexibility is one of the major causes of injury. It is interesting to see some body builders moving like ‘robots’ with their rigid limbs. This is because of their lack of sufficient flexibility training.

(vii) **Body composition** – Having right proportion of fat and lean body mass is an important component of fitness\(^4\). (Total body mass includes fat and lean body mass. Lean body mass includes everything other than fat, viz., bones, water, protein, minerals).

V. **FITT FACTORS**

The acronym FITT stands for Frequency, Intensity, Time and Type (of exercise). It is important to keep these factors in mind while designing your exercise programme.

**Frequency**

It pays well to exercise the same muscle / muscle group frequently, 3-5 days a week, and to have two days off for recovery. While less than required frequency will yield very marginal benefits, too much of frequency may result in overtraining.

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\(^4\) This has been discussed in detail in the chapter *Weight Management.*
**Intensity**

Intensity refers to the degree of effort. Intensity in cardiorespiratory endurance is measured by heart rate. Low intensity endurance training means training at low heart rate. As the intensity of training goes up, heart rate also goes up.

Similarly, intensity in strength training refers to the load or resistance. Low intensity strength training means training with low resistance or low weights. Intensity in this case is measured by the maximum number of repetitions, popularly referred as RM (repetition maximum). Thus 5 RM would mean that one can do maximum 5 repetitions with a particular weight. Higher the intensity, lower would be the R M. (Naturally!)

Selection and progression in intensity will depend upon your exercise goal. For example, if your goal is to increase your muscular endurance, select a weight that allows you a 12+ R M. However, exercising at this intensity will have little effect on your muscle strength. To gain muscle strength you will have to increase the intensity that allows you 3-5 RM. Similarly, for cardiorespiratory endurance, major part of your training should consist of building aerobic base at low intensity. But to reduce your race time you will have to increase the training intensity e.g., by including interval runs. (See section on Running).

Also, follow the principle of progression while increasing your training intensity and avoid ‘too much too soon’ approach.

**Time (duration)**

This is one of the most frequently asked questions – what should be the minimum or maximum duration of exercise for maximum gains? Well, the answer is – it all depends upon your training goal, and availability of time. On one hand, there are professionals who train 5-6 hours daily; on the other hand, there are executives who hardly find more than 20-30 minutes to spare for physical training. If your goal is just to keep fit, and you have
only 20-30 minutes, a circuit training consisting of one or two sets of muscle strength / endurance training of all major muscles / muscle groups may be the answer. But if you really want to improve your cardiorespiratory endurance or muscle strength or flexibility, you need to invest a little more time in training.

For good cardiorespiratory endurance, one requires to do at least 20-30 minutes of continuous training. This excludes time for warm-up, cool-down and stretching. For muscle strength one needs to perform at least 3-5 sets of the same exercise. Total exercise time depends upon the number of repetitions, sets and recovery time taken between two sets. Similarly, each flexibility exercise also may require minimum 15-30 seconds, depending upon the type of stretch.

If you have to cut short your time on exercise, do so on the total number of repetitions / sets, but never compromise on the recovery time. Rushing through the ‘rituals’ of all exercises hurriedly without allowing recovery may result into undue fatigue and injury.

**Type**

There are different types of exercises e.g., walking, running, stair climbing, bicycling, rowing, swimming, etc., for cardiorespiratory endurance; free weights, resistance machines, free hand etc., for muscular strength / endurance; stretches, Yogasanas for flexibility. The selection of a particular type or a combination of more than one type depends upon your exercise goal. For example, if your goal is to excel in running, focus on running; swimming is not going to help you much. Likewise, for a discuss thrower, cardiorespiratory endurance exercises may not be of much help; he has to focus more on strength training and flexibility training. Availability of resources may be sometimes a crucial factor in selection of a particular type/types of exercise.

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5. Sample circuit training has been given in Appendix-I.
VI. WARM-UP AND COOL-DOWN

A. **Warm-up** – Systematic and sufficient warm-up is a must before starting any vigorous exercise session. Warm-up consists of a set of continuous exercises, which are done with a gradual build-up of speed to elevate body’s core temperature till the point of perspiration. Beginning of perspiration is a good indicator that we are sufficiently warmed-up. During warming-up the temperature of muscles increases. A warmed-up muscle contracts and relaxes more quickly. Secondly, warming-up also helps more blood flow to the muscles. More blood flow means supply of more oxygen to muscles and hence more energy is available for exercise. Thirdly, our ligaments, tendons lose their stiffness and become more stretchable. Fourthly, our joints become more flexible. All these prevent possible injury caused by sudden load of high intensity exercise caused by high speed or heavy weight.

No warm-up session is complete without stretching. Some people start warm-up session with stretching. This is not a proper way to start. In absence of sufficient elevation of our core temperature, our muscles, ligaments, tendons would remain stiff. If we stretch them in this condition, we would make them more susceptible to injury. Therefore, proper sequence of warm-up procedure would be to start with some easy slow body movements, gradually increasing the speed till the point of perspiration and then following it by stretching.

**Types of warm-up**

(i) **Passive warm-up** – In passive warm-up temperature of muscles is increased by outside efforts, e.g., by giving vigorous massage or hot baths. This is not always practical.

(ii) **General warm-up** – It involves movement of maximum number of muscles for overall warm-up. Slow jog followed by 20-30 metre
sprints, cycling, skipping, climbing hill or stairs, etc. are a few activities for general warm-up.

(iii) **Specific warm-up** – Before loading a specific muscle with high intensity exercise, it is advisable to warm-up that specific muscle. For example, slow jog will be good before starring a run. Light repetitions of bench press or a few push-ups will be helpful to lift a heavy weight afterwards.

Warm-up process may take slightly more time in a cold weather. Better conditioned sportspersons are also likely to take more time. Nevertheless, warm-up is too important to be overlooked.

**B. Cool-down** – Cool-down is reverse process of warm-up. While warm-up may be compared to pre-take-off run of an aeroplane, cool-down is like its taxiing after the landing. The same set of exercises used for warm-up can be used for cool-down also. It involves gradual decrease in the intensity of exercise before stopping completely. Cool-down allows increased heart rate and blood pressure to gradually come down to normal level. Cool-down process should be concluded with stretching. In fact, stretching is more important during cool-down than during warm-up. It helps to reduce blood pooling in exercised muscles and removes lactic acid build-up (which is the immediate cause of tiredness and discomfort). In absence of proper cool-down, we may feel discomforts like headache, nausea, cramps, at the end of intense exercise and stiffness of muscles, tendons subsequently.

**VII. INJURY MANAGEMENT**

**Causes** – 99% of our injuries during exercise are result of our own carelessness and violation of the basic principles of exercise. Injury may occur due to incorrect form and or technique, ‘too much too soon’ approach, low level of experience, medical history, low fitness level combined with overtraining, inadequate recovery time, lack of proper
nutrition, insufficient or no warm-up/cool-down, poor concentration, adverse environment, failure to understand warning signs of body. Injury may also occur due to malfunctioning of exercise equipment, cluttered gym, etc.

**Prevention** – Injury is largely preventable if we follow these guidelines –

(i) Purchase good quality equipment, training apparels including shoes.
(ii) Never ignore warm-up and cool-down.
(iii) Use proper form and technique.
(iv) Follow the basic principles of exercise.
(v) Get assistance of a spotter in case of lifting heavy weights.
(vi) Focus your mind on the exercise, especially during high-intensity exercise. Focus of mind not only protects you against injury, it also enhances your performance.
(vii) Take sufficient precautions against extreme environment (heat, cold).
(viii) Take proper nutrition. For example, lack of required protein may impair muscle growth and its repair.
(ix) Slight discomfort or agony during exercise is OK and desirable. However, any kind of joint or muscular pain should be treated as a signal to stop or slow down.
(x) When you resume exercise after a long gap, start from a lower degree of intensity / volume and gradually reach the standard you had achieved when you had left training.
(xi) Avoid jerky movements in weight training. All movements should be at a controlled, slow, smooth pace.
(xii) Stop exercise at once on warning signs of dizziness, acute fatigue, mental confusion.
(xiii) Flexibility prevents injury. Do include flexibility in your exercise session.
(xiv) In case of long-duration (more than 30-40 minutes) exercise, hydrate yourself well at frequent intervals.
In case of an injury, don’t deny your injury. Discontinue exercise and seek proper medical help to avoid further worsening of injury.

**Management** – In case of injury apply the principle of RICE (Rest, Ice, Compression, Elevation). Rest – Give rest to the injured part. Ice – Apply ice to the injured area. Cooling by ice decreases swelling of the affected part. Ice can be applied for 10-15 minutes at interval of 30-40 minutes. Compression – Compress the affected area with a firm but not too tight elastic bandage. Elevation – During first 24-72 hrs elevation of the affected part helps in checking swelling by reducing the blood flow.

Remember, RICE is a first aid only. Don’t hesitate to consult a doctor in case your injury prolongs.

Injury of any part of the body does not necessarily mean complete abandon of exercise. Unless medically advised otherwise, one can exercise one’s unaffected body parts. For example, if your shoulders are injured, there is no reason why you cannot exercise your legs, abdominal muscles, forearms.

**Overtraining** – Overtraining is generally caused by our ‘too much too soon’ approach to exercise. Inappropriately high levels of intensity or volume of exercise, or both combined together, and insufficient recovery time lead to overtraining. Neglect of proper nutrition is another significant factor that contributes to this phenomenon. One important sign of overtraining is that despite regular training, gains are stopped at a point and even worse, performance starts to decline. Other psychosomatic symptoms of overtraining are –

- Chronic muscle soreness/ joint pain, unduly nagging fatigue
- Stress-induced injury like tiny fractures
- Lack of enthusiasm for work out
- Lack of concentration
• Irritability
• Sleep disorders
• Decrease in lean body mass (decrease in muscle mass)
• Decrease appetite
• Lowered immunity level
• Frequent cold-like symptoms
• Altered blood pressure
• Altered resting heart rate (RHR)

An increase of more than 5 beats per minute above your normal Resting Heart Rate (RHR)\(^6\) may be an indication that you have done too much exercise on the previous day. So, next day either do little training or simply take rest.

VIII. ENVIRONMENTAL CONSIDERATIONS

Heat

It is important to maintain our body’s normal range of core temperature (36.1° - 37.8° C). Any excessive variation on either side of this range may affect our training performance and if not regulated, it may lead to injury also. During excessive heat (which may be caused by outside temperature or by high intensity of the exercise itself) our body starts sweating for cooling. However, sweating as a cooling mechanism of body has certain limitations. For example, during long bouts of exercise, as body’s water contents deplete, the rate of sweating also declines and it becomes less effective as a cooling mechanism. Similarly, cooling effect of sweating also depends upon the relative humidity of air. Higher the air humidity, less will be the sweat evaporation (as air is saturated) and consequent cooling of body will be less. (Recall the experience with desert...)
coolers during humid months). Thus, it is quite possible to feel more uncomfortable to run at 35° C on a humid day than to run at 40° C on a hot but dry day.

Exercising in excessive heat may cause heat cramps (muscle cramps in arms, legs or abdomen), dehydration (symptoms like fatigue, dizziness, rapid pulse rate, weakness), heat exhaustion (weakness, excessive sweating, low blood pressure, dizziness) or heat stroke (high body temperature, rapid pulse, stoppage of sweating, mental confusion, disorientation, hallucinations). Children and elderly persons are particularly more susceptible to heat induced injuries as their body has less sweating capacity.

Heat induced injuries, if not treated on time, may be fatal. Therefore, once the symptoms appear, exercise should be immediately stopped and medical help should be taken.

Heat-related injuries may be prevented by (i) drinking water before and during exercising in the sun; (ii) drinking appropriate sports drinks to maintain electrolyte balance in the body; (iii) avoiding exposure to excessive heat and doing exercise during cooler part of the day; (iv) wearing light, porous clothes that promote fast sweat evaporation; (v) reducing the intensity and volume of exercise. On humid days, it is advisable to exercise at lower intensity. Take time to acclimatize to hot days.

**Cold**

Mildly cold winter mornings are probably the most enjoyable part of the year to train. However, the problem starts in extreme cold when the body heat loss is greater than body heat production. This condition may occur due to either extreme cold or insufficient clothing or very low intensity of exercise. Exposure to severe cold may lead to hypothermia, frostbite or dehydration. Wind worsens the situation during cold. Here again, children and elderly are more susceptible to risks of cold related injury as their body cannot produce metabolic heat that effectively.
Exercising during cold is a good idea to retain one’s normal range of core body temperature. However, once exercise is stopped, exposure to sweat-soaked clothing may lead to hypothermia. Therefore, it is advisable to (i) do low intensity exercise to avoid excessive sweating; (ii) wear porous clothes to allow maximum sweat evaporation; (iii) change into a set of dry clothes immediately after the exercise. Do not forget to change socks and undergarments. Wearing track suit throughout the exercise session is not of much use. Once you are sufficiently warmed up, remove your track suit and exercise in normal one-layer apparel to allow sweat evaporation. Once you stop exercising, again wear the track suit to keep body warm.

Cold related injuries can be prevented by wearing suitable multiple layers of clothing. Multiple layers of thin clothing are more effective in retaining heat than single thick-layered clothing. A good amount of heat loss occurs through open head, neck and hands. Therefore, these exposed body parts should be properly covered. In extreme cold, wearing an additional pair of socks and undergarments will be helpful.

Our subcutaneous fat is an excellent insulator against cold. This makes skinny models (who have very low fat mass) more vulnerable to cold related injuries in comparison with others who have normal % body fat. Another interesting thing about cold is that for its maintenance our body utilizes more carbohydrate and fat than in summer. So, winter is a good time to work out hard, eat heartily and still be in shape!

High Altitude

At high altitudes our performance decreases mainly due to presence of less oxygen. Before starting serious training, therefore one should take 3-4 weeks time to acclimatize by progressively increasing the intensity and volume of exercise. If not sufficiently acclimatized, one may get headache, nausea, loss of appetite, sleep disorders, etc.
**Pollution**

When pollution level is very high outside, it is better to exercise indoors. Pollution is more harmful if you are doing a serious endurance training as it involves breathing through mouth. As you know, our mouth, unlike our nostrils, does not have any natural filter against pollutants. Therefore, select a time and place for exercise where pollution level is relatively low.

It is relevant to mention here that quality of indoor air – whether inside your house, office or gym – is an important issue. Moisture, pets, dust mites, materials used in household furnishings, e.g., mattresses, curtains, carpets, etc. are some of the major sources of poor quality indoor air. These may cause minor allergies and may aggravate respiratory problems. By providing proper ventilation, allowing sunshine to enter into the room, regular cleaning of furnishings, replacing carpets with hard surface tiles (which are easy to clean), regular cleaning of air conditioners, coolers etc. we can reduce the pollution level indoors.

**IX. WOMEN AND EXERCISE**

As men are generally bigger than women in size, their greater strength compared to women’s is mainly due to their larger size and hence greater muscle mass. There is no difference in muscle response of men and women and both can benefit in the same manner from a similar exercise programme. Generally, women are more flexible than men. Women have 25% smaller heart and 25-30% less lung capacity than that of men. Smaller heart means that it would have to work more to pump the same amount of blood. This combined with less lung capacity implies that women will fatigue faster than men. But this holds good only when we compare a woman with equally trained man. This should not, however, give men a false sense of superiority over women. A well-trained woman can beat an untrained/under-trained man in all aspects of physical fitness.
Women can exercise during menstruation. Pregnant women also can exercise, though with medical advice. Vigorous activity does not have any adverse effect on women’s reproductive organs or menstruation. There should be no undue concern about post-partum (after delivery of a child) fitness of women unless there have been other medical complications associated with it. There are many top ‘mother’ athletes in all sports and games. As regards apparels, proper sports bras are advised for women to prevent any damage to their breasts tissue during exercise causing prolonged jarring of breasts (e.g., in long distance running). Similarly, men are also advised to wear properly fitted underwears/supporters during such exercises.

Some women, especially long distance runners, may experience menstrual irregularities. Possible explanation for this is temporary sharp decline in estrogen production which is linked with fall in body fat below a certain level. Low-calorie intake and other nutritional deficiencies may be some of other factors causing menstrual irregularities. However, it is a temporary phenomenon and with restoration of normal fat percentage, normalcy is restored.

Many women fear that strength training would make them too muscular and give them a ‘manly’ look. This fear is unfounded as the muscle size of a woman cannot increase much beyond a point.

Women (as well as men) who are obsessed with weight control, often rely more on cardio-vascular exercise combined with low calorie diet. They ignore strength training and flexibility training. Such practice is against the basic principles of exercise. Avoiding strength training will deprive women of all its related benefits, viz., strengthening of muscle, bone, ligaments, tendons, etc. Bigger muscles help in weight control as they increase RMR of the body. Higher RMR means more caloric expenditure. Low calories intake decreases RMR and thus decrease the rate of weight loss. These
things have been further explained in the chapter on **Weight Management**.

There is another misconception that strength training would turn fat into muscle. It is impossible as these two are quite different. Strength training increases size of muscles fibres, not of fat cells.

**X. CHILDREN AND EXERCISE**

Moderate strength exercise, e.g., push ups, chin ups, squatting does not affect children adversely. It does not blunt their growth. It rather helps them to perform better in their school sports. However, intensive strength training involving heavy weights is not recommended for children on two grounds— (i) they may overtrain themselves without realizing its adverse implications and (ii) they may not follow the correct form and technique making themselves more vulnerable to injuries or deformities caused by repetitive use of wrong technique over a period of time.

As far as endurance training is concerned, studies suggest that children should not train intensively before age 18. Hard training before this age may result into their early burn outs. Intensive endurance training combined with low calorie diet may further cause damage to them. Therefore, it is advised, once they are mature, they can train hard. Speed training is more advisable for children. They should be encouraged to participate in a variety of games and sports for overall fitness and normal growth.

**XI. ELDERLY AND EXERCISE**

Exercise is beneficial at any age. It is never too late to start exercise. And there is no reason to stop it at any age. Look at **Baba Fauja Singh (born 1911)**, who set up a marathon world record of 5 hours 40 minutes in 2003 in the 90 plus age category. He re-discovered his passion for running at 81. **Manohar Aich (born 1912)**, nicknamed ‘Pocket Hercules’, the first
Mr. Universe (1952) from India, was another example of what elderly can do. WHO (World Health Organization) recommends that older adults should engage in at least 30 minutes of moderate intensity physical activity 5 days per week. In fact, there are no specific advices to elderly than for anyone else. Whether adult or elderly, the only point to remember is – follow the basic principles of exercise. Elderly should have a thorough physical examination before starting an intensive strength or endurance training.

Older adults must realize that with age their age-predicted maximal heart rate (APMHR or MHR)\(^7\) declines.

\[
\text{APMHR} = 220 - \text{age}.
\]

Therefore, know your training heart rate (THR)\(^8\) (see section on Endurance Training) and exercise within the limit. The body of an elderly takes more time to adapt to increased intensity and volume of exercise. It implies that your progression may be slower and recovery period may be longer.

Degree of (physical) balance declines in old age. Some of the bathroom falls may be avoided by ensuring good balance exercises. A few practical exercises can be done in day-to-day life to improve balance, e.g., taking off shoes while standing, standing on one leg and lifting the other upto knee level, (or, doing the same exercise with eyes closed) etc.

Aerobic exercise, e.g., brisk walk, jogging, cycling, swimming, etc., is an effective tool for weight management because it increases our total daily caloric expenditure. However, one must include some sort of strength training in his exercise programme because only strength training can slow down age-related decline in muscle mass, bone mass and overall strength.

\(^7\) MHR is the maximum safe limit of heart rate for exercise intensity.
\(^8\) THR is the heart rate at which one should train for optimal exercise benefits.
XII. EXERCISE APPARELS

Clothing

Clothing should be comfortable and should not restrict any movement of body during exercise. A good quality non-cotton T-shirt or sleeveless undershirt and gym shorts are best in warm weather. Light, porous clothing such as ‘fish net’ vests allow sweat to come on their outer surface and evaporate quickly, thus promoting faster heat loss from our body. (Such T-shirts and shorts are available in local markets and also in almost all brands, e.g., ‘Climalite’ (Adidas), ‘Dri fit’ (Nike) etc.). On the other hand, cotton T-shirts become soggy (heavy with water) after absorbing sweat and make a layer that prevents adequate heat loss from our body. The recommendation for polyester vests/T-shirts might sound strange, as we have always been advised to prefer cotton clothes. Yes, cotton clothes are preferable for their sweat-absorbing quality when we have to sit in the office where we do not sweat much, but polyester/nylon clothes are preferable during exercise for their faster heat loss facilitation quality.

Light-material sleeveless vests/shorts are easy to maintain, as they hardly require any ironing. They can be daily washed after one use (unlike track lowers, which are generally washed after 2-3 or even more usage). We should also not forget about the decency of our wears.

During winter, clothing should be both insulating and ventilating. It is better to wear more than one layer of clothing than to wear single thick clothing. Upto 40% of heat loss may take place through head, neck and hands when uncovered. Therefore, in case of extreme cold, head, neck and hands should be well covered.

Shoes

Choice of appropriate shoes can prevent one from many running-induced injuries. There are hundreds of varieties of shoes available in the
market in different price categories. While money is a factor, one should not save money on shoes only to later spend more (money as well as peace of mind) on treatment of injury! Therefore, choice is very clear – invest reasonable amount of money on purchase of good shoes, enjoy an injury-free running or buy a cheap pair of shoes, injure yourself and then go on spending more money on treatment of your injury!

Generally, while buying shoes, keep the following points in mind –

(i) Try shoes in the afternoon. The size of shoes should be slightly larger than your normal use conventional shoes. (Buy 9½ -10-No. running shoes, if you generally wear 9-No. shoes). This is because your foot swells during the day and during running.

(ii) When trying on shoes, wear socks in which you will run. Also, try on both shoes, as our feet slightly differ in size and shape.

(iii) Shoes must have proper arch support and heel-cushioning.

(iv) Feel the seams inside for ensuring that they are smooth.

(v) Shoes are not to be used for running after approx. 800-1000 kms of running.

(vi) The width of the toe box should be sufficient to allow easy toe movement inside

(vii) Shoes with extensive toe box netting material allow faster heat loss through evaporation of sweat.

(viii) Never ignore the quality of socks. Cushioned socks function as additional shock absorbers during running.

XIII. EXERCISE PROGRAMME DESIGN

For optimal results, any fitness training programme design must take care of (a) basic principles of exercise, (b) FITT factors and (c) major
components of fitness. This can be better understood by the table given below –

<table>
<thead>
<tr>
<th>FITT</th>
<th>Components of fitness</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cardiorespiratory Endurance</td>
<td>Muscular Strength</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>3-5 times/week</td>
<td>3 times/week</td>
</tr>
<tr>
<td><strong>Intensity</strong></td>
<td>60-90% HRR⁹</td>
<td>3-6 RM¹⁰</td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td>20-30 minutes or more</td>
<td>The time required to do 3-6 repetitions of each exercise</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Running, Swimming, Bicycling, Jumping Rope, Walking/Hiking, Stair Climbing</td>
<td>Free Weights, Resistance Machines, Partner-Resisted Exercises, Body-Weight Exercises (Pushups/Situps/Pullups/Dips, etc.)</td>
</tr>
</tbody>
</table>

If you have a 6-day exercise regimen; Monday, Wednesday and Friday may be devoted to cardiovascular fitness and Tuesday, Thursday and Saturday for muscle strength / endurance. Sunday can be the rest day. In case of a 5-day regimen, in the first week Monday, Wednesday and Friday may be kept for cardiovascular fitness and Tuesday and Thursday for muscle strength /endurance. Saturday and Sunday may be the rest days. In the next week, the training days are flip-flopped, i.e., muscle strength/endurance can be done on Monday, Wednesday and Friday and cardiovascular on Tuesday, Thursday and so on. Stretching should be done in every training session, during warm-up, during exercise (between two sets) and during cool-down.

Earmarking number of days for strength or endurance training depends on your training goal. If you are primarily focusing on strength, you may like to devote four days to strength training and two days to endurance training, and vice versa.

9. HRR is heart rate reserve is the difference between one’s MHR and RHR. (HRR = MHR-RHR)
10. RM – Repetition Maximum.
11, 12. See ‘Types of stretching’ in the chapter **Flexibility Training**.
Here are some other important tips for an effective exercise programme design –

- Firstly, decide about your specific goal.
- Keep in your mind total availability of time.
- Never skip warm-up / cool-down for lack of time. If you do not have enough time, better you reduce the number of sets rather than reducing warm-up session.
- If you resume your exercise after a long lay off (due to illness, job engagement etc.,) start from a lower intensity/volume so as to condition yourself before you reach your pre-lay off level. This will save you from injury.
- Monitor your progress. If you have reached your training plateau or your performance is declining, then redesign the exercise programme.
- Keep scope for occasional games and sports for variety and freshness.
- Include Yogic breathing, i.e., Pranayam in your exercise routine.
Chapter -2

STRENGTH TRAINING

Strength is the ability to produce a force. Strength training consists of resistance exercises, which increase one’s muscle strength, muscle size, speed and power.

I. BENEFITS OF STRENGTH TRAINING

These are some major benefits of strength training –

(i) It benefits individuals of all ages.

(ii) It increases muscle strength, muscle endurance and muscle power.

(iii) Increased muscle mass causes increased resting metabolic rate (RMR) and consequent increased total daily energy expenditure. This helps in weight management.

(iv) It slows down the process of sarcopenia (loss of muscle mass in older adults) by increasing muscle mass.

(v) It strengthens our bones by loading them and thereby increasing bone density. The risk of bone fracture by falling in old age is thus reduced.

(vi) It helps us carry out our day-to-day work easily.

(vii) It improves stability, balance, posture and boosts up our self-confidence.

1. Resistance against weights, own body weight or machines
II. **STRENGTH TRAINING EXERCISE TECHNIQUES**

Remember the following basics of strength training techniques –

(i) Assume *correct body form* and maintain it throughout the exercise.

(ii) Know about the muscles to be targeted and focus on them while exercising.

(iii) Proper breathing is very important during exercise. Here, the simple rule is this – *Breathe out during the hardest part of the exercise and breathe in during the easier part of the exercise.* For example, during bench press, breathe out while lifting the weight and breathe in while lowering the weight. But at **no point**, you should **forcibly hold your breath**. Holding breath can induce excessive increase in blood pressure. Dizziness, sudden loss of strength would be warning signs. In such a situation, immediately stop exercise.

(iv) Use weightlifting belts in case of lifting maximal or near-maximal weight while doing *structural exercises*. Structural exercises are those exercises which load your trunk and place stress on the lower back (e.g., squat, standing shoulder press, dead lift, etc.). However, use of weightlifting belt for even lighter weights may cause under-exercise and related under-strengthening of muscles of lower back and abdomen. Such weaker torso-muscles may get injured, in case a heavier weight is lifted without weightlifting belts.

III. **STRENGTH TRAINING PROGRAMME DESIGN**

A strength training programme should be guided primarily by one’s training goal. Broadly, training goals may fall into one of these categories – (i) muscular strength (ii) muscular endurance (iii) hypertrophy (increased muscle size). A common man or woman may be happy with just overall fitness. Athletes and sportspersons will do it for improving their sports
performance. Professionals like members of police or army may find it useful to achieve prescribed physical fitness standards set for them.

Like any other exercise programme, strength training also should take into account the following principles of exercise/FITT factors –

A. **Specificity** – Identify your training goals. Identify the muscles that come into play in your specific game, sports or job. Select specific exercises that target those relevant muscle groups. Beginners should select exercises to workout their all important large and small muscles for overall conditioning, viz., chest, shoulders, upper back, lower back, thighs, calves, abdomen, biceps and triceps. Afterwards, they can select specific exercises as per their goal.

B. **Frequency** – When we say that strength training should be done 3-5 times a week, we mean that the strength training of the *same muscle* group has to be done 3-5 times a week. There should be a recovery gap of 48-72 hours (not less than one day and more than two days) between two sessions.

A beginner can have two sessions in a week (e.g., Monday and Thursday) or three sessions (e.g., Monday, Wednesday and Friday). Advanced trainees can have workouts on three days. A split routine allows them four or more sessions also. However, it is important to avoid workout of the same muscle groups on two days in a row. Workouts may be planned thus – Upper body on Monday and Thursday; lower body on Tuesday and Friday. There may be several other combinations depending upon your time constraints.

C. **Progression** – Once you overload your system, your muscles would adapt to it by increasing their strength. If you continue your training with the same load, (i.e., same number of repetitions /sets with same weight), you will not gain further. Therefore, go on increasing your training load to reach your full training potential.
How do you know that it is time to increase the load? **2-for-2-rule** may help you in this regard. According to this rule, if you can complete 02 more repetitions than the repetition goal in the final set of an exercise for 02 consecutive training sessions, the load in all sets of that exercise should be increased in the next training session. For example, if your repetition goal is 10 in an exercise and you can complete 2 more repetitions (i.e., 12 repetitions) in the final set in two consecutive training sessions, it is time to increase load during the next training session.

The next question comes – how much weight should you increase? The answer is, increase the weight with which you can perform minimum number of required repetitions of your target range. For example, if your target range of repetitions is 8-10 per set, you should be able to perform minimum 8 repetitions with the increased weight.

D. **Overload** – Overloading in strength training can be done by (i) increasing weight/resistance, (ii) increasing total number repetitions/sets, (iii) reducing recovery time between two sets, (iv) reducing repetition velocity by slowing down muscle movement. (For example, while doing bench press, take 8 seconds (instead of usual 4 seconds) to lower down the weight.)

It is important to perform all repetitions while strictly maintaining correct form and technique. Secondly, required number of repetitions should be done till total muscle failure. Total muscle failure occurs when one cannot do another correct repetition anymore. Never distort your body and compromise with the correct form just to perform one or two additional repetitions. You will gain nothing but injury by doing so.

The number of repetitions and sets depends upon your primary training goal. Beginners may benefit even with one set (during initial 3-4 weeks). However, you will have to perform 2-6 sets to reach your full
potential. Select a weight that allows you to do prescribed range of repetitions. The following guidelines will be useful in this regard –

<table>
<thead>
<tr>
<th>Training Goal</th>
<th>Repetitions</th>
<th>Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscular endurance</td>
<td>≥ 12</td>
<td>2-3</td>
</tr>
<tr>
<td>Hypertrophy (increased muscle size as in body building)</td>
<td>6-12</td>
<td>3-6</td>
</tr>
<tr>
<td>Muscular strength</td>
<td>≤ 6</td>
<td>2-6</td>
</tr>
</tbody>
</table>

It is important to perform the same number of repetitions in each set. It may happen that the fatigue caused by the earlier set may not allow you to perform the same number of repetitions in the subsequent set. Then you have two options to reach your repetitions goal – (i) take assistance of your partner (spotter), or, (ii) drop some load and perform the target number of repetitions.

E. **Recovery** – Duration of recovery period between two sets is an important factor in strength training. For endurance, sets (with light weight) are performed in quick succession allowing little rest between two sets. For strength, sets (with heavy weight) are performed allowing full rest between two sets. General guidelines in this regard are given in the following table –

<table>
<thead>
<tr>
<th>Training Goal</th>
<th>Rest Period Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscular endurance</td>
<td>≤ 30 seconds</td>
</tr>
<tr>
<td>Hypertrophy (body building)</td>
<td>30-90 seconds</td>
</tr>
<tr>
<td>Muscular strength</td>
<td>2-5 minutes</td>
</tr>
</tbody>
</table>

With experience you will learn about the optimal rest period for you. Full rest means when your rate of breathing becomes normal.

F. **Variation** – Performance of the same set of exercises for a long time may result into overtraining or undertraining of particular muscle groups and boredom of the trainee – all resulting into a decline in performance. The remedy is to introduce variation in exercises. For example, different
training days may be marked as heavy, medium, light training day when the load would be heavy, medium and light respectively, though number of repetitions may be the same.

G. **Balance** – While principle of specificity in strength training is important, equally important is the element of balance. Never ignore any muscle group completely, even though you may like to focus on specific muscle group, train the whole body. There should be a balance between upper body and lower body. To ensure a balanced workout, do at least one set of exercise for each of the major muscle group.

**Important** – A strong lower back adds considerably to our overall strength and protects us against lower back injuries, yet sometimes it is the most neglected area. *Never ignore your lower back.* In our day to day life, lower back injuries are one of the most common injuries. They occur due to (a) weak lower back and abdominal muscles and (b) wrong form and technique of lifting weight. I will go to the extent to recommend that, if you have only 5-10 minutes to spare for exercise, exercise your lower back and abdominal muscles only. Strong lower back and abdominal muscles are great support for the spine. In absence of strong supporting muscles the spine will have to bear the maximum load by itself and therefore would be susceptible to injury.

**IV. SEQUENCE OF EXERCISE**

Follow these guidelines –

(i) The most important point is that exercises should be ordered in such a manner that fatigue caused by the previous exercise either (a) does not affect or (b) affects your strength for subsequent exercise the least. One way to ensure this is to alternate e.g., upper body exercise followed by lower body exercise, again upper body exercise, and so on. This sequence gives the exercised muscle enough time to recover.
between two sets. The sample circuit training given in Appendix-I is based on this principle.

(ii) Start with core exercises\textsuperscript{2} and then proceed to assistance exercises\textsuperscript{3}. In other words, larger muscle groups should be addressed first followed by smaller muscles.

V. SAFETY FACTORS

Strength training is thoroughly enjoyable and safe. Injuries happen mostly because of neglect of certain basic safety rules. Make sure you follow these safety rules –

(i) Warm up well before starting the training.

(ii) Focus your mind especially while lifting heavy weights.

(iii) Always use proper form and technique.

(iv) Avoid ‘too much too soon’ approach.

(v) Have a spotter (partner) especially during lifting of heavy free weights.

(vi) Never hold your breath while lifting weights.

(vii) Obey the discipline of gym. Don’t leave weights, bars, etc. unattended on floor.

\textsuperscript{2} Core exercise involves two/more primary joints and one/more large muscle groups, e.g., bench press, squats.

\textsuperscript{3} Assistance exercise involves only one primary joint and smaller muscle group, e.g., biceps curls.
VI. FREE HAND EXERCISES

Here is a list of free hand exercises with full description of their technique, variations, etc. The same set of exercises can be used for both muscular strength training as well as muscular endurance training. You can use them for strength training in these ways –

(i) **Slow down** the movement, e.g., take 6-8 seconds to lower down instead of usual 2 seconds while performing push-ups, squats, chin-ups, etc.

(ii) **Pause** at the peak of each repetition for 2 seconds.

(iii) Ask your **partner** to increase the load by applying pressure on you throughout the movement. The load should be such as to allow you maximum 3-6 repetitions in a set. Follow the **overload** principle mentioned under Strength Training Programme Design.

(iv) Adopt more **difficult** variations.

(v) Take sufficient recovery time in between.

Familiarity with major muscles of human body will help you to be more systematic and focused. *(fig-1)*
Major Skeletal Muscles of Human Body

- Trapezius
- Deltoids
- Pectorals
- Triceps
- Biceps
- Latissimus Dorsi (Lats)
- Gluteals
- Abdominals
- Hip Adductors
- Quadriceps
- Hamstrings
- Calves
1. **Push-ups**

**Areas worked** – Pectorals, deltoids, upper back, triceps and abdominals.

**Technique**

- Assume the position as in [fig-2]. Feet 10-12 inches apart. Hands 4-5 inches wider than shoulder width. Body straight. Stomach pulled in.

- Lower your body slowly till your chest touches the ground (*Peak*) ([fig-3]).

- Push your body up to the original position ([fig-2]). (This is 01 repetition).

- Do required number of repetitions.

- Keep your body straight throughout the movement.

**Don’ts**

- Don’t arch your lower back. This may unduly stress your lower back. ([fig-4]).

- Don’t let your body ‘fall’. Lower your body in a slow, controlled way.

- Don’t hold your breath at any point of time.
Hints and Tips

- Use bricks to rest your hands for greater range of movement of your muscles(fig-5).

- Place your feet on a chair or bed to work out your upper chest (fig-6). Gradually you can increase the elevation and finally do push ups with legs supported against a wall. Take care not to get dizzy.

- Increase the width of hands for wider push-ups (fig-7).

- Perform push-ups with your hands closed together or 2-3 inches apart. This is an excellent exercise for triceps.

- Tell your partner to apply pressure on your upper back to increase load throughout the movement.
Variation
(a) **Power push ups** are more difficult variation of push ups.

**Technique**

- Rest your hands on a medicine ball (**fig-8**). (Place the ball in a shallow pit for stability).

- Move your hands off the ball and quickly place them on ground at shoulder width, simultaneously lowering down the body till your chest almost touches the ball (**fig-9**).

- Push your body back to the original position (**fig-8**). (This is 01 repetition).

- Do required number of repetitions.

- Keep your body straight throughout the movement.

- **Alternatively**, acquire the standard push-ups position as in **fig-2**. Push your body up, clap in the air (**fig-10**) and again come back to the original position (**fig-2**).

- Keep your body straight throughout the movement.
(b) **Shallow dive push-ups** are another variation of push-ups, which are very popular among traditional wrestlers. I have found that this variation of push-ups addresses more muscle groups of upper body than the standard push-ups.

**Technique**

- Acquire the position (**fig-11**).

- Lower down your body, move forward and up as if you are diving into and emerging from water (**fig-12, 13**).

- Come back to the original position (**fig-11**).
• Take care not to make any jerky movement. There should be no stress on lower back at all.

2. **SQUATS**

**Areas worked:** legs and hips (Quadriceps, hamstrings, gluteals and calves)

**Technique**
- Stand on your feet shoulder width apart.
- Keeping your back straight slowly sit down on an imaginary chair till your thighs are parallel to the ground (*Peak*) ([fig-14]).
- Stand up to the original position. (This is 01 repetition)
- Do required number of repetitions.

**Don’ts**
- Don’t round your back. Keep your back straight throughout the movement.
- Don’t tilt your knees forward. It puts too much stress on knees and also robs target muscles of the main benefits of squats. A perpendicular line drawn from the knees should not fall out of the toes.
Hints and Tips

- You can hold a fixed object, e.g., window bar to maintain your balance during squats.

- Fold your hands overhead for greater difficulty.

- Occasionally, you can do squats while standing on your toes throughout. This exercise mainly strengthens quadriceps close to knees and partly calves. This also improves your overall balance.

Variation

(b) **Lunges**

**Technique**

- Stand on your feet shoulder width apart.
- Take left leg forward and lower down bending left knee at 90°. Knee of right leg would be just above the ground *(fig-16)*.
- Come back to the original position and take right leg forward. Do lunges with alternative legs. (This is 01 repetition)
- Do required number of repetitions.
- Keep your back straight throughout the movement.

(c) **Single leg squat**

This can be done with help of a partner or by holding a fix object *(fig-17, 18)*. Again, keep your back straight throughout the movement.
3. **UPPER ABDOMINAL CRUNCHES**

**Areas worked** – upper abdominals

**Technique**

- Lie on your back. Fold your legs so that your feet are close to your hips. Hands folded across your chest (fig-19).

- Curl your torso 5-6 inches above the ground (Peak) (fig-20).

- Slowly come back to the original position (fig-19). (This is one repletion)

- Do required number of repetitions.

![Fig-19](image1)
![Fig-20](image2)

**Don’ts**

- Don’t flatten your legs on the ground. That would put undue stress on your lower back.

- Don’t do jerky movements. All movements should be rhythmic and smooth.

**Hints and Tips**

- Hold weight plates on your chest to increase the load.

- You can place your legs on a chair or in air for complete immobilization of your lower body (fig-21).
• Cross your hands over your head behind your back to increase load (fig-22).

• Exhale while going up and inhale while coming down.

![Fig-21](image1) ![Fig-22](image2)

**Variation**

• Lie on your back. Keep your hands straight on the ground, palm down, close to your body (fig-23).

• Slide your palms 4-5 inches forward on the ground (fig-24) and come back to the original position.

![Fig-23](image3) ![Fig-24](image4)
4. **LOWER ABDOMINAL CRUNCHES**

**Areas worked** – lower abdominals

**Technique**
- Lie on your back. Fold your legs so that your feet are close to you (fig-23).
- Lift knees towards chest and slowly lower down to the original position (fig-25). (This is 01 repetition).
- Do required number of repetitions.

**Don’ts**
- Don’t place your feet away from the hips. Greater the distance of feet from hips, greater will be the stress on lower back.
- Never hold your breath during movement.

**Hints and Tips**
- For greater range of movement this exercise can be performed by placing hips on the edge of a bench or bed (fig-26).
- Range of movement should be limited so that it does not hurt your lower back.
**Variation**

(a) **Hang from a chin-up bar and lift the knees towards chest** *(fig-27)* and then lower down to original position.

(b) **Cycling**: Lie on your back. Raise your knees and keep your legs in air parallel to the ground *(fig-28)*.

- Pull left knee towards chest and simultaneously straighten the right leg forward *(fig-29)*.
- Go back to the original position *(fig-28)*. Perform similar movement by alternating legs.
(c) **Obliques crunches** are good exercise for strengthening obliques.

**Technique**

- Lie on your right side keeping your body straight *(fig-30)*.
- Curl your torso 5-6 inches above the ground. You can take support of your right elbow towards the end of movement *(fig-31)*.
- Slowly come down to the original position. (This is 01 repetition)
- Perform similar movement while lying on your left side.
- Keep your alignment straight throughout.

**Don’ts**

- Don’t take too much support from elbow. Try to minimize it. Let your obliques take the maximum load.
Hints and Tips

- Cross your hands over your head behind your back for increasing load (fig-32).

5. **PULL-UPS (overgrip)**

**Areas worked** – Latissimus dorsi (Lats) and biceps

**Technique**

- Hold the chin-up bar overgrip with hands slightly wider than shoulder width (fig-33).

- Slowly pull your body up so that your chin is above the bar (Peak) (fig-34).

- Slowly go down to the original position (fig-33). (This is 01 repetition)

- Do required number of repetitions.
Don’ts

- Don’t make any jerky movement. Body should be straight in air throughout the movement.

Hints and Tips

- In case you find it difficult to pull your body up, take assistance from your partner.
- Bigger the width between two hands, greater will be the difficulty level.

Variation

- Single hand pull-ups.

6. **CHIN-UPS (undergrip)**

Areas worked – Biceps, Lats

Technique

- Hold the chin-up bar undergrip with hands shoulder width apart (**Fig-35**).
- Pull your body up so that your chin is above the bar (**Peak**) (**fig-36**).
- Slowly go down to the original position (**fig-35**). (This is 01 repetition)
- Do required number of repetitions.
Don’ts

- Don’t make any jerky movement. Body should be straight in air throughout the movement.

Hints and Tips:

- In case you find it difficult to pull your body up, take assistance from your partner.

Variation

- Single hand chin-ups.

7. DIPS

Areas worked: Triceps, anterior deltoids

Technique


- Lower down your body till upper arms are parallel to ground.(fig-38)

- Go back to the original position (fig-37). (This is 01 repetition)
• Do required number of repetitions.

**Don’ts**

• Don’t arch your back throughout the movement. Back should be straight throughout.

• Don’t go ‘away’ from the edge of bed/bench. Be close to it throughout.

• Don’t try to ‘push’ the ground with your feet to lift yourself up. This will rob the target muscles of their workout benefits. Use the strength of arms for the movement.

• Don’t use a furniture that would not be stable during the exercise.

**Hints and Tips**

• Dips can be done on any stable furniture like bed, chair or high steps. Take care that it is stable and strong enough to take your load.

**Variation**

• This can be done by placing your legs on a chair/stool.

• For further difficulty level, weights can be placed in your ‘lap’. (fig-39)
8. **BACK EXTENSION**

A strong and supple lower back is very important for us. If one does not have enough time to perform all exercises, I would recommend
him to do at least those exercises which relate to lower back and abdominals.

**Technique**

- Lie on your abdomen. Keep your hands close to your body *(fig-40).*
- Raise your torso *(Peak) (fig-41).*
- Go down slowly to the original position *(fig-40).* (This is 01 repetition)
- Do required number of repetitions.

![Fig-40](image1)
![Fig-41](image2)

**Don’ts**

- Don’t make any jerky movement. It should be slow and rhythmic.
- Don’t hold breath at any point of time.
- Don’t raise torso so much that belly loses its touch with ground.

**Hints and Tips**

- Take minimum support of your hands to raise your torso. It will be better if you do not take any support of hands at all.
- Exhale when you go down, inhale when you go up.
- To increase the load perform exercise with your hands folded across your back *(fig-42).*
Variation

Superman raise
This variation puts slightly less stress on lower back at a time. Beginners may find it more convenient.

Technique

- Lie on ground as shown in fig-43.
- Raise right hand and simultaneously the left leg 10-12" above the ground keeping a slight bend in the knees and elbows (fig-44).
- Go down to the original position (fig-43). (This is 01 repetition)
- Do 10-15 repetitions.
- Repeat similar movement with left hand and right leg.

Don’ts

- Don’t make any jerky movements.
- Don’t raise hips.
9. CALF RAISE

Areas worked: Calves, ankles

Calves are often called ‘second heart’. They should never be ignored. Well formed strong calves add to strength, speed and beauty of our legs.

Technique

- Hold a fixed object like railing or column and stand on the edge of a step on toes with knees slightly bent (fig-45).

- Raise your heels to the maximum point so that you stand on your toe (fig-46).

- Slowly lower down your heels to the original position. (fig-45). (This is 01 repetition)

- Do required number of repetitions.

Don’ts

- Don’t keep your knees stiff while going down.
• Don’t stop before full range of movement. It may rob calves of full benefits of exercise.

Hints and Tips
• Ask your partner to apply pressure on your shoulder to increase resistance throughout the movement.

Variation
• As you advance, do it on single leg (fig-47, 48)
ENDURANCE TRAINING

Though there are various types of endurance training, e.g., walking, swimming, running, cycling, hiking etc., this chapter focuses only on running. Running is an excellent exercise for cardiovascular fitness. It hardly requires any equipment other than a good pair of shoes, some space and a will to run!

We will discuss here both aerobic (endurance) and anaerobic (speed) running. The term *aerobic* literally means ‘with oxygen’. During aerobic running there is enough oxygen available to your muscles. Therefore, you can run for hours, though at a slower speed. During running at high speed (anaerobic running) your body cannot meet the huge demand of oxygen to the muscles. Therefore, though you can run very fast, you cannot continue the activity for more than a few seconds.

**ENDURANCE RUNNING**

I. **BENEFITS** – There are many benefits of endurance running –

(i) It is an excellent fat-burning exercise. When you run, initially your body depends more on carbohydrates and less on fats for energy. But after 30-35 minutes, the situation reverses and body starts burning more fats than carbohydrates for its energy need.

(ii) It strengthens your cardiovascular system and protects against cardiovascular diseases.

(iii) It increases the number and diameter of capillaries. Capillaries transport oxygen in and waste products out from muscle fibres. The end result of this is availability of more oxygen and more energy in your body system.
(iv) It increases the number and size of mitochondria. Mitochondria are microscopic structures inside your muscles. They are termed as ‘power houses’ or ‘aerobic engines’. In the mitochondria carbohydrate, fat and protein break down in presence of oxygen and release energy. Therefore, bigger the size of mitochondria, the more energy will be generated for your longer, faster runs. This is one of the reasons, long distance runners go for slow long distance(SLD) runs to improve their performance.

(v) Regular running develops a healthy ‘addiction’ among runners. There is an increase in the mental alertness, awareness of surroundings, effortlessness, feeling of well-being, and euphoric relaxation especially after 30-40 minutes of continuous run. This phenomenon is termed as ‘runner’s high’ and is worth trying.

(vi) Long distance running at low intensity is one of the most powerful anti-depressant ‘natural’ drugs. Try it yourself. Next time when you get anxious, angry or depressed, put on your shoes and jog for 30-40 minutes. Your depression will vanish. I have tried it on several occasions with definite success (though for me it requires at least one hour of jog). Students may practise it before their exams, or before appearing for an important interview.

II. ENDURANCE RUNNING PROGRAMME DESIGN

Your endurance running programme design will be guided by your specific goal. Let’s discuss the FITT factors for running.

A. Frequency – 3-5 days of endurance run per week produces reasonable cardiovascular fitness. The number of training days per week depends on the intensity (heart rate) and volume (duration) of training. For beginners and non-athletes 3 days of training on alternate days will be sufficient. Athletes may train on 5-6 days with 1-2 days of rest. However, they have to alternate their training days as ‘hard’ and ‘easy’. Hard days will be marked by
high intensity / high volume. Easy days will be marked by low intensity / low volume. Some studies suggest that one can maintain his aerobic fitness by training only 2 days per week, but for that your intensity/volume has to be on higher side.

B. **Intensity** – Intensity is the most important factor in endurance run programme design and hence it deserves a detailed discussion. In simple words, intensity in running is related to how hard you run. The ‘hardness’ or intensity, is measured by heart rate BPM (beats per minute). At increased intensity the heart rate also increases.

Let’s first understand these terms – Maximum Heart Rate (MHR), Resting Heart Rate (RHR), Training Heart Rate (THR) and Heart Rate Reserve (HRR). MHR is the maximum safe limit of heart rate for exercise. It is determined by subtracting one’s age from 220. If some woman is 30, her MHR will be 220-30 = 190 BPM (beat per minute). RHR is the heart rate taken when you are fully rested and relaxed. The best time to take RHR is immediately after you wake up in the morning, while still lying in bed. HRR is the number beats per minute (BPM) that the heart rate can increase from resting up to the maximal.

**How to determine Training Heart Rate (THR)?**

It is important to determine the required intensity (required heart rate) of your training to reach your fitness goal. There are two methods to determine THR –

(i) % MHR method and (ii) % HRR method.

(i) **% MHR method** – MHR is determined by subtracting one’s age from 220. Thus, for a 30 year old person MHR will be 220-30 = 190 BPM (beat per minute). For a generally healthy person Training Heart Rate (THR) for aerobic fitness will be in the range of 70%-85% of MHR. (In this example, minimum and maximum THR for 30 year old will be (70% x 190=) 133
and \((85\% \times 190=)\) 161.5 (say 162) BPM.) For those whose aerobic fitness level is very poor, a lower range of 55-65\% of MHR may be more appropriate\(^1\).

Though \% MHR method is a simple method, it has its own limitations. It does not take into account the existing aerobic fitness level of a person and prescribes the same THR to all persons of the same age. This method ignores the fact that in case of persons with higher fitness level, the training intensity has to be higher for their further gain. For example, exercising at 60\% of MHR can benefit a sedentary person of 30, but an athlete of the same age is hardly going to gain anything at 60\% of MHR. It will be a total waste of time for him. Therefore, THR by \% MHR method should not be used blindly in all cases. THR with a higher \% is recommended for those who have higher fitness level. For example, a fit person can have 70\% or 80\% MHR as his THR.

(ii) \% HRR method – This method, though apparently complicated, is more accurate in prescribing THR. It is based on the Karvonen formula. It takes into account the existing aerobic fitness level of a person. In this method there are two steps –

Step-1. \(HRR=MHR−RHR\)
Step-2. \(THR=(HRR \times \text{exercise intensity}) + RHR\)

If your age is 30, your RHR is 70, and you have to train at 60\% intensity of HRR,

Calculate your THR thus –

\[
\text{Step-1. } HRR = MHR − RHR \\
= (220−30) \text{ BPM} − 70 \text{ BPM} \\
= 120 \text{ BPM}
\]

\[
\text{Step-2. } THR = (HRR \times \text{intensity}) + RHR \\
= (120 \times 60\%) \text{ BPM} + 70 \text{ BPM} \\
= 142 \text{ BPM}
\]

\(^1\) NSCA’s Essentials of Personal Training p.404.
The recommended THR for aerobic fitness by % HRR method is 50-85% of HRR.

Why is it useful to take RHR into account while determining THR? Because, RHR is an important indicator of one’s aerobic fitness. As one becomes more fit, his RHR decreases. Normally, a healthy person’s RHR will be 60-80 BPM. Endurance athletes often have their RHR below 60 BPM. (The famous cyclist, Lance Armstrong who won Tour de France consecutive seven record times, has RHR around 32 BPM.) And, as the RHR decreases, one’s HRR will increase. This means that he can train himself at greater intensity.

A. Technique of taking heart rate –

You can take your heart rate by placing finger on carotid artery (located on both sides of the Adam’s apple), or on radial artery (wrist) or simply by placing hand over your heart. Ideally, Training heart rate should be taken still while running. But as it is inconvenient to do so by above mentioned methods, the second best option is to take heart rate immediately after running. Take pulse count for 06 seconds and then multiply it by 10 to get your heart rate per minute. Or, you can take pulse count for 10 seconds and multiply it by 06 to get heart rate per minute.

Alternatively, if you can afford, buy a good heart rate monitor and monitor your heart rate while running.

Take heart. It is not necessary to take your heart rate in each running session. After monitoring your heart rate for some time, you may get a fair idea of your intensity level based on your biofeedback/exertion level.

Important – It is important to avoid ‘too soon too much’ approach while determining your THR. Train at the THR that you can maintain throughout a 20-30 minute running session. If you are running at THR based on 80% of your HRR and have to slow down or stop after 5-10 minutes, this means that you are overexerting yourself. Lower the % HRR down to 70% or 60% at

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2. NSCA’s Essential of Personal Training.
which you can run comfortably all through the session. Running at unreasonably high THR is counterproductive and entails risk of injury also.

One simple way to measure intensity while running is the ‘talk test’. If you get so much breathless during running that you cannot talk to your partner, the intensity is too high for you. Slow down a bit so that you can talk to your partner comfortably.

B. **Time**

How long one should run? Well, it depends on what is your goal. Generally, one should run for at least 20-30 minutes for cardiovascular fitness. If you are a long distance runner, run as per your training schedule which may extend to hours together. Training for distance runs (cross country, marathons, ultramarathons) is a specialized training and one should take help of professional coaches and books on these sports.

C. **Type**

For cardiovascular fitness other alternatives to running are – brisk walk, rope skipping, swimming, cycling, rowing, hiking, stair climbing, any activity that engages you continuously for at least 20-30 minutes at an increased heart rate.

III. **OTHER IMPORTANT POINTS**

(i) Total weekly training volume (total number of kms run every week) should not be increased by more than 10% (to avoid overtraining)\(^4\).

(ii) If you discontinue training, your fitness gains will reduce by approximately 50% within 4-12 weeks\(^5\). Galloway, based on his experience, observes that you hardly lose conditioning within first five days of complete rest. However, for each week thereafter you will lose 25% of your fitness level. Thus after complete rest for a month, you will have to start like a ‘beginner’. He suggest a rule of

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5. Ibid
thumb i.e., in case of complete rest you’ll need at least twice the number of weeks you took off to gradually reach back the pre-off level of fitness⁶.

(iii) To introduce variety, you should ‘cross train’ by occasionally taking up swimming, cycling, etc. During cross training your running muscles get some rest but your cardiovascular fitness remains the same. This cross training should be of the same intensity and volume, then only it will maintain your cardiovascular fitness.

(iv) If you don’t have time (or energy) to carry on running session for 20-30 minutes, you can do it in 10-minute bouts also, twice or thrice in a day.

(v) In endurance running as you need lot of oxygen, you can breathe through both your nose and mouth partly open. Normally, we should breathe through our nose because our nostrils filter the air and adjust the temperature of incoming air to our body’s temperature. Mouth does not have this mechanism. But as the volume of oxygen during long running cannot be sufficient through nose breathing alone, we advise to breathe through mouth also.

(vi) Take sufficient carbohydrates within half an hour after training to compensate for calories lost during long running. In absence of sufficient carbohydrates body will utilize protein for energy and your muscles will suffer.

(vii) If you are running for more than 40-50 minutes, take care to hydrate yourself regularly by sipping water. This becomes all the more important if you are running in a hot weather.

(viii) Adopt proper form and technique of running – Keep yourself upright and relaxed throughout. Arms should be bent at the elbows and forearm should move loosely parallel to the ground at waist level. Don’t clench your fists. Fists should be loose and wrists relaxed. Take natural strides. Don’t let your foot land too far in front

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6. Running, Jeff Galloway, p.197.
of your body (fig-49). It will have a ‘braking’ effect on your speed and will cause more stress on your knees. Ideally, foot should land under the hips (fig-50). Take rhythmic, relaxed steps. Avoid raising your steps too high in the air as it results in a harder landing and greater stress on lower back and leg joints. Keep your feet low to the ground to avoid harder landing.

(ix) Preferably run on softer surfaces like dirt or grass rather than on roads.

(x) Use good pair of shoes and socks for better shock absorption during running.

IV. HOW TO TRAIN FOR BETTER PERFORMANCE?

The following will help you to improve your long distance run performance –

(i) Slow long distance (SLD) runs – SLD runs at low intensity (60-70% of MHR) form the base of any long distance running training. Low intensity practically means such level of effort that does not
make you *breathless* at any point of time. SLD runs increase the number of capillaries and mitochondria which contribute to faster and longer runs. (See *Benefits of Endurance Running*). You should run SLD once every week (not more than this). The distance of SLD should be longer than distance of your target race (e.g., 5 km, 10 km, half marathon, marathon, etc.). For example, if your target is to race 5 km, your SLD should cover more than 5 kms. Galloway’s suggestion is to run SLD of 10-12 miles if your goal is 5 km race, 16-18 miles for 10 km race, 17-19 miles for half marathon, and 28-30 miles for marathon. I remind that while aiming for the maximum SLD, progression principle of exercise should be kept in mind. You should not increase more than 1 km distance every week.

(ii) **Hill training** – Hill training strengthens our legs (especially calves) and cardiovascular system by offering more resistance. The place for training can be a hill with gentle slope, or flyover or steps of stadium / stairs of a multistoried building. Hill training is hard training. It should be introduced in later part of the endurance run training only after body is sufficiently conditioned through easy SLD runs. **Run up** the hill at 80-90% HRR effort. Take care not to become breathless at any point of time. Relax by **walking down** the hill before each repetition of the hill run. The maximum duration of hill training should be 15-20 minutes. Warm up well by jogging for 10-15 minutes before doing hill training, as hill runs are very demanding. During hill runs run on your toes with slightly higher knees. Keep your body upright while running.

(iii) **Interval training** – Interval training consists of speed runs with rest intervals between two speed runs. It can be done on tracks in segments of 100 m / 200 m / 400 m or even more distance. Run, for
(iv) example, 100 mtrs, recover by jog or walk till your heart rate drops to 60% of MHR, then do the next repetition of 100 mtr, and so on. Interval training should be done at 80-90% HRR intensity and should be of 15-20 minutes duration. Jog for 10-15 minutes before starting interval training session. Interval training is very helpful in improving speed.

(v) **Weight training** – Weight training for endurance run focuses more on muscular endurance rather than on muscular strength. Weight training gives all the benefits of strength training (see section on **Strength Training**) and increases overall fitness of an endurance runner. They should train themselves by doing 2-3 sets (each set of 12-15 repetitions) of exercises (for both upper body and lower body) with less recovery time between two sets. Weight training makes their running muscles stronger and contributes to faster speed.

(vi) **Walk breaks** – Galloway advocates introducing frequent ‘walk breaks’ for improving performance in endurance run. Walk break may be approximately of 1 minute duration. The idea is to take walk break whenever you feel that your running intensity is getting higher than your target rate. Take walk break before you fully exhaust yourself. You can take several walk breaks during a race. In many cases, this technique has been found to improve the performance.

V. **EXERCISES TO IMPROVE ENDURANCE RUN PERFORMANCE**

For overall fitness – Upper and lower body exercises mentioned in sections on strength Training and Flexibility Training.

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8. Running, Jeff Galloway, p.82-85
Endurance run specific exercises –

1. Leg lift
   - Sit comfortably on a high table / platform so that you feet do not touch ground **(fig-51)**
   - Straighten and stiffen left leg and lift up, parallel to ground. Hold it for 10-15 seconds **(fig-52)**
   - Bring the leg down to its original position **(fig-51)**
   - Do 10 repetitions.
   - Repeat the same with right leg.
   - Try to keep your back straight throughout.

2. Ankle lift
   (A) • Sit comfortably on a high table **(fig-53 A)**
   - Fix light weight to your foot.
   - Lift your left foot up. Hold it for 10-15 seconds **(fig-53 B)**
   - Bring it down to original position.
   - Do 10 repetitions.
- Repeat the same with right foot.

(B) Lift your left foot inward, hold it for 10-15 seconds (fig-54)

- Bring it down to original position.
- Do 10 repetitions.
- Repeat the same with right foot.

(C) Walk on your heels for 50-60 mtr (fig-55)
3. Handkerchief play

(A). Stand on (an imaginary) spread out handkerchief (fig-56)

- With squeezing and curling action pull the handkerchief under your feet. (fig-57)

- Reverse the same action to spread the handkerchief to its original position.

- Do 5 repetitions.

- This can also be done while sitting on a chair.
(B). Sit on a chair.

- Lift your toes up. Hold it for 10 seconds. (fig-58)
- Contract your toes hard. Hold it for 10 seconds. (fig-59)
- Repeat the same action 10 times.
4. Phantom chair –

- Sit on an imaginary chair against a wall. Head, shoulders should touch the wall, thighs parallel to the ground, feet firmly planted at 90°. (fig-60)

- Sit as long as you can in this position.

- Stand up and relax by taking a walk.
VI. SAFETY FACTORS –

(i) Preferably, train on soft surface (grass or dirt).

(ii) While running only on one side of the road (e.g., left side) your one foot (left foot) will always be in slightly lower position due to cambering of the road (the surface of road is higher in the middle and lower towards the sides). (fig-61). Over a period of time it may result in imbalance in your running posture and cause injury. To overcome this problem, run on the same side while on return also. This time your right foot will be in lower position (fig-62). It can be remembered this way – run 1st half of the distance on the left side of the road (left foot lower) and the other half on the right side of the road (right foot lower).
(iii) Beware of rogue drivers and dogs while running on a road.
(iv) Hydrate yourself sufficiently, especially during long runs. Sip water in small quantity.
(v) Choose suitable shoes and socks to avoid injury.
(vi) Avoid ‘too much too soon’ approach in increasing your weekly mileage. Follow the guidelines of progression.
(vii) Don’t introduce hill training or speed training without sufficient conditioning.
(viii) Running should be an enjoyable experience. Never scare your body (and mind) by pushing yourself ‘too hard’. In endurance run improvement comes by patient, consistent efforts with sufficient recovery time allowing repairs of wear and tear.
(ix) Strength training, flexibility training must be incorporated in your training schedule for improvement in performance and injury free running.
(x) Always maintain upright posture to avoid lower back pain. Never slouch.

**SPEED RUNNING**

Speed is any activity continuously performed at approximately 100% effort for about 6 seconds. Generally, this is the maximum duration of time a person will be able to hold his maximum speed in a race. This is the duration in which he would ‘explode’. To be able to maintain the maximum speed beyond 6 seconds one requires a great deal of training.

I. **BENEFITS**

(i) Speed helps in almost all track and field sports and games. It is especially beneficial to school children to excel in school sports and games.

(ii) It helps strengthen our fast-twitch muscle fibres and thus improves speed element in endurance runs also. Speed training is an essential element in all endurance run training programmes.

II. **SPEED RUNNING PROGRAMME DESIGN**

**A. Frequency** – It depends upon your specific goal. Speed training is hard training and requires sufficient recovery time between two repetitions / sets. For a person training mainly for speed, the frequency may be 3-4 days per week; for endurance runners 1-2 days; for a normal person also 1-2 days.

**B. Intensity** – Speed training is done at very high intensity. Therefore, before starting next repetition or next set one should recover well by slow jog, walk and stretch to bring his heart rate to almost normal level. The number of repetitions or sets should be increased gradually every week. Be careful. ‘Too much too soon’ approach will invite injury only.
C. **Time** – The actual time on speed training will depend upon the number of repetitions and sets in a training session. However, since it is a hard training, total duration should not exceed 20-30 minutes. Each speed training session should start with sufficient warm-up by 10-15 minutes of jog and stretch and should be concluded with proper cool-down. Failing to warm up and cool down will make your muscles stiff and susceptible to injury.

D. **Type** – There is no alternative to speed running. To excel in speed run, you have to run at speed. That’s all.

**III. OTHER IMPORTANT POINTS**

(i) Master the correct technique and form of speed running. The technique of speed running is different from that of endurance running in the following aspects –

a) For speed, you push and land on the *ball* of the foot, not on the heel or flat foot as in endurance run.

b) The correct technique for a good sprint start is to start at 45° angle and then quickly move upright throughout the race (fig-63)
c) High knee lift (when thigh becomes parallel to the ground) combined with good stride length is correct technique of speed running. In endurance running, knees are not lifted to this degree. Here also, like endurance running technique, one should take care not to place foot far ahead of the body, but to place it directly under the hips. (fig-49 and 50).

(ii) Speed running is done not only by legs, but also by arms. The more aggressive your arms action forward and backward, the more will be your speed. Arms should be flexed to $90^\circ$ and move forward and backward (maintaining the same elbow angle) almost parallel to the ground (fig-64)
(iii) If you have to train for both speed and endurance, do it on two different days. If you have to do both on the same day, do it in two different sessions (one in the morning and the other in the afternoon). If you have to do both in the same session, complete speed training first, recover and then start endurance training.

(iv) You cannot achieve your peak training potentiality in both speed and endurance run simultaneously. Speed run is primarily dependent on fast-twitch muscle fibres and endurance run on slow-twitch muscle fibres. Therefore, you have to select your specific goal (speed running or endurance running) and train accordingly.
(v) For overall fitness, like for armed forces personnel, students or a common person, good strategy to improve both speed and endurance will be to combine the both in this manner – for two months do endurance training on 3-4 days and speed training on 2 days; next two months do endurance training on 2 days and speed training on 3-4 days, and so on. This strategy will gradually bring improvement in both while maintaining the gains in both.

IV. HOW TO TRAIN FOR BETTER PERFORMANCE?

(i) Speed running is primarily based on strength. Therefore, to improve speed overall body strength training is recommended. A look at the sprinters’ muscular body will make this point clear.

(ii) Mimic running movements while standing. For example, take small weights in hand and do arm action as you would do while running; lift knees to 90°; (try to) kick your butt with your heels, etc.

(iii) Do short sprints of 10-20 mtrs with adequate recovery in between.

(iv) Wear tight shoes (in endurance training we recommended for slightly larger sized shoes) with good sole grips.

(v) Do stretching exercise religiously.

**Exercises to Improve Speed Running**

For overall strength and flexibility – exercises mentioned in sections on Strength Training and Flexibility.

**Speed run-specific exercises –**

1. **Butt kicking –**
   - Stand on your feet.
- Keeping rest of the body stationary, kick your butts alternatively with both heels. *(fig-65).* Don’t allow your thighs to move forward or backward.

- Do 30-40 repetitions with each heel.

2. Arm action –

- Stand on your feet.

- Hold light weight in each hand and swing your arms forward and backward simulating arm action during running. Arms should be bent at 90° at elbows throughout and upper arm will be parallel to the ground. Movement should be rhythmic.
• This can be done without weights also.

3. Stride frequency drill –

• Run short sprints focusing mainly on maximizing the number of strides in a given time.

• You can do it in a stationary position also.

4. Stride length drill –

• Run short sprints at low intensity focusing mainly on increasing the stride length.

• Never overdo the stride length as it may injure you. Do some stretching exercise especially for hamstrings and calves to avoid injury.

V. SAFETY FACTORS

(i) Do proper warm-up and cool-down before and after speed training session respectively.

(ii) Keep the duration of session short.

(iii) Keep your abdominal and lower back muscles strong to avoid any undue stress on you lower back.

(iv) Speed training is mostly a safe training.
FLEXIBILITY TRAINING

Flexibility refers to the range of movement or motion (ROM) of a joint (e.g., elbow) or a series of joints (e.g., spine). In other words, flexibility is the ability of a joint to move freely through its full normal range of motion. Good flexibility allows maximum ROM during our day-to-day work and improves our performance in exercise. It also prevents injury like muscle tears or low back pain. As we age, we experience a progressive loss of flexibility due to disease, deterioration of joint structures, etc. In combination with loss of strength, loss of flexibility plays a significant role in accidental falls-related injuries in advance age. Stiff muscles or stiff connective tissues restrict full ROM.

There are two important things about flexibility training. Firstly, a flexibility training must address all primary joints or series of joints for overall flexibility. Unless this is done, it is quite possible that a person may have excellent flexibility in a certain joint and at the same time he may suffer from poor flexibility of some other joint. Secondly, it has been found that flexibility can be improved at any age by proper stretching exercises.

Inclusion of flexibility training in warm-up and cool-down phases (though traditionally recommended) is now a matter of debate. Some authors are of the opinion that static stretching during warm-up phase may actually adversely affect the force-producing capabilities of muscles. This school of thought recommends that a warm-up session consisting of only cardio-respiratory exercise may be more effective in increasing flexibility than static stretching. However, in my opinion till the time this debate is settled, it is safer to include flexibility training during warm-up and cool-down process.
I. BENEFITS

(i) Flexibility training prevents stiffness of joints and makes our day to day movements comfortable.

(ii) It prevents injury during sudden or excessive movement of joints. For example, a person with less flexible spine is more likely to incur injury during sudden bend to catch a falling glass.

(iii) It is very relaxing. Yogic stretching (Yogasanas) is far more beneficial than normal stretching. It improves not only ROM of joints, but also helps internal systems (nervous system, digestive system, etc.).

II. FLEXIBILITY TRAINING PROGRAMME DESIGN

A. Frequency – It should be done preferably on every day. Discontinuity of flexibility training even for a week drastically reduces our flexibility. Secondly, briefly stretching a muscle immediately after completion of each set removes lactic acid and helps faster recovery. For example, after completing a set of push ups, immediately stretch your pectoral muscles for faster recovery; or, stretch your quadriceps and hamstrings immediately after each set of squats, and so on.

B. Intensity – Stretching should be done to the point of slight discomfort but never to the point of pain. At least in matters of stretch, never compete with anyone. There would be sure chance of injury.

C. Time – Stretching during warm-up and cool-down may be for shorter duration (10-15 seconds each stretching). However, for improvement of flexibility, stretching should be for 30-60 seconds duration. During holding period of stretch one should breathe normally. Holding one’s breath may cause dizziness.
D. **Type** – There are mainly two types of flexibility training –

(i) **Active stretching** – Hold a stretch at the extreme of ROM of a joint for 10-30 seconds.

(ii) **Passive stretching** – Take assistance of partner or equipment (e.g., towel, rope) to reach you full ROM.

**Ballistic or bounce stretching** is done to achieve greater ROM by using momentum of the body or bouncing. It is a very popular type of stretching in traditional physical training programmes. It is in fact flexibility and endurance training combined together. However, for not so well conditioned individuals it may be potentially dangerous as uncontrolled bouncing may cause injury.

III. **EXERCISES TO IMPROVE FLEXIBILITY**

1. For neck –

   (i) • Sit (or stand) upright.
      • Roll the head in a circle from left to right 2-3 times.
      • Do the same from right to left.

   (ii) • Bring the chin down to touch your chest. Hold for 5-10 seconds.
      • Lift your chin up and stretch your neck backward. Hold it for 5-10 seconds.

   (iii) • Bend your head over left shoulder. Hold it for 5-10 seconds.
      • Bend your head over right shoulder. Hold it for 5-10 seconds.

2. For shoulders –

   (i) • Stand or sit upright.
      • Position your hand on your shoulders as shown in fig-66.
      • Rotate your elbows forward, 10 times.
      • Rotate your elbows backward, 10 times.
(ii) • Extend the arms parallel to the ground.

• Rotate the shoulders forward and make a big circle with the arms 2-3 times (fig-67)

• Rotate the shoulders backward and make a big circle with the arms 2-3 times.
3. **For chest –**

- Stand upright with your back against a window bar. Grip the bar at waist height.

- While gripping the bar, try to move away from the bar as far as possible fully extending your arms (fig-68). Hold the stretch for 10 seconds.

- Keep your body upright throughout.

- This is good stretch for deltoids and biceps also.
4. For upper back –

(i) • Stand or sit upright.

• Extend your arms at shoulder height, palms facing outward. Interlace
  your fingers (fig-69)

• Extend the arms and shoulders further forward till you feel stretch in
  upper back. Hold it for 10 seconds.
(ii) • Hold a window bar at shoulder height.

• Move away from the bar as far as possible (till you feel the stretch in your upper back). Hold it for 10 seconds. (fig-70)

• Keep your posture upright throughout.
5. **For lower back** –
   - Do *Bhujangasana* as described under section on Yogic stretching.

6. **For Quadriceps** –
   - Stand upright.
   - Grip the ankle of left leg with right hand and pull it so that your left foot heel touches your right hip *(fig-71)*
   - Hold it for 10-15 seconds.
   - Do similar stretch with right leg with left hand.
7. For hamstrings –

(i) Do Pashchimottanasana. If you have problem in bending forward, do this –

- Sit down on floor extending right leg to the front closing left leg to your body as in fig-72.
- Grip the ball of the left foot with both hands and extend the left leg to the front as far as you can. (fig-73)
- Hold it for 10-15 seconds.
- Extend left leg to the front and close right leg to your body.
- Grip the ball of the right foot with both hands and extend the right leg to the front as far as possible.
- Hold it for 10-15 seconds.
8. For groins –

- Adopt lunging position with left foot forward and right leg straight (fig-74)
- Lean forward to stretch the right groin muscles. (fig-75) Hold it for 10-15 seconds.
- Repeat the similar action with right foot forward and left leg straight to stretch left groin muscles.
9. For calves –

(i) • Stand on the edge of a stair as shown in figure-47.
   • Hold it for 10-15 seconds.

(ii) • Lean against a wall with left foot forward and right leg extended (fig-76)
   • Lean further keeping your back straight and right foot firmly planted to feel stretch in right calf. Hold it for 10-15 seconds.
   • Keep the right heel on the ground throughout.
   • Do similar action with right foot forward and left leg extended.
10. For ankles –

- Lean against the wall as described in stretching exercise number alternatively.

- Raise your heel slightly above the ground to stretch ankles. (fig-77)

**Yogic stretching**

1. **Pashchimotanasan** –

   This *asana* stretches almost whole body, particularly hamstrings, calves and small of the back. It improves digestion also.

   - Sit erect. Stretch out legs. (fig-78)
   - Bend forward and grasp your toes.
   - Pull the toes towards yourself and rest your forehead on the knees. (fig-79)
   - Maintain the stretch for 20-30 seconds.
   - Come back to starting position.
Important

- Don’t do this asana if you have lower back problem.
2. **Bhujangasana**

This is an excellent stretching for the back and whole spinal column.

- Lie on your abdomen, keeping arms close to your sides, palms beneath shoulders. *(fig-80)*

- Pushing the ground with your hands. Bend backward till your upper abdomen is up and navel still touching the ground. *(fig-81)*

- Maintain the stretch for 20-30 seconds.

- Come back to the starting position.
3. **Dhanurasana –**

This is an excellent whole body stretching, especially for arms, shoulders, quadriceps and back.

- Lie on your abdomen. Bend the legs and grasp ankles. *(fig-82)*
- Pull the legs upward and simultaneously raise upper body. Aim to balance your body on the navel region. *(fig-83)*
- Maintain the stretch for 5-10 seconds.
- Come back to the starting position.
4. **Gomukhasan** –

This is very good stretching of the upper back, shoulders and triceps.

- This can be done in traditional sitting position (fig-84) or even in upright sitting or standing position.

- Bring the left arm behind the back, palm facing outward, moving up along the spine. Push the forearm up as far as possible. Folding the right ear, palm facing inward, slide down the right hand forearm behind the back till the right hand touches the left hand. (fig-84)

- Aim to lock the forefinger of both hands together.

- Hold it for 10-15 seconds.

- Return to the original position.
IV. SAFETY FACTORS

- Preferably stretching should be done only towards the end of warm-up.

- Stretch to the point of discomfort, but not pain. There will not be any gain from this pain.

- Never stretch an injured part. It will further aggravate the injury.

- Adopt correct form and technique.

- Breathe normally.

- All movements should be in rhythmic manner.

- Sometimes too much of flexibility may be too good to be desirable. Excessive flexibility may lead to injury especially in heavy weight lifting exercises.
• Focus your mind on correct technique of movement. Try to do it better than the previous day.

• Don’t do forward bending in case of any lower back problem.
Chapter -5

NUTRITION

I.  BASICS OF NUTRITION

Introduction

Proper nutrition in combination with adequate exercise and emotional well-being is the key to optimal performance of human mind and body. Lately, lot of research has been done in the field of dietetics. But all these studies have certain inherent limitations. One of the major limitations of these studies is that they have often been conducted on small groups of population or on rats in the laboratories. Even within the same group, different members have responded in different ways to dietary stimulus. For example, in many case studies, where the group was put on the same diet and exercise regimen, some of the group members gained weight, while the others did not gain any weight at all. However, despite all these limitations there are certain basic principles of nutrition which are supported by scientific research as well as by empirical findings.

Preparation of diet plan is not a matter of plain arithmetics in which calculations are made on the basis of calories, proteins, carbohydrates, vitamins, etc. A balanced diet plan for an individual has to take into account several other important factors, e.g., age, gender, nature of physical and mental work, health status, sensitivity to a particular food, income, family food tradition etc. This section explains the basics of nutrition and provides broad guidelines for diet planning.

Principles of nutrition

There are three basic principles of nutrition:-

i) Our body requires six essential nutrients, viz., proteins, carbohydrates, fats, vitamins, minerals and water.
ii) These nutrients are found in four basic food groups, viz., (a) cereals (b) vegetable/fruits, (c) meat/meat substitutes, (d) dairy products

iii) The food items from these groups have to be consumed each day in the way that our maximum food intake comes from cereals followed by vegetables/fruits, meat/meat-substitutes and dairy products.

**Food guide pyramid**

US Department of Agriculture (USDA) has developed the following food guide pyramid as guidelines for daily dietary intake from different food groups, which can be useful for us also.

### Serving size for different food groups

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<td></td>
<td>1 slice of bread, ½ cup of cooked cereal/rice (1 cup is equivalent to volume of a tennis ball/ approx. 8 tablespoons)</td>
<td>½ cup of cooked vegetable</td>
<td>1 medium apple, banana, orange</td>
<td>1 cup of milk/yogurt</td>
<td>Approx. 80-100gm of cooked lean meat, poultry, fish, ½ cup of cooked dry beans, 1 egg</td>
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**Important** – The number of servings given in the food pyramid is recommended for the entire day. For example, 4 slices of breads in the breakfast, ½ cup rice in the lunch, 4 *chapatis* in the dinner, ½ cup *dal* in the
lunch and ½ cup dal in the dinner taken together will provide 9½ servings from the bread/cereal group.

**Vegetarian or non-vegetarian?**

This is one of the most frequently asked questions, especially by vegetarian sportspersons – Can I compete against non-vegetarians on a vegetarian diet only?

To this question, my answer will be – **Yes!** Look at these vegetarian sportspersons –

1. **Carl Lewis** – One of the fastest athletes in the world, in 1991 broke the world record for 100 meters in 9.86 seconds.
2. **Martina Navratilova** – The first tennis player to win Wimbledon nine times (six being consecutive).
3. **Edwin Moses** – From 1977 to 1987 achieved 122 victories in the 400 meter hurdles. Won two Olympic gold medals, two world titles, four world records and a streak of 122 consecutive victories.
4. **Paavo Nurmi** – Great marathon runner, achieved 20 world records with nine Olympic gold medals. In 1924 Olympic Games, he won the 1500 meters and the 5000 meters with just one hour of rest between the two events.

The diet of **Tarahumara Indians**, a tribe of North Central Mexico is mainly vegetarian. They are known for their extraordinary endurance ability. During their popular sport ‘Raripuri’ the participants run for 150-300 kms, repeat, 150-300 kms!

**Who is a vegetarian?**

In fact, vegetarianism has its own different shades. For example, ‘Lacto-vegetarians’ do not eat meat, fish, fowl and eggs, but they eat dairy products. ‘Lacto-ovo-vegetarians’ avoid meat, fish and fowls but include
dairy products as well as eggs in their diet. ‘Vegans’ simply avoid all animal products including meat, fish, fowl, eggs, dairy products and even honey. In India, a traditional vegetarian diet falls somewhere in ‘Lacto-vegetarian’ category. In our analysis, those who rarely consume meat can also be called vegetarians by and large.

**Advantages of non-vegetarian diet**

(i) It is rich in protein.

(ii) It provides complete protein and has all essential amino acids.

**Disadvantages of non-vegetarian diet**

(i) Too much of meat consumption means too much intake of protein. Excess protein intake is fraught with many health risks. Studies have found that diets rich in protein cause excretion of more calcium through urine, thereby increasing the risk of osteoporosis (thinning of bones).

(ii) Non-vegetarian diet is high in saturated fats. High intake of saturated fats is associated with major risk factors of cardiovascular disease.

(iii) It is high in cholesterol. Again, high cholesterol is associated with major risk factors of cardiovascular disease.

(iv) It is low in roughage and therefore promotes constipation.

(v) It is low in vitamins.

**Advice to non-vegetarian**

(i) Select those animal products which are comparatively low in saturated fats and cholesterol, e.g., chicken is preferable to beef, egg whites to egg yolk.

(ii) Consume meat within a reasonable limit to avoid excess intake of protein, saturated fat and cholesterol.

(iii) Take adequate carbohydrates.
(iv) Include green vegetables and salads in your diet for roughage and essential vitamins.

**Advantages of vegetarian diet**

(i) It is high in carbohydrate, the principal source of energy.

(ii) A diet based on cereals, vegetables, fruits does not have saturated fats and cholesterol and thereby reduces the major risk factors associated with cardiovascular disease.

(iii) It is rich in vitamins and minerals.

(iv) It has plenty of roughage facilitating good bowel movement.

**Disadvantages of vegetarian diet**

(i) It is generally low in protein.

(ii) It does not contain all essential amino-acids. Low protein intake may result into low muscular gain.

**Advice to vegetarians**

(i) Combine two or more cereals or vegetable proteins for getting all essential amino acids. For example, combine rice or wheat with soybeans/pulses/legumes/lentils. Actually, this is what traditional Indian diet usually includes. By this method of combination (mutual supplementation), you can compensate individual amino acid deficiency of a vegetable protein.

(ii) You can increase protein intake by simply increasing your caloric intake, e.g., take additional cup of *moong* sprouts or additional cup of milk.

(iii) Include low fat dairy products in your diet.
II. PROTEINS

Importance of proteins

(i) Proteins are important for building and repairing of all cells and tissues, including internal organs, muscles, blood cells, brain, bones and skin.

(ii) Proteins are components of enzymes and some hormones which regulate our body’s activities.

(iii) Proteins also provide energy (4k calories/gm) in case of carbohydrate-depletion. Carbohydrate-depletion takes place during starvation or prolonged exercise session. However, foods rich in proteins are often expensive and we should not waste them as fuel for energy. Proteins are primarily meant for building and maintenance of the body; carbohydrates and fats are preferred fuel for energy.

More protein – more muscles?

More protein does not lead to more muscles. In our body, proteins exist in a dynamic state. They are continually broken down and replaced by new proteins. This continued replacement is known as ‘protein turnover rate’. Increased physical training, severe illness, hard manual labour etc. increase protein turnover rate. Thus, demand for more proteins arises from within the body. It is not possible to increase the body’s protein metabolism artificially and thereby stimulate muscle growth simply by eating more amount of protein. Therefore, you should be careful of the advertisements of high-protein diets claiming to give you a bodybuilder’s body without doing any exercises. You might be really pumping your money to the shopkeeper’s pocket by eating so much of protein-supplements!
How much proteins do we need?

(i) The RDA (Recommended Dietary Allowance) for proteins in adults is .8 gm per kg/body weight per day. If one weighs 70 kg, his daily proteins requirement will be 70 x .8 =56 gm.

(ii) Those who are involved in exercise of high intensity and high volume may benefit by taking proteins well above the RDA (1.2-2 gm/kg body weight/day). Studies show that protein intake beyond 2 gm/kg body weight is not desirable.

(iii) Normally, caloric intake from proteins should be 15-20% of the total caloric intake. If one’s daily total caloric intake is 3000 Kcalories, 450-600 Kcalories should come from proteins. Rest of the calories should come from carbohydrates and fats.

(iv) Depending upon the nature, intensity and volume of work/exercise, there can be minor variations in proportion of calories from three major nutrients (i.e., proteins, carbohydrates and fats). For the athletes engaged in strength exercises, 20% of calories may come from proteins, 60% from carbohydrates and 20% from fats. On the other hand, in case of endurance athletes the proportion of carbohydrates may go up to 70%, thereby reducing the caloric percentage from proteins and fats.

(v) If there is decrease in total caloric intake for any reason (e.g., in case of someone trying to lose weight by reducing the total caloric intake) he should raise the percentage of caloric intake from proteins above 15% to avoid loss of lean body mass. Lean body mass is the body mass minus fat. The main reason for this is that our major energy requirement should be met from carbohydrates and proteins should be spared for building and maintenance of the body. Proteins are used for energy, only under the extreme conditions, as mentioned earlier. Therefore, if carbohydrate-depletion is a deliberate act and
proteins are intended to be used as fuel, total percentage of protein intake will have to be increased above the RDA.

**What happens to surplus protein?**

(i) If dietary protein’s intake is more than our requirement, it can be utilized by our body for energy or simply converted to fat for future use.

(ii) Many of the high-protein diets are high in fat also (e.g., animal foods have large amount of saturated fat and cholesterol). This is a health risk factor.

(iii) High-protein diets are often low in fibre. This hampers smooth food movement inside on body and overloads digestive system leading to constipation.

(iv) Studies have found that high-protein diet can even cause too much loss of calcium through urine. Those who take high-protein diet should also take high doses of calcium to avoid osteoporosis over a period of time.

(v) Excess protein is not good for kidneys. The kidneys would have to process more nitrogenous wastes which are generated during protein metabolism. This overload on kidneys may ultimately lead to kidney disease.

(vi) High-protein diets are also more dehydrating. Removal of nitrogenous wastes by kidneys is done through increased fluid excretion causing fluid loss. Dehydration often leads to poor physical and mental performance.

**Essential and non-essential amino acids**

Amino acids are building blocks of proteins. There are approximately 22 different amino acids. Ideally, our food should provide all amino acids. The body itself can synthesize some amino acids from carbohydrates (these
are called non-essential amino acids). But there are nine amino acids which cannot be synthesized by the body and we have to obtain them from our dietary protein (these are called essential amino acids).

Dietary proteins that contain all amino acids (both essential and non-essential amino acids) are known as ‘complete proteins’. The complete proteins are generally found in foods of animal sources, i.e., meat, dairy products, eggs, fish, etc. Contrary to this, dietary proteins that do not contain all the amino acids are called ‘incomplete proteins’. These are generally of plant origin, e.g., nuts, grains, legumes, seeds, etc.

However, vegetarians need not get alarmed by this. By ‘mutual supplementation’ two or more vegetable proteins can be mixed together to compensate for each other’s individual deficiency of all amino acids. For example, soy beans, peas, beans, lentils, legumes can be mixed with rice, wheat, corn etc. This way vegetarian proteins can be as good (and as complete) as non-vegetarian proteins.

III. CARBOHYDRATES

Introduction

The main function of carbohydrates is to supply energy. Though carbohydrates provide approximately equal amount of energy as proteins (4Kcalories/gm), they are far more efficient fuel than proteins.

Dietary carbohydrates are of two types – simple and complex. Simple carbohydrates are made up of one or two sugar molecules (e.g., honey, jelly, soft drinks, etc.). Complex carbohydrates contain many sugar molecules linked together. (e.g., whole grains, potatoes, vegetables and fruits, etc.).

How much carbohydrates should we take?

(i) As per the RDA, (Recommended Dietary Allowance) our daily carbohydrates intake should be within range of 6-11 gm/kg of body

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weight. If a person weighs 70 kg, he should take 420-770gms of carbohydrates depending upon his daily caloric requirement. A 70-kg marathoner will require more caloric intake (and, thereby, proportionately more carbohydrates) than a 70-kg sedentary clerk.

(ii) 55-60% of our total dietary calories should come from carbohydrates. If a person’s daily caloric intake is 3000 calories, 1650-1800 calories should come from carbohydrates.

(iii) Carbohydrates are a preferred metabolic fuel. They spare proteins for muscle building and maintenance of body. If our intake of Carbohydrates is less than the RDA, our body may tend to utilize proteins for energy and consequently muscle building may suffer.

(iv) Low carbohydrate diet will build up low glycogen stores in the muscles. Thus, chronically deplete muscle glycogen stores may lead a person to reduced performance. Those on ‘crash diet’ should note this.

Digestion of carbohydrates

Digestion of carbohydrates starts in mouth. While chewing of food (mastication) we produce saliva. Salivary enzyme amylase breaks down the starch(which is tasteless) of carbohydrate to maltose which is sweet. This is why food tastes sweet if properly chewed.

During digestion carbohydrates are broken down into glucose and circulated in blood to be used for energy. If our body does not use glucose immediately for energy, surplus glucose is converted into glycogen and stored in muscles and liver for future use. Approximately, 2/3 glycogen is stored in muscles and 1/3 in liver. Since total glucose storage capacity of muscles and liver is limited, the surplus amount of glycogen is converted and stored as fat. This is why overeating causes more fat deposit in body.
Chewing our food well helps better digestion and optimal utilization of food intake. Yoga teachers recommend to ‘drink the food’ (chew the food so long that it becomes liquid in your mouth, then swallow it) for its best utilization. Chewing well also discourages overeating. (The task itself is so boring that naturally you will not have much patience to take huge dose of food!)

**Complex vs simple carbohydrates**

Complex carbohydrates are preferable to simple carbohydrates for these reasons –

(i) Complex carbohydrates contain fibre, water, vitamins and other nutrients. Simple carbohydrates on the other hand, have hardly any other nutrients.

(ii) The presence of fibres in whole-grain food makes them more satisfying. Foods rich in fibre prevent constipation.

(iii) High-fibre foods, also take more calories for their digestion. This has an important implication for weight control. One can eat high-fibre foods to his satisfaction and still may not gain much weight!

(iv) Complex carbohydrates encourage better glycogen storage than simple sugars.

**Carbohydrates loading (carbo-loading)**

Carbo-loading is a practice prevalent among endurance athletes. This technique is used to enhance muscle glycogen store of the athlete prior to the race. Firstly, the athlete eats low-carbohydrates diet for 3 days and simultaneously has prolonged exercise sessions of high-intensity to deplete his body of the carbohydrates to a great extent. This is followed by 3 days of rest or very low-intensity exercise and simultaneously a high-carbohydrates diet. During these 3 days, a ‘carbo-starved’ body tends to store more muscle glycogen than its normal level (super-compensation
effect). This increased level of glycogen store helps the athlete to perform for a longer time. ‘Hitting the wall’ is an experience that occurs to runners during long distance runs (e.g., during marathon) when marathoner’s body is so depleted of carbohydrates that he seems to ‘hit the wall’ and has hardly any energy left in him to carry forward. Carbo-loading pushes the ‘wall’ further towards the finishing line. (If earlier you hit the wall at 30th km, now you may experience it, may be, at 40th km.)

However, this technique does not suit everyone. Sometimes carbo-loading in its carbo-depletion stage causes undesirable side effects, e.g., physical and mental fatigue, depression and irritability. Never try this at the time of race unless you have done so during your training.

**Tips to make the most out of carbohydrates:**

(i) Carbohydrates are best absorbed if taken immediately after the exercise. Why? A prolonged, intense exercise causes carbohydrates-depletion in our body. The muscle glycogen level requires to be restored soon after the exercise. If carbohydrates are not ingested within half an hour or so, our body turns to utilize its proteins for energy requirement. As mentioned earlier, proteins are primarily meant for body building and not for supplying energy. If they are diverted to be used as fuel, muscle building will take a back seat.

(ii) What’s the best type of carbohydrates for instant refuelling after exercise? A natural choice will be those carbohydrates that figure high on glycemic index. (Glycemic index is a scale that describes how fast a food is converted to glucose in the blood). However, in some cases, taking too much of high glycemic carbohydrates may elevate blood-sugar level. This may stimulate sudden spurt of insulin which may cause abnormal fall in the blood-sugar level (hypoglycemia). Due to temporary hypoglycemia, one may feel weak or dizzy. Therefore, it
is advised to have a wise combination of both high and low glycemic foods.

Most fruits and vegetables, whole grain breads, milk, *dals* are low glycemic Index foods. Cornflakes, potatoes, watermelon, white bread, sugar, honey are high foods.

Major sources of carbohydrates are rice, wheat, *jowar, ragi*, potato, tapioca, banana, honey, fruits.

**IV. FATS**

**Introduction**

Fats are not as bad as most of us are made to believe. On the contrary, they are useful in many ways -

(i) They help in absorption of fat- soluble vitamins, i.e., vitamin A, vitamin D, vitamin E and vitamin K. Vitamin A is required for growth and repair of tissues, maintenance of proper vision, resistance to infection; Vitamin D is required for bones and teeth; Vitamin E helps in the muscle tissue/repair process; Vitamin K is required in the process of blood clotting, protein formation and also for healthy bones.

(ii) Fats provide energy.

(iii) Let’s be honest about it, fats make our food tasty.

(iv) Essential fats (those fats which our body cannot make; therefore, we have to get them from food) are required for our normal growth, healthy arteries and nerves, for smooth skin and healthy joints. They also help in cholesterol metabolism. Corn, soybean, safflower oils are very high in essential fats. Nuts, seeds are also very important source of essential fats.
(v) Studies have shown that Omega-3 fatty acids (found mainly in fish as well as in green leafy vegetables, nuts) are helpful for the patients of heart disease and high blood pressure. They help to make high density lipoprotein (HDL) and regulate production of low density lipoprotein (LDL).

(vi) Fats regulate sex hormones.

(vii) Fats are necessary for healthy cells.

**How much fat is enough?**

(i) American Heart Association (AHA) recommends that in our daily diet not more than 30% of total calories should come from fat. However, in case of bodybuilders, athletes, who have to carry more muscle mass than fat in their body composition for peak performance, fat may come form 15-20% of their total calories. For a normal person 20% dietary fat is enough.

(ii) Saturated fats should contribute not more than 30% of the total calories from fats.

(iii) However, by reducing fat intake less than 15-30% of total dietary calories you risk trouble in absorption of fat-soluble vitamins (vitamins A, D, E, K).

**Saturated, unsaturated and trans fats**

The classification of fats is based on the saturation of their chemical bonds by hydrogen. In saturated fatty acids most of the chemical bonds are occupied by hydrogen. Unsaturated fats have fewer of these bonds occupied by hydrogen.

Animal fats are available in meat, egg, milk and milk products. These fats are predominantly saturated and associated with heart disease. Therefore, their consumption should be limited. Vegetable fats are predominantly unsaturated. Unsaturated fats are mostly liquid at room
temperature (e.g., vegetable oils). Saturated fats are mostly solid at room temperature. However, coconut oil is an exception, which is saturated but exists as a liquid at room temperature. Trans fats are produced when liquid fat is made solid by a process called hydrogenation. Trans fats act like saturated fats and can pose the same health risks. Many of the processed foods like potato chips, samosa, bakery items (cakes, muffins, cookies, etc.), french fries contain trans fats.

**Why excess dietary fat is not good for you:**

When we count the fat intake in our diet, we should not overlook the hidden fat. For example, while munching deep fried peanuts we should not forget that in addition to the oil used for cooking, the peanuts themselves contain huge amount of fats.

These are some inherent health risks involved with high-fat diet –

(i) There is a relationship between dietary fat (especially saturated fat), blood cholesterol level and risk of heart disease. The risk of colon cancer is also associated with high-fat diet.

(ii) Unsaturated fats contribute to production of free radicals which are associated with aging and certain degenerative diseases.

(iii) Fat has less thermic effect. This means that fewer calories are required to convert dietary fat into body fat. This contributes to weight gain.

(iv) Fat is a high-energy source. (Protein/carbohydrates=4 kcalories/gm; fat=9 kcalories/gm). It satisfies appetite very readily and is stored in body very easily. This may discourage one to take balanced food if his hunger is already satisfied.

**Cholesterol**

Cholesterol is a waxy, light-coloured substance. It comes in two different forms- cholesterol in food and cholesterol in blood. Our dietary cholesterol intake should not exceed 300mg/day. Food cholesterol is
mainly found in foods of animal origin (meat, dairy products). Plant foods do not contain any cholesterol. Foods like liver, eggs, beef, pork, chicken, milk are high in cholesterol.

Our liver manufactures blood cholesterol from saturated fats. This means that the more saturated fat we take the more cholesterol our liver will make. The excess circulation of cholesterol in blood can accumulate on the inner walls of the arteries (called plaque) leading to heart disease. Cholesterol may be present in blood as a constituent of Low Density Lipoprotein (LDL) or of High Density Lipoprotein (HDL). LDL and HDL affect heart disease risk differently. LDL is known as bad cholesterol. It is responsible for depositing cholesterol on the artery walls. HDL is good cholesterol. It contains smaller amount of cholesterol. Its job is to remove cholesterol from the cells in the artery walls and transport it back to the liver for reprocessing.

V. VITAMINS AND MINERALS

Introduction

Vitamins and minerals are referred to as **micronutrients**. Unlike **macronutrients** (i.e., proteins, carbohydrates and fats) they do not directly supply energy. But they help in the metabolism of macronutrients.

Vitamins

Vitamins are organic substances. They cannot be synthesized by our body. Therefore, they are to be obtained from our diet.

Vitamins are classified according to their solubility in fat or water. There are four fat-soluble vitamins – vitamins A, D, E and K. They are absorbed with dietary fats and can be stored to some extent in our body.

Water-soluble vitamins are – vitamin C, B₁, B₂, B₆, B₁₂, niacin, folic acid etc. Unlike fat soluble vitamins, these vitamins are not normally stored
in the body. Therefore, we have to take them daily. Symptoms of water-soluble vitamins deficiency may be apparent in 6-7 days.

**How much vitamins do we require?**

One of the most frequently asked questions is whether one requires vitamins supplements. The answer is – generally, there is no cause of worry about vitamins deficiency if one is on a nutritionally balanced diet. This applies to athletes also.

However, in case of very intense/high-volume exercise, one may require to take vitamin/mineral supplementation. Studies have shown that heavy exercise may reduce vitamin/mineral status in the body. This generally happens in case of vitamin C and riboflavin (B_2). Stressful situations may increase the need for vitamins and minerals too. But one should remember that generally the increased requirement for vitamins and minerals can be met by proportionately increasing total amount of diet.

Sometimes, high doses of vitamins may produce a temporary feeling of improved performance. But remember that vitamins taken in abnormally high doses, are no longer working as vitamins only; possibly they are acting like performance-enhancing drugs.
Functions of major vitamins and their food sources are given in the table below –

<table>
<thead>
<tr>
<th>Vitamins</th>
<th>Functions</th>
<th>Best Food Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>Normal vision, growth and repair of body tissues</td>
<td>Liver, egg yolk, whole milk, butter, carrot, ghee, papaya, green leafy vegetables</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>Helps in absorption of calcium and building of bone mass</td>
<td>Fish, milk, egg yolks, butter and sunlight.</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>Helps in repairs of exercise-induced tissue damage</td>
<td>Nuts, seeds, wheat germ, polyunsaturated vegetable oils, fish liver oils, peanut butter</td>
</tr>
<tr>
<td>Vitamin K</td>
<td>For normal blood clotting, bone formation</td>
<td>Vegetables, milk.</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>Helps iron absorption, protects against infections.</td>
<td><em>Amla</em>, Citrus fruits and green leafy vegetables, lemon juice, potatoes.</td>
</tr>
<tr>
<td>Vitamin B-Complex</td>
<td>Metabolism of carbohydrates, proteins, fats, healthy nervous system, normal growth.</td>
<td>Rice, wheat, animal foods, nuts, peanuts, soybean, leafy vegetables, fruits, beans.</td>
</tr>
</tbody>
</table>

**Minerals**

Minerals are inorganic elements constituting approximately 3-4% of our body weight. These are generally divided into two categories – (i) Trace elements – these minerals are present in very small quantities, i.e., less than .01% of body weight; (ii) Macrominerals – they are more then .01% of body weight. Both are equally important for our body and their deficiency may have major health implications. The macrominerals include sodium, calcium, phosphorus, magnesium, potassium, sulphur. Important trace
elements are iron, zinc, selenium, iodine. We will discuss about some important minerals.

**Sodium**

Sodium maintains normal water balance within our body, affects blood pressure, maintains acid-base balance and muscular contraction. The major sources of sodium are common salt (Sodium Chloride) and MSG (Monosodium Glutamate). One tea spoon of salt (approx. 5 gm) has approximately 2000-2200 milligram of sodium. Sodium is naturally found in majority of the foods. The recommended sodium intake is around 500-2400 mg a day (i.e. not more than approximately 1¼ tea spoon). Most of us eat more salt and thus take more sodium than we actually need. This will be evident when we notice the ‘hidden salt’ in our foods – both natural as well as processed. Junk foods are bad due to their high salt contents also.

Excess sodium intake can cause water retention in our body which may result into undesirable weight gain. Don’t be surprised if one fine morning your weighing machine suddenly shows a weight gain of 200-400 gm. In all probability, the culprit may be just the small salty pickle you ate previous night! Secondly, high salt intake may increase the risk of high blood pressure. Thirdly, too much of salt is bad for our kidneys.

There are two myths associated with salt – (i) one requires more salt while doing vigorous and prolonged exercise, and (ii) cramps can be avoided (especially during distance running), if salt intake is increased. The fact is that actual loss of salt through sweat is not very significant. If we look at our daily amount of salt intake, we will find that our daily intake of salt is enough for running a marathon per day! Secondly, the studies have yet to find any substantive relationship between muscle cramps and salt deficiency.
Calcium

Calcium and Phosphorous are major constituents of our bones and teeth. Every day some amount of calcium from the bones circulates in the blood. This removed amount of bone calcium is quickly replaced by calcium from our diet. If the dietary calcium is not adequate, the lost bone calcium cannot be fully replaced. Calcium deficiency may thus lead to inadequate bone calcification and subsequently to osteoporosis. Dairy products are major sources of calcium. Therefore, those who avoid intake of dairy products in their diet (for fear of weight gain) are at a greater risk.

Increasing calcium content of diet may be useful to prevent osteoporosis. Physical exercise, particularly weight training, may also help prevent and reverse osteoporosis. Weight training increases the density of bones by stressing them. Therefore, the best way to prevent osteoporosis will be to combine both exercise and diet.

There is a word of caution for those who are engaged in long-distance running. Their diet may not be adequate enough to provide sufficient calcium for replacement of lost bone calcium. In their cases, prolonged exercise may lead to bone-thinning instead of bone-strengthening. Such athletes should seek medical advice to increase their calcium intake accordingly.

Iron

Iron deficiency is found to be common among athletes, especially, those involved in prolonged physical activities (e.g., long-distance running). This deficiency may be due to inadequate absorption of dietary iron, losses from gastrointestinal tract, or excessive sweating.

The RDA for iron is 10 mg/day for men and 15 mg/per day for women. Women require more iron than men because of iron losses during their menstruation.
Since iron is necessary for carrying oxygen to muscles, iron deficiency may lead to less oxygen supply to muscles. This deficiency may result into extreme fatigue, loss of strength and endurance, and prolonged recovery periods after an exercise.

Iron is found in two forms. Heme iron (in animal foods, e. g., meat, liver, poultry, fish) is readily absorbed iron. Non-heme iron (in vegetables) is less absorbed. Your body is not able to absorb all iron present in the vegetables. However, there are certain food items that help in more absorption of non-heme iron, e. g., foods rich in Vitamin C. Add some fruit or a glass of fruit juice, or salad to your diet, or simply sprinkle some lemon juice for better absorption of iron from vegetables.

Coffee and tea tend to inhibit the absorption of iron. Hence, these beverages should be taken 1-2 hrs. after the meal.

On the other hand, excess iron intake has its own harmful implications. It tends to cause indigestion and constipation. In its extreme form excess iron intake may lead to hemochromatosis, in which the body stores excess iron in heart and liver tissue.
Functions of important minerals and their food sources are given in the following table –

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Function</th>
<th>Best Food Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Major Minerals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>Healthy bones, teeth, muscle contraction.</td>
<td>Dairy products, green leafy vegetables, Ragi.</td>
</tr>
<tr>
<td>Phosphorous</td>
<td>Strong bones and teeth.</td>
<td>Animal foods, whole grains, nuts.</td>
</tr>
<tr>
<td>Magnesium</td>
<td>Metabolism of carbohydrates and proteins.</td>
<td>Whole grains, nuts, green vegetables.</td>
</tr>
<tr>
<td>Potassium</td>
<td>Maintenance of normal fluid balance of cells, muscle contraction.</td>
<td>Potatoes, vegetables, fruits, banana.</td>
</tr>
<tr>
<td>Sodium</td>
<td>Maintenance of normal fluid balance of cells, Nerve and muscle function.</td>
<td>In almost all foods</td>
</tr>
<tr>
<td><strong>B. Trace</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td>Red blood cell formation, oxygen transport to cells.</td>
<td>Green leafy vegetable, liver, meats, nuts, beans.</td>
</tr>
<tr>
<td>Iodine</td>
<td>Regulation of growth, development, energy metabolism.</td>
<td>Iodized salt.</td>
</tr>
</tbody>
</table>

**VI. WATER**

**Importance of water**

By weight, water constitutes approximately 45-60% of human body. Water provides a medium for biochemical reactions as well as transport and exchange of nutrients, metabolic by-products, gases and heat. Therefore, any small change in water content in our body may cause changes in
biochemical reaction dependent on water. Acute water loss, i.e., dehydration may bring many health complications.

Sufficient water intake is necessary for healthy kidneys. Inadequate water intake increases concentration of urine and thus contributes to stones formation as well as growth of germs infections. The best way to avoid these complications is to keep urine sufficiently dilute by drinking sufficient water throughout the day.

One body loses water through perspiration and respiration. Depending upon intensity and duration of exercise or outside temperature, a person may lose between 1-3 litres of water per hour (i.e., approximately 1-3 kg of body weight). Any intense exercise beyond one hour will thus interfere with cooling function of the body and will affect a person’s performance. A marathon runner may lose even upto 4.5 litres of water during 2½-3 hrs. of race. This loss cannot be compensated during the race and there will be a huge deficit of water intake. It is, therefore, important to hydrate one’s body before, during and after any prolonged exercise.

Guidelines for adequate hydration:

(i) Don’t wait for thirst. The feeling of thirst lags behind your body’s need for water. Therefore, without waiting for thirst, drink sufficient amount of water in a day. The colour of your urine is a good indicator of your body’s hydration. It should always be clear or pale; if it is yellowish, it may be indicative of under-hydration.

(ii) Cold water (4-5 °C) is absorbed faster in your system. However, during cold day warm water will make you more comfortable.

(iii) On higher altitudes, where it is dry, drink more water.

(iv) Avoid coffee, tea, cola, alcohol. These are diuretics (diuretics cause the body to eliminate water and thus dehydrate it). It is a good idea to drink a glass of water before drinking tea or coffee.
(v) During an exercise of a longer duration (beyond 1 hour), drink (100-150 ml) every 15-20 minutes. But never ‘over drink’.

(vi) Sugar-and-electrolyte solutions can be taken during prolonged exercise, but they should be sufficiently diluted. It should be a hypotonic solution with a lower osmotic pressure than that of body’s fluids. If the solution is too concentrated, it will not be absorbed by the body and can lead to gastric distress. Taking glucose in dry powder form is not a good practice.

**Hyponatremia (water intoxication)**

It is good to hydrate oneself at regular intervals during an exercise of long duration. But too much of water intake has its own hazards. Over drinking may lead to hyponatremia (loss of sodium). This happens as too much of water ingestion dilutes sodium contents in blood. Acute sodium-deficiency may result into heat exhaustion and cardiovascular collapse.

**Summary of the chapter** –

Nothing is as confusing as the subject of nutrition. Don’t get confused. Be practical. Eat whatever you have been eating and enjoying so far. Just keep following points in your mind regarding your diet –

(i) Proportion of daily calories should approximately follow this formula – 60% from carbohydrates, 20% from protein and 20% from fats.

(ii) Avoid processed, tinned food (which are high in sugar, salts and low in fibres). Prefer natural, seasonal, fresh, fibrous food.

(iii) Follow Food Guide Pyramid.

(iv) Reduce your salt intake. Excess salt adds to high blood pressure. It also adds to overall body weight by retaining more water in body.

(v) Include *nuts* in your diet.
(vi) Eat sprouts of Bengal gram, *moong*, soybeans, etc. They are filled with enzymes, protein, complex carbohydrates, fibre, vitamin and minerals. Sprouts also contain antioxidants and protect us from the ongoing effects of aging.

(vii) Cut down on sugar.

(viii) Cut down on saturated fats. Prefer low fat diet.

(ix) Avoid overeating. Eat 4-5 small meals instead throughout the day.

(x) Be happy while eating your food.
WEIGHT MANAGEMENT

I. INTRODUCTION

The term ‘weight management’ refers to maintenance of one’s weight within a healthy range, being neither overweight nor underweight. Overweight or obesity can be defined as an abnormal or excessive fat accumulation in our body. Overweight and obesity affect one’s day to day physical performance. What is more important, these are major risk factors for heart disease, stroke, type II diabetes, osteoarthritis and certain forms of cancers. On the other hand, being underweight makes one vulnerable to gastrointestinal diseases and affects immune system adversely. Parents and teachers may please take note that as per World Health Organization (WHO) report, childhood obesity is associated with a higher chance of premature death and disability in adulthood\(^1\).

The problem of overweight is so huge and widespread that WHO has termed it ‘global epidemic’. It is no longer confined to developed countries; it is increasing at faster rate in developing countries. As per WHO report, in 2005, globally approximately 1.6 billion adults (age 15+) were overweight and at least 400 million of them obese.

However, the good news is that the problem of overweight and obesity is largely preventable. And, the solution lies in an intelligent mix of balanced diet, regular exercise and positive mind-set.

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2. Ibid
II. CAUSES OF OVERWEIGHT

For a normal person who is not suffering from any medical abnormality, the fundamental cause of overweight and obesity is *more caloric intake and less caloric expenditure*. This caloric imbalance may occur due to following reasons –

(i) **Aging process** – With age our body composition$^3$ changes. There is an increase in fat percentage and decrease in fat free mass. Consequent to this, our Resting Metabolic Rate (RMR) declines. The decline in RMR means that our body now requires less number of calories for its maintenance. Failure to adjust our caloric intake to changed body composition leads to weight gain.

(ii) **Sedentary life style** – Increasing urbanization, sedentary nature of work, widespread use of mechanized transport give us less scope for physical activity. Ignoring this fact and continuing with higher caloric intake contributes to weight gain.

(iii) **Discontinuation of exercise** – Those earlier accustomed to regular physical exercise may suddenly discontinue exercise due to illness, work commitment or out of sheer laziness, yet continue with the usual high caloric intake. This would surely cause weight gain. It is not very uncommon to see many ex-sportspersons walking with those extra tyres of fat around their waist, for this reason only.

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3. Body composition is the percentage distribution of fat and fat free mass in our body. Fat free mass includes muscles, bones, water and other non-fatty tissue.
(iv) **Junk food** – Frequent and indiscriminate consumption of junk foods is a major cause of overweight and obesity, especially among children. Junk foods are very high in calories due to their high contents of fats, sugar and salts. While high calories from fats and sugar directly contribute to weight gain, salt contributes so by causing more water retention in the body.

(v) **Poor understanding of exercise and nutrition** – The relationship between amount of calories spent and calories gained has to be understood properly. Remember this simple common sense formula – for weight maintenance, caloric expenditure should be equal to caloric intake; for weight loss, caloric expenditure should be more than caloric intake and for weight gain, caloric expenditure should be less than caloric intake. Some of the new comers to exercise have a tendency to overestimate their energy expenditure during exercise and taking it as a licence to consume high calories food. This results into imbalance between caloric intake and caloric expenditure.

### III. WHAT IS THE IDEAL BODY WEIGHT (IBW)?

We are a generation obsessed with weight management. We are always in quest of an *ideal* body weight. We starve ourselves to ridiculous extent, put more faith in miracle machines, devour magic pills and spend thousands of rupees to visit slimming centres.

The question is – what is the ideal body weight (IBW) for a person? The answer is – this is a **WRONG** question. In fact, there is **NO** ideal body weight for any one.

From time to time, efforts have been made to devise some sort of Height-Weight Tables to determine IBW for a corresponding height. For
example, Metropolitan Life Insurance Height & Weight Table (1980), developed by Metropolitan Life Insurance Company, was based on data associated with long life of the subjects who were closer to average IBW.

Later, **Body Mass Index (BMI)** came to be widely accepted as a simple, quick and convenient method for determination of overweight and obesity. BMI is calculated by dividing weight in kilograms by height in meters squared.

\[
\text{BMI} = \frac{\text{Weight (Kg)}}{\text{Height (Mtr)}^2}
\]

IBW is measured at a BMI between 18.5-24.99 Kg/m\(^2\), overweight at a BMI of 25 kg/m\(^2\) or more and obesity at a BMI of 30 kg/m\(^2\) or more. These cut offs are based on association between BMI and chronic disease and mortality and have been adopted by the World Health Organization (WHO). Please see the following table –

<table>
<thead>
<tr>
<th>Classification of Overweight and Obesity by BMI</th>
<th>Obesity class</th>
<th>BMI kg.m(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td></td>
<td>&lt; 18.5</td>
</tr>
<tr>
<td>Normal</td>
<td></td>
<td>18.5-24.9</td>
</tr>
<tr>
<td>Overweight</td>
<td>I</td>
<td>25.0-29.9</td>
</tr>
<tr>
<td>Obesity I</td>
<td>II</td>
<td>30.0-34.9</td>
</tr>
<tr>
<td>Obesity II</td>
<td>III</td>
<td>≥40</td>
</tr>
<tr>
<td>Extreme obesity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

However, despite its wide acceptability and use, the concept of BMI suffers from the following limitations:

(i) **BMI is not a valid\(^4\) method to assess body fat.** It is based on a simplistic presumption that ‘overweight’ is due to excess fat and hence more the fat, greater the risk of diseases. Therefore, being ‘overweight’ is always undesirable. This presumption is not true. BMI lacks validity as it

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4. Validity refers to the degree to which a test measures what it is supposed to measure. BMI cannot measure fat.
does not distinguish excess adiposity (fatness) from greater muscul arity. In other words, it ignores the fact that overweight can also be caused by greater muscul arity or a larger body frame. For example, sportspersons like bodybuilders, heavyweight boxers, footballers, sprinters etc. may be ‘overweight’ or even ‘obese’ by BMI standards despite their excellent athletic ability and low body fat percentage.

There is a distinction between overweight due to excess fat and overweight due to excess muscul arity. When your overweight is due to excess fat, it is a liability. It will reduce your physical performance and increase the risk of certain diseases. Such overweight is harmful, hence undesirable and a matter of concern. On the other hand, if your overweight is due to extra muscle gain, it will contribute to your better physical performance. Such overweight is useful hence desirable and a matter of celebration. Look at the following illustration–

In above illustration BMI will blindly place both A and B in the same category. Whose health is more at risk? You cannot find any answer from BMI. Actually, in case of the person B, high % fat is a matter of concern while for A, low % fat and high % lean body mass is a matter of celebration though both of them have the same weight.

(ii) BMI ignores the element of body frame size. A person of same height and body composition but of larger body frame may weigh more than his medium or small body frame counterpart. But for all three body frame sizes, the same IBW has been fixed. Thus when we prescribe the
same IBW for all body frame sizes and allow a concession of 10% (beyond which one would be categorized as overweight), it practically means allowing a narrower range of concession to a person of larger body frame (as he is already heavier due to his larger skeletal frame). This is not a fair practice.

Look at the following illustration –

In this illustration D will have a greater BMI than C despite having equal % of body fat only because of his larger body frame.

(iii) BMI is not a suitable measure of ideal weight in case of children. For adults who have stopped growing, BMI method presumes that thereafter an increase in their weight will by caused by an increase in their body fat. In case of children, their amount of body fat keeps on changing as they grow up. Their BMI may decrease during early school days (due to shedding of baby fat) and then again increase as they grow into adulthood (due to increased muscle mass and larger body frame).

(iv) Similarly, BMI will underestimate the amount of body fat of an elderly person. I have found many persons declaring with satisfaction (and pride) that over the years they have maintained their ideal weight. Take example of a person who weighed 70 Kg at age of 20, 40 and 60.

Look at the following illustration –
It is clear from this illustration that weight of the person has remained in an ideal weight range throughout despite increase in % body fat over the years (which is not a healthy sign). This person has lost muscle mass, bone mass and is still happy about his weight!

By now, it must be fairly clear that it is not the ‘overweight’ as such but it is rather the ‘over fat’ which should be of our real concern.

Now, the question arises – what is the ideal body fat (IBF)?

IV. WHAT IS THE IDEAL BODY FAT (IBF)?

Unfortunately, unlike Body Mass Index (BMI) there is no universally accepted set of body fat standards. Different studies have recommended for a *minimal essential fat* percentage of total body weight. Minimal fat is the body fat that is necessary for health. It is essential for our nervous system, cell membranes, regulation of body temperature and production of sex hormones. According to American College of Sports Medicine (ACSM), minimal fat percentage for men and women should be 5% and 10-12% of total body weight respectively\(^5\). Body fat less than 10-12% in women may lead to bone-thinning disease osteoporosis. The healthy range of fat percentage may go upto 25% and 38% for men and women respectively\(^6\). US Army standards allow upto 26% and 36% for men and women above 40 respectively\(^7\). There are so many other studies which recommend an ideal fat % range with slight variations. Let’s not embark upon this endless journey of finding ‘the ideal body fat’.

What is important for us is that we should be well within healthy range of body fat percentage. Lower the body fat percentage, the better will be our physical performance.

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6. Ibid
7. US Army Physical Fitness, p.50.
How to Measure Body Fat?

Well, this is the most intriguing part of the entire problem. Body fat can be measured by any of these methods, viz., Hydrostatic Weighing, Air Displacement Plethysmography (ADP), Bioelectric Impedence Analysis (BIA), Ultrasound, Dual Energy Projection Method, Magnetic Resonance Imaging (MRI), Anthropometry (by measuring body parts, e.g., waist-hip ratio and skin fold calipers method). None of these methods is perfect and has its own limitations and error margin.

Let the complexity of methods mentioned above for body fat measurement not worry you at all. I would suggest two rather simple methods which would help you to know about your health risks associated with body fat. These are –

(i) **Waist-Hip Ratio (WHR)** – WHR is obtained by dividing the waist circumference by the hip circumference. For this, measure the *smallest* girth around your abdomen and the *largest* girth around your hips. (Don’t cheat yourself by sucking in your belly to minimize your waist circumference!)

(ii) **Waist circumference (WC)** – As mentioned above, waist circumference is to be obtained by measuring the *smallest* girth around your abdomen.

**Important for Indians** – Studies have been conducted to determine cut-off values (for Indians) for BMI and upper-body adiposity (measured by Waist circumference) or WHR and their risk association with diabetes and cardiovascular disease. One such study found that universal criteria for BMI, WC or WHR did not hold good for all races. For a given BMI, Indians have higher upper-body adiposity and higher visceral fat when compared with the White population. This makes Indians more vulnerable for fat-related health risk at even lower BMI. Based on its findings, the study suggested that the healthy BMI for an Indian is <23 kg/m². Cut-off
values for WC are 85 cm for men and 80 cm for women. Cut-off values for WHR were 0.89 for men and 0.81 for women\(^8\). The cut-off value for BMI may not be useful, when used in isolation to predict fat related health risk. However, cut-off values of WC and WHR are good predictor of one’s health risks.

V. METHODS OF WEIGHT \textit{(READ FAT) LOSS}

The underlying principle of a \textit{healthy} fat loss programme is this – \textit{Lose fat but preserve your fat free mass (lean body mass)}. Never adopt a method which causes loss of muscle mass.

We will discuss the following common methods of weight loss –

\textbf{A. By diet control only} – Reduce total caloric intake and lose weight. This method is not recommended for the following reasons –

(i) It ignores the basic principle of nutrition that our diet should be balanced – total calories-wise, ratio of nutrients-wise (i.e., 60% carbohydrate, 20% protein, 20% fat) and nutrition-wise (should have carbohydrates, proteins, fats, vitamins, minerals). In this method, one may simply cut the total amount of calories without paying any heed the \textit{quality} of calories. This may lead to nutrition-specific health problems.

(ii) In this method, generally the first victim of diet reduction is fat as fat is considered to be the main culprit causing overweight. One should not forget that inadequate fat intake would impair absorption of fat-soluble vitamins. (See section on \textbf{Fats}).

(iii) You may not get enough proteins, carbohydrates and micronutrients. All this would result in lowered level of strength, energy, etc.

(iv) One may be tempted to undertake ‘crash dieting’. This is very harmful as well as a foolish method of weight loss. By crash diet one will surely lose weight but in the process he will also lose his muscles and health. It is foolish because in case of crash diet out body

\footnotetext{8}{Cut-off Values for Normal Anthropometric Variables in Asian Indian Adults: \url{http://care.diabetesjournals.org/content/26/5/1380.full} dated 16.06.2010}
develops a ‘starvation syndrome’. This syndrome is marked by a lowered Basal Metabolic Rate (BMI). If our body does not get enough calories, it develops a tendency to conserve energy by slowing down its systems and spending less energy on the same kind of activity. For example, an underfed runner will spend less amount of energy per mile compared to his ‘pre-starvation’ phase. Thus at the end you don’t gain much.

B. **By exercise only – Eat as usual, exercise more and lose weight.**
   This method is also not recommended for the following reasons –
   (i) Without any diet control one may have to work out a lot, may be for hours every day. This may result in overtraining and injury. One may not have luxury of so much time also.
   (ii) One may be psychologically charged up and overestimate the amount of caloric expenditure during exercise. The worse, he may have a tendency to reward himself with more food after exercising! The end result will be weight gain only.

C. **By both diet control and exercise – Exercise more, eat less and lose weight.**
   This is the healthiest and most lasting method of fat loss. However, it is not recommended to lose more than 500 gms weight per week. Unless you are going to participate in some weight category specific sport, go slow. This method will ensure that your health and fitness never gets compromised in the process of weight loss. Rapid weight loss affects immune system, reduces muscle strength and glycogen level and adversely affects physical performance.

**Important–**
   (i) Interestingly, it may happen that once you are into serious strength training, you may actually *gain* weight due to gain in your muscle mass.
Don’t be alarmed by this. This is healthy weight gain. Be happy and celebrate this weight gain!

(ii) Take up activities which burn more energy in less time. For example, running will burn more energy than walking. Running on a hill will burn more energy than running on a track. In short, all activities performed at higher intensity and for longer duration will burn more energy.

(iii) Initially, minimum caloric intake per day should not be less than 1800 – 2000 kcal which is required for maintenance of our body system.

(iv) Did you ever wonder why during recent years your body fat percentage increased even though you maintained the same exercise routine and ate the same amount of food? The fact is that as you age, your body undergoes certain irreversible changes. Adults lose about 0.2 kg of muscle per year during their 30s and 40s. This process is known as sarcopenia. The rate of muscle loss increases to 0.45 kg in their 50s and 60s\(^9\). With decreased muscle mass your caloric needs will also decrease as muscles consume more calories. If you continue with the same amount of food, extra calories will be now stored as fat and will add to your weight. Therefore, bring changes in your diet accordingly, and take less calories as you age. Exercise combined with adequate diet will reduce the process of sarcopenia.

(v) Decrease dietary fat. However, do not go to the other extreme. Severe restriction of fats may deprive your body of some vital fat-soluble vitamins (see chapter on Fats).

(vi) Your choice of food should be such that it gives less calories but has high nutrients. For example, vegetables, fruits, salads, soups are low calorie foods, but very high in vitamins and minerals. The diet should provide variety of foods, high in nutrition and low in calories.

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9. NSCA’s Essentials of Personal Training, p.468
Be comfortable with your age, exercise and food. If you no longer enjoy your exercise or food, it is time to stop and review your routine. It is quite possible that you are overtraining or over-restraining yourself. Remember, both exercise and food have very wide ranging psychological implications. You will not gain much, rather you will harm yourself, by sticking to a regimen of exercise and food that allows you no stimulation or satisfaction.

VI. SWEATING AND WEIGHT LOSS

It will not be out of place to mention here that there are many among us who innocently believe that the more they sweat, the more they would lose fat. The fact is that there is no relation between sweating and fat loss. Sweating is just a cooling mechanism of the body. It brings out water and salts, not fat. Had there been any relationship between sweating and fat loss, there would have been more number of cozy sauna baths in the world than the gyms with their monstrous equipments! The mother nature always favours only those who believe in hard (and harder) work (outs)!

Weight loss caused by sweating is a false and temporary weight loss. This is actually a loss of body fluid. Firstly, one should not dehydrate himself to ‘lose weight’ as there are many harmful effects of dehydration. Secondly, the moment fluid is replenished, one would regain original weight.

VII. EATING DISORDERS

Eating disorders originate from an individual’s distorted self body image. Studies have shown that these disorders are more prevalent among adolescents and young women, who are highly conscious of the shape and size of their body. Skinny models, cinema idols, dolls, etc. reinforce the idea among these vulnerable sections of the population that ‘thin is beautiful’.
These are the characteristics of a person who is vulnerable to eating disorders. He/she –

- Feels herself fat even though people tell that she is thin.
- Worries too much about what to eat and what not to.
- Rushes to weighing machine to check weight after every party night.
- Avoids friends’ company and eats alone. He/she gets anxious when invited to eat.
- Gets depressed when an exercise session is missed.
- Swears not to eat this food or that food.

**Anorexia Nervosa**

The term literally means ‘loss of hunger on a psychological basis’. In this condition the person, though hungry, stops eating for fear of gaining fat and starts to starve.

There are two types of anorexia –

a) **Restricting type** – In this type the kind and amount of food is severely restricted;

b) **Binge eating/purging type** – In this type one firstly eats the food and then throws it out by spitting, vomiting, using laxatives or enema.

Warning signs of anorexia include rapid loss of weight, obsession with weight, obsession with exercise, sensitivity to cold, decline in work/school performance, growth of baby-fine hair over face and body, dry hair/skin, yellowish skin, irregular menstrual periods, constipation, abnormally slow pulse rate at rest.
Bulimia Nervosa

Bulimia nervosa is binge-eating followed by purging. Binge eating is uncontrolled, eating of abnormally high amounts of food. Then comes ‘purging’ stage. Purging is done by use of laxatives, enema or vomiting to get rid of ‘excess’ food. Some persons prefer fasting or doing heavy exercise to ‘compensate’ for the excess food eaten.

VIII. WEIGHT GAIN

The problem of desirable weight gain by underweight individuals is the other end of the problem of weight management. Some of the commonly used methods for weight gain are –

A. **Exercise and diet** – An increase in intensity and volume of exercise, especially, resistance training, (e. g. weight training) causes muscle hypertrophy (muscle gain). When combined with increased intake of diet, especially protein, it results into a healthy weight gain.

B. **Protein and Amino Acids supplements** – An increase in the intake of protein above the RDA (.8gm/kg body weight) helps to gain muscle mass. But excess of protein intake has its own harmful implications. This issue has been elaborately discussed in the section on Proteins.

C. **Creatine supplements** – Creatine monohydrate loading is popular among athletes. This results into an increase in body mass (1-2 kg) during a week. However, it is yet to be determined whether this increase in weight is due to increased lean muscle tissue or increased water retention. Moreover, prolonged intake of creatine causes overloading of kidneys by nitrogen worsening of allergy problems, disturbance of insulin functions, dehydration.

D. **Anabolic steroids** – Through a very popular method among unscrupulous athletes to gain muscularity, it is fraught with many dangers. Some of the dangers of use of steroid are – reductions in the high density
lipoprotein cholesterol (HDL), increase in low density lipoprotein (LDL) cholesterol, low testosterone production and atrophy of the testes, liver damage, risk of cardiovascular disease, etc. With prolonged use of steroid men develop women-like features and vice versa in voice, facial hair, breasts, etc.

**Recommended Method for Weight Gain**

Combining resistance training with an increase in total dietary calories will provide a safe, systematic and sure way to weight gain. A *slight* increase in the protein intake above the RDA has been found to be very effective in gaining more lean muscle mass.

**IX. EXERCISE AND WEIGHT CONTROL**

Weight control as such is a complex phenomenon. The problem of overweight or underweight is not simply a calculation of daily food intake and energy expenditure. Various studies have been undertaken and experiments carried out on different samples of people to ascertain the relationship between caloric intake and caloric expenditure. However, the results have not always been uniform. In our daily life also we find many examples around us. Some of our friends refuse to lose weight despite their pitiably meagre food intake while there are also the gifted ones who binge on every food they get and still maintain their enviably lean body frame.

One explanation given for this anomalous behaviour of human body is that genetic factors play predominant role in determination of our body composition. Another study suggests that the body maintains a certain size of fat cells. Beyond a limit, fat cell size cannot be reduced irrespective of amount of food or duration of exercise. Difference in resting metabolic rates (RMR) is also one of the factors that explains this anomaly. Between two individuals there is always a difference in the amount of energy they actually derive and store from the food or in the amount of energy they need to maintain their weight. With equal food intake and equal amount of
exercise a person with higher RMR (who spends more energy) will gain less weight than a person with lower RMR (who spends less energy).

However, things cannot be left upon genetics alone. There are certain definite ways in which exercise helps weight control –

(i) Intense and prolonged exercise elevates metabolic rate for some time after exercise. This means that our body would spend more energy on the same activity even after exercise.

(ii) Exercise also increases thermogenic effect of food eaten. This means that you would spend more energy to process the food.

(iii) Exercise increases lean body mass. Lean body mass includes muscles, bone, water. Muscles require more energy. This means that a more muscular man would burn more energy.

**How Fat Burns?**

Fats are basically fuel stored in our body for hard times like starvation. Initially, it is mostly the carbohydrate which is utilized by the body for energy. But after 30-40 minutes of continuous exercise fat will be utilized more and carbohydrates less for energy.

Better conditioning through exercise (both aerobic and anaerobic) helps the body burn fat in the following way –

(i) Aerobic exercise in particular enhances the development of capillaries to the muscles. This means more blood supply and thereby more oxygen to the muscles. With more blood flow and greater oxygen supply fat is more efficiently burnt.

(ii) During aerobic exercise and after anaerobic exercise, considerable mobilization of free fatty acids occurs. Free fatty acids oxidation is related to body fat losses.

(iii) Prolonged, low-intensity aerobic activities e.g., slow jogging, cycling are more effective ways to burn fat, as fat burns only as long as oxygen is available.
X. SOME PRACTICAL TIPS FOR IDEAL FAT MANAGEMENT

(i) Change your lifestyle. Grab every opportunity to walk, jog, exercise.

(ii) Never starve. You will have a tendency to overeat or eat indiscriminately after starvation.

(iii) Take fruits between meals as snack. Avoid fast food. Fast food will make you slow.

(iv) Keep healthy snacks of your choice ready at hand.

(v) Reduce total fat consumption. Shift from saturated fats to unsaturated fats.

(vi) Consume less sugar.

(vii) Do at least 30-40 minutes of moderate to high intensity activity on most of the days of the week.

(viii) Enjoy your food. Let’s confess it – junk foods are tasty, often tastier than ‘health’ foods. Most of the children will agree with me. Once in a while it is all right to enjoy junk food. But let us eat it in a ‘healthier’ manner. Mothers may add more greens and less fat in the junk foods for enhancing their nutritive value.

Finally, throw away the weighing machine out of your house. That is the real junk lying in your mind and scaring you for such a long time. Remember that focus on weight loss is a misplaced focus. Instead, focus on your gains in health and fitness. If you are getting better and better everyday as far as your health, fitness and satisfaction is concerned, you don’t have to worry about your weight at all.

Be a gainer, why a loser?
Appendix-I

Sample circuit training

You can organize a circuit training in a number of ways. The sample circuit training given here is designed in such a sequence that your upper body as well as lower body gets rest alternatively, while your heart rate never rests. This is an excellent cardiovascular fitness regimen with sufficient emphasis on strength training also.

### Important
- This circuit makes 1 set (10 minutes).
- Do another set in the same sequence.
- Warm up and cool down sufficiently.
- Don’t rest in between two exercises or sets.
- If you are too fast, you’ll get breathless. Stop for a while then resume.
- If you have time, do 3 sets.
- Master the basic exercises, then include difficult variations for more gains.

### Note
(i) You can use the same exercises for strength training by (a) asking your partner to increase load, (b) pausing at the peak for 1-2 seconds, (c) slowing down (take 6-8 seconds to perform a repetition).
(ii) Shuttle run is running between two parallel lines of 5-6 meter gap. This is an excellent exercise for agility.

### Method -
- Start from the first line at full speed. Stop at the other line, touch the line with your hand and without resting, run back to the starting line.
- Do as many runs as you can within 2 minutes.