Physical education pamphlet (1)

Management of Physical Education

Deputy of Education and Culture of Tehran University of Medical Sciences

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1. Chapter one: physical fitness and its ingredients

Definition of physical education and its purposes

Physical education is an important part of pedagogy which eases the growth process in all dimensions of human beings through movement and exercise (generally, the purposes of physical education are met in movement) and helps to develop the interested talents. Broadly speaking,

In general, training the body is through physical activity and observance of moral qualities.
The common purposes of physical education throughout human history have been keeping health, teaching hygiene, growth and improvement of physical power for defensive goals, gaining happiness and achieving success in professional life.

The ultimate purpose of physical education from the Islamic point of view is to ensure physical and mental health and move towards well-being.

Purposes of physical education are as follows:

Hygienic and well-being purposes

Pedagogical and ethical purposes

Psychic and social purposes

Kinetic and skill purposes

Definition of sports:

Sports is an organized, systematic, planned, ordered and regular game in which physical exercises are performed to empower physical and mental health to achieve better results.

Definition of gaming:

Gaming or healthy entertainment is an instinctive and uplifting activity which is for the process of man's development and is done unpredictably and casually. In fact, sports and entertainment are created out of a chain of movements, exercises and regular activities which are organized to supply man's growth and modify it in all dimensions. The ability to accept physical education is usually favorable in childhood when body has the utmost capability of learning. This age varies among different sports and usually starts when a person is able to endure hard and regular exercises in that sport and therefore develop.

Physical fitness:

Definition:

Physical fitness can best be defined as the ability to perform all the daily obligations with power and consciousness without feeling enervated soon and having full energy to enjoy leisure time or deal with unexpected accidents.

Physical fitness is about what needs to be done and physical ability along with existence of the individual. Therefore, different people need a variety of physical fitness depending on their professional status and life style. Physical status is affected by various environmental factors such as weather, seasons, and altitude. Determining a person's level of physical fitness is related to a person's abilities and benefits. Of

course, it should be noted that physical fitness is not one-dimensional; rather it includes mental, emotional, and social factors as well.

Examining a person in terms of physical fitness, it should be noted that a person has good physical fitness who can perform daily activities in an acceptable manner without being enervated.

In addition, the person should be able to recover the lost energy and continue the activities. Conversely, if each activity is not performed satisfactorily, or leads to severe fatigue or takes a long time to get to the first position, then the person is not in a good position.

Physical fitness contains several ingredients as follows: power, pace, muscular, and cardiac stamina, force, concordance, balance, flexibility, and physical structure.

Physical fitness is related to health usually consists the follows: cardiac stamina, body composition, power, muscular stamina, and flexibility.

People who exercise regularly have stronger skeleton, stronger muscles, more endurance and more active joints comparing with their inactive peers. Moreover, athletes have less fat; they react faster and can do better on mental tests as they have stronger memories. In the following, you can find a brief definition of the aforementioned issues with examples.

Flexibility:

The ability of a person to move all or parts of the body in the most dynamic range without damaging muscles and joints.

The current measure of flexibility is to touch the toes with the wrist also called Wells experiment which measures the flexibility of the back of the buttocks (sciatic), the back of the thigh (hamstring group) and the back of shin (solei).

Power:

Ability to use at least one muscle or a group of muscles once or the maximum amount of tolerance to resistance. Since power is a relative factor in physical fitness, it is better to assess one's power according to his/her weight.

An example of common power tests includes:

- Lifting the maximum weight for once

Muscular stamina:

Muscular Stamina is the ability of a muscle to repeat similar movements.

Muscular stamina tests include the following:

- Swedish push-ups (muscular stamina of shoulder waist)

- Pull-ups (muscular stamina of shoulder waist provided that palms face out and the movement is done completely)
- Sit-ups (muscular stamina of abs in 45 degrees-if done completely the muscular stamina of the upper muscles will be assessed as well.)

Stamina of cardiac-vascular-respiratory system:
Means the ability of blood circulation and respiration system to accommodate with the interested activity and the ability to return to the first status quickly after the movement.

Readiness of cardiac-vascular system test includes:

540 meter running test

12-minute running test (Cooper test)

Many studies show that doing endurance exercises with a range in 70%-85% increases the heartbeat and makes the blood circulation and respiratory system easier. To calculate the maximum heart beat during exercise among adults, you should subtract the age from 220. Then multiply the resulted number by 70% and 85%.

Maximum heart beat= 220-age

Targeted or interested pulse during exercise= maximum heart beat × 70%

Targeted or interested pulse during exercise= maximum heart beat × 85%

For example, appropriate heart beat for a healthy 30-year person during exercise is approximately as follows:

220-30=190 maximum heart beat of the individual

190 × 70% = 133

190 × 85% = 162

Muscular power:
The ability to optimize maximum power in the shortest possible time including tests such as vertical jumping, double jumping, shot put, medicine ball put. In other words, power is the work done in a unit of time. This shows the combination of power and pace. This relationship can be shown as follows:

Power = pace × force

Agility:
This is the ability that allows humans to change body position and direction of movement while still keeping their balance. Zigzag running or hit-the-ground running are examples of agility tests.

Pace:
This ability to move the whole or part of the body in space in the shortest possible time is usually measured by short and fast running tests. The tests include 50-meter sprints or 60-meters sprints.

Balance:

the ability of the body to keep and maintain a specific posture is called balance. Such as standing on the metatarsus or jumping over obstacle, walking backwards, forward or side on parallel sticks (gymnastics)

Neuromuscular coordination

Cooperation between nerves and sensory organs is called coordination. In other words, the ability by which the athlete is able to perform activities smoothly and in balance.

Such as opening and closing arms and legs alternatively which is practiced in butterfly exercise.

2. Chapter two: How to develop some factors of physical fitness?

Stamina and how to develop it

Stamina is defined as the ability of being active with a specific intensity for a long period which is sometimes called energy. Tiredness is a fundamental factor that impacts the way an activity should be done and it limits it. You can say that stamina of an athlete is proper when s/he does not get tired soon or can continue the activity by the amount of lactic acid in the muscles even when tired. Stamina is the most important factor from among all the biologic-movement abilities because it can expand and improve other parts of physical fitness.

Generally, stamina is composed of two parts:

A) Aerobic stamina
B) Anaerobic stamina

Aerobic endurance

Aerobic means “with oxygen” and aerobic endurance is the movement or activity of the muscle in which that muscle uses oxygen to provide necessary power. If an athlete is able to use oxygen properly to quickly produce energy in muscular cells, s/he is benefitting from an appropriate “aerobic power”. Aerobic endurance level can be increased with continuous and slow running or with long-term trainings.

One of the principles of training programs to develop endurance is developing aerobic endurance before anaerobic endurance.

Anaerobic endurance

Anaerobic means “without oxygen”. Anaerobic endurance is referred to the activity of energy systems in which muscles use inner saved energy to perform. Therefore, muscles cannot use oxygen during the exercise.

Anaerobic endurance allows the athlete to tolerate the lactic acid in the body. There are usually two types of anaerobic endurance as follows:

A) Endurance in power
B) Endurance in pace

Ways to develop endurance

As mentioned earlier, the basis for a high level of fitness in sports and achieving excellent records is following a planned and studied. Exercises that do not achieve the expected results without planning and studying, for example, athletics, swimming, cycling and skiing.
As mentioned earlier, the basis for achieving high levels of readiness in sports and obtaining great records is following a scheduled and studied program. Among sports those which will not yield expected results without scheduled and studied are, for example, track and field, swimming, cycling, and skiing.

In any training method there are variables being familiar with which can help one to have successful and planned exercise. These variable are as follows:

A) **Intensity of exercise:**

Intensity of exercise is actually its quality and is called the intensity and speed of repetition of exercises and can be considered as a percentage of the maximum speed of exercise.

B) **Amount of exercise:**

Amount of exercise is in fact the quantity of it and is referred to the time and total repetitions of exercise in one session.

C) **Repetition:**

Total repetition of one exercise or one activity in one session.

D) **Inactive rest:**

The inactive period between repetitions.

E) **Active rest:**

This is when the athlete has kind of an activity such as walking, jogging or stretching with low intensity between each repetition.

In the following, you can find appropriate examples to develop endurance:

Regular method:

In this method, the athlete runs or swims the distance with a steady flow so that the heartbeat reaches 130 to 160 per minute. The duration of this exercise is 30 minutes for amateurs and 60 to 120 minutes for professionals. The development and improvement of aerobic endurance results in long-term exercise.

This method is advised usually for endurance run athletes such as 10000 meter and marathon in track and field, and endurance swim (1500 meter) and skiing.

Fast and slow method:

In this method, the athlete trains for long hours based on the sport type and acts according to the program fast and slow. For example, an athlete can slowly run a 1000meter distance with 130 to 150 heart beats per minute then, immediately, quickly run a 500meter distance with 170 to 180 hear beats per minute. The effect of this method is that during the 500-meter run, the athlete, based on the high intensity of the course, faces the anaerobic endurance and lacks oxygen but in the 1000meter run, this lack of oxygen is regained and this kind of exercise can improve the consumption of oxygen by muscles. Many of endurance and semi-endurance athletes use this method.

Fartlek method:

In this method, the runner or the swimmer does the exercise in different intensities and continues based on the needs. For example, the athlete can mount a hill, cross a jungle or run on a sandy beach as the training field. In such a case, the intensity of exercise differs according to the surface of the field. In this method, just like the fast and slow method, when the exercise turns to non-aerobic, the muscles can better use oxygen. Moreover, exercising on the hills and sandy beaches can increase the power and endurance of the athlete.

Periodic training:

Periodic training is one of the most common ways for athletes to progress doing track and field, swimming, and some other sports such as canoeing. Using this method among endurance athletes can increase cardiac-respiratory readiness and boost the performance of various systems in the body. Although this

method is mostly seen among speed training athletes of track and field and swimming, it should be admitted that it could be utilized to increase the basic endurance of all athletes as well. According to the rules of this method, development of aerobic endurance in athletes is achieved sooner, but if trainings are not maintained the aerobic effects might be evaded even sooner that the slow jogging and walking. Anyhow, this type of training includes a combination of running and swimming in various distances in which the athlete has an active rest during the training so that the heart beat lowers for a while and repeat the activity.

Types of periodic training

Since we put that endurance consists two types of aerobic and non-aerobic, you can find the principles of periodic training for development of aerobic and anaerobic endurance in the following table:

Anaerobic endurance	**variables**	**aerobic endurance**
90 to 100% maximum heart beat	**intensity**	60 to 75% maximum heart beat
10 seconds to 2 minutes	**duration of exercise**	1 to 10 minutes
Almost little	**repetition**	almost many
Few	**time**	much
2 to 10 minutes	**rest time**	1 to 3 minutes
Active: walking	**type of rest**	active: slow walking and running

Table Error! No text of specified style in document.**-1 General basics of periodic training for development of aerobic and anaerobic endurance**

As it can be seen, periodic training can be categorized into two parts as aerobic and non-aerobic.

In the following tables you can find types of periodic training to develop aerobic and anaerobic endurance. To better convey the meaning of the concepts of the training method, we will use examples from track and field.

Training to develop aerobic endurance	Time or distance of training	Heart beat Per minute	Rest Time	Example of training
Long aerobic periodic training	2 to 8 minutes	180-190	1-4 minutes	Running 1000 meter for 5 times, 200 meter slow run after each 1000
Short aerobic periodic training	Running 100 to 400 meter with 75% of the best personal record	180	30 seconds to 2 minutes	Running 300 meter for 12 times, then 100 meter slow run as rest between each repetition

Table Error! No text of specified style in document.Error! No text of specified style in document.**-2 Types of periodic training to develop aerobic endurance**

Distance (KM)	Intensity of exercise (percent)	Repetition	Exercise time(s)	Rest time	Rest time between exercises
60	90-95	4-6	4-6	30-60 seconds	3-5 minutes
100	85-90	5-8	3-4	30-60 seconds	6-8 minutes
300	80-90	2-4	3-4	2-5 minutes	10-15 minutes
600	75-85	1-3	2-3	3-6 minutes	15-18

Table 1-Error! No text of specified style in document.**-3 Types of periodic training to develop anaerobic endurance**

Long term periodic training to develop basic endurance

Characteristics of this training are as follows:

1- Intensity of the training: running with almost 60-85% of maximum speed. Intensity of this training can be calculated using the following formula:

For instance, if the best record of a runner for 400meter course is 50 seconds, the time equals the maximum effort of the runner and 100% of pressure and in the next phase of the training the pressure will be 70%. To calculate the time of 400meter run with 70% pressure, you must add 30% of the best time of the runner to the total time.

That is, 50 × 30% or 15 = 30 × 50 → 50 = 100% divided by 100

The resulted time is 30% of the total run and will be added to the total time of the runner, that is:

50 seconds + 15 seconds = 65 seconds

Those who do this training can determine the pressure and intensity with this formula and continue the training with more knowledge.

2- Amount of training: to develop basic endurance with the maximum speed, you can use periodic running in different distances. You can find trainings with regards to their amount in the following table:

Distance (meter)	**Number of turns**	**Rest time between run**	**Type of activity while resting**
200	20-40	30-90	Jogging
400	20-40	60-90	Jogging
800	10-20	60-120	Jogging
1000	8-10	120-300	Jogging

Table Error! No text of specified style in document.**-4 trainings with regards to their amount**

3- Density of training: This is the way that periods and turns of each rest time will be carried out between two activities. Time of rest will vary between 30 seconds to 5 minutes according to the distance, intensity and situation of training. One could run slowly for 100 to 1000 meters. Yet, rest time can be reduced based on the physical condition.

4- Time of training: For speed activities we should use slow running in rest periods. When a runner covers a distance by periodic method, which is fast running at the beginning and then slow

running, the ability of the runner develops for long-term runs because rest periods result in the increase in performance of the whole training.

Group	Distance (meter)	Time of training (seconds)	Slow running between rest periods	Repetition
14-16 year olds	100 200 300 400	17-20 38-43 54-60 80-100	60-100 90-120 90-120 90-150	10-12 8-10 7-8 5-7
17-18 year olds	100 200 300 400	14-16 36-32 56-52 70-90	60-90 60-120 90-120 120-150	12-15 10 8-10 6-10
Professional runners	100 200 300 400 500 600 800 1000	14-15 29-32 48-58 60-72 80-110 110-130 140-160 180-205	45-60 45-90 45-90 60-120 60-120 90-180 90-180 120-300	20-40 40-50 16-20 16-20 12-20 12-20 8-16 8-12

Table Error! No text of specified style in document.**-5 Examples of long periodic training to develop aerobic endurance of amateur and professional athletes**

Power and how to develop it:

The body's ability to enforce power depends on the power of muscles. Power in sport is very important between men and women. Muscles are reflected when they are forced to be activated with endurance exercise or trainings with weights. This reflection causes muscles to perform more, it allows them to respond better to the central nervous system. Power types are classified as follows:

Maximum power:

Maximum power is the highest amount of power that a muscle can produce when contracted.

Endurance power:

This is the ability of muscle to maintain power production when the muscle is tired. In other words, it consists of power and time of an activity.

General power:

This is the general power of the muscular system of body and it is in fact the basis of structuring power training. This type of power must be developing at the first phases of training program. Lowness of general power hinders the development of the athlete.

Explosive power:

This is the power by which a muscle can react quickly to a force of resistance. This type of power is very crucial for some sections of track and field, jumping and throwing sports, diving, header in soccer, jumping in volleyball and basketball in which explosive power is very necessary.

Principles of power scheduling:

To ensure compatibility and prevent injuries, you must follow the 3 main principles for each strength training course. This action is very important for young athletes.

First rule: Increasing the flexibility of joints

Majority of activities in power trainings are performed using a range of complete movement of big joints, especially knee, ankle, and pelvis. Proper flexibility of joints stops the ligaments laxity and hinders pain penetration around knee, elbow and other joints. Ankle flexibility should also be paid enough attention to especially for amateur athletes. Athletes should start empowering ankle flexibility when they are teenagers and continue to adolescence and only maintain it in other eras.

Second rule: Increasing the power of tendons

Muscle power increases faster than tendon and ligament power. Lack of sufficient during training might lead to neglect developing ligaments. Heavy trainings might damage tendons and ligaments. Training tendons and ligaments will increase the diameter and expands their tolerance towards tension and laceration.

Third rule: Increasing central power

Power of hands and feet is related to the body. Weakness of the body causes other organs to perform weakly during tense action. Central muscles should be strengthened in the early steps of power programs and before concentrating on hands and feet. Role of central muscles is to take the hit in jumps, rebounds, etc.

Methods of power training:

Every athlete can develop his power by overcoming internal or external endurance. There are restrictions about endurance or inner power of body. Therefore, external endurances should be used to develop power. These endurances are as follows:

1. Weight of the individual like doing Swedish push-ups
2. Using medical malls
3. Using training rubber bands attached to somewhere
4. Using training dumbbells
5. Using free weights and weight-lifting exercises

As people mostly use free weights to increase their power, the following principles should be mentioned during training with weights:

A) Other methods such as using medical balls, rubber bands and strings should also be used during trainings to develop power; this way as trainings are getting complicated the effects of trainings will be completed and will be more useful for the athlete.
B) Small and localized muscles, as well as main muscles, should also be paid attention to during training with weights.
C) Before starting the training on the active organ, inactive organs such as ligaments, tendons and spine muscles should also be warmed up to avoid injuries.
D) Safety measures and correct way of doing the technique must be observed during the training.

Principles of scheduling the power training

First stage: structural adjustment

A key factor to success in any sports program is to include power training in the schedule which in fact constructs the physiologic framework of the individual to reach top condition. Therefore, training should be scheduled in a way that guarantees development from a level to the next and takes the athlete to the highest readiness for contest season.

The purpose of the structural adjustment phase is to gradually adjust the muscles, especially the muscles that attach to the bone, so that the athlete can easily and comfortably face the heavy training of the next steps.

A) **Circuit training**

One method for structural adjustment is to do circuit training which helps the increase of muscular endurance. To design a normal circuit training in this phase, one could benefit from a variety of movements with body weight, medical balls, dumbbells, barbells and any kind of fitness machines. To decide about the number of stations, repeating each station, number of repeating the circuit, and amount of endurance in each station, stamina and readiness of the individual must be considered. Circuit training movements should be designed so that similar muscle groups are activated periodically to allow energy recovery for smoother and better muscles. Load amount of main muscles will be determined using a maximum repetition test (this will be explained later). Young athletes with little or no experience will be given light and easy weights and later on the level of activity will be increased with dumbbells, barbells and common body building machines.

Note that in structural adjustment level most of muscular groups must be activated; i.e. exercises should be done with a general procedure and without considering specific needs of each athlete. 4 circuits are providing in the following using different machines, for example.

Rest period between stations can vary between 60 to 90 seconds and 1 to 3 minutes between circuits.

- **Circuit A (Using body weight)**

1. Half-sitting up
2. Push-ups
3. Sit-up with bending knees
4. Short jump on a spot
5. Pulling up the body
6. Pull-ups using bar fix
7. Butterfly exercise

- **Circuit B (Using a fixed ladder and gym benches)**

1. Mounting the stairs
2. Push-ups in sloping surface (palms on the ground)
3. Zigzag jumping from the bench (longitudinal)
4. Jumping on the bench

- **Circuit C (Using dumbbells)**

1. Half-sitting

2. Throwing medical ball from the chest
3. Standing on the paw
4. Body twist

- **Circuit D (Using dumbbells and body building machines)**

1. Leg press
2. Chest press
3. Rowing workout upwards

B) **Determining maximum power or one repetition maximum (1RM)**

1RM (one repetition maximum), is the maximum amount of weight an individual can move only once. For power training, amount of weight for every muscle will be calculated using percentage of 1RM.

For example, if one can lift a 100Kg weight only once, the 1RM of him equals 100Kg.

The following formula is used to calculate percentage of 1RM:

100 – (Repetition × 2) = 1RM%

Observe the following points for determining 1RM:

1- Pick a weight you can move easily.
2- For instance you can repeat 50kg weight for 15 times.
3- Using the above formula:

1% RM= 100 – (15 × 2) = 70%

4- In fact the 50kg weight, is 70% of your 1RM.
5- 1RM can be found using the following proportion:

7050% → X=71/42 that is about 70 kilograms

X 100%

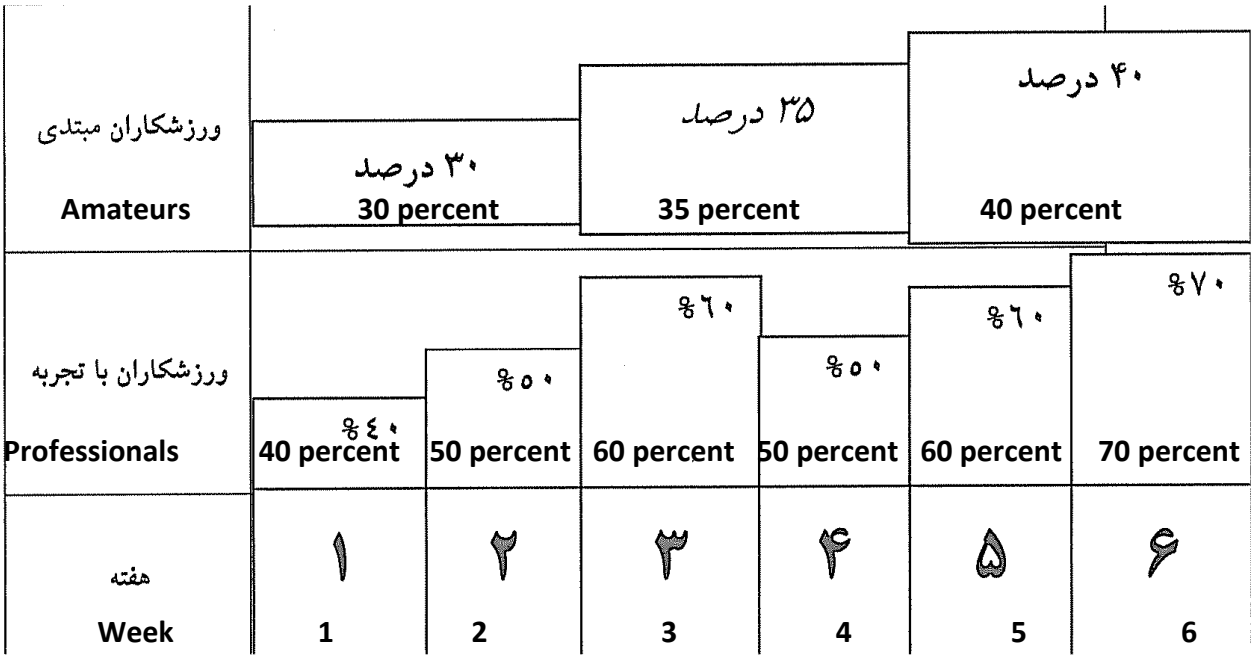
6- Therefore, one repetition maximum of this athlete is 70 kilograms. You can calculate necessary percentages.

In the following table (1-6) you can find explanations about time of structural adjustment, sessions per week, and other variables of circuit training with a percentage with 1RM.

Training variables	**Amateurs**	**Professionals**
Structural adjustment time	8-10 weeks	3-5 weeks
Times (if weights are used)	30-40 percent	40-60 percent
Stations per circuit	9-12	6-9
Circuits per session	2-3	3-5
Total time of exercise per session	20-25 minutes	30-40 minutes
Total rest time per station	90 seconds	60 seconds
Total rest time per circuit	2-3 minutes	1-2 minutes
Sessions per week	2-3	3-4

Table Error! No text of specified style in document.**-6**

Recommended pattern for amateur and professional athletes in circuit trainings



Second stage: Muscle mass building

To build muscles, movements must be done at a slow or normal pace; still such methods are not recommended for speed and power athletes for the process of muscle mass building more than 4 to 6 weeks.

1RM should be calculated for muscle mass building exercises, then professional athletes can start the program with 70-80 percent of it or the amount of weight that is repeated 6 times. Then by creating structural adjustment, you can add up to 12 repetitions then load of the pressure can be increased. Following you can find recommended training for amateur athletes.

Training variables	Amateurs	Professionals
Round time	6-8 weeks	4-6 weeks
Endurance (times)	60-70%	70-80%
Movement times	8-10	6-9
Times per turn	10-15	6-12

Rest time	3-5 minutes	3-5 minutes
Speed of action	Low to normal	Low to normal

Table 1-7

Third stage: Maximum power

Almost all sports need power but what really matters in each sport is the power specific for that sport. If specific power is not the main factor for sports, it is of high value for them and this importance varies between sports. This is actually the main reason why this stage lasts longer. The more the role of maximum power (such as throwing, track and field) the lengthier this stage will be and when the final performance of the athlete is not dependent to the maximum power such as table tennis, this stage becomes shorter.

As the pressure of training is high in power exercises, the athletes should use maximum power at least after 2-3 years of general power (structural adjustment) with lighter endurance.

As far as heavy weights are used in this stage, repetition is few for each turn (1-4) and total recommended reps for each movement varies between 8 and 15 per session.

Hartman and Tunman have designed total recommended reps per session for elite athletes as follows:

15 to 25 reps: 95 to 100%

20 to 45 reps: 90 to 95%

35 to 85 reps: 80 to 90%

70 to 110 reps: 75 to 80%

Recommended indices for training with maximum endurance method are presented in the following table.

Indices	**How to run**
Endurance	85-100
Movements	3-5
Reps per turn	1-4
Turns per session	6-10
Rest time	3-6 minutes
Sessions per week	2-3

Table 1-8

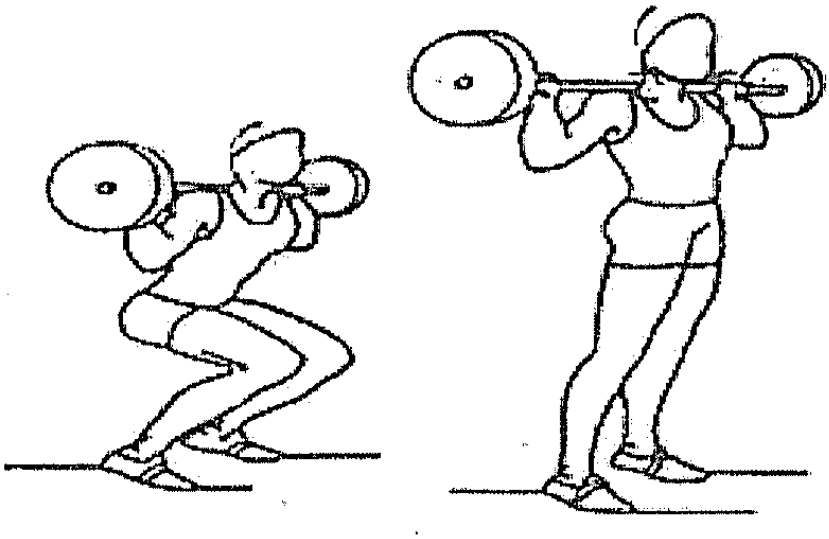
Max workout

Maximum training should be used to develop power, especially in sports which pace and power are dominant. Team sports, speed sports, throwing and jumping in track and field, martial arts, boxing, wrestling, speed skiing, ski jumping, fencing, diving, freestyle skiing, speed swimming, etc. are examples of sports in which maximum power can be mixed with an explosive action. This new method which is a combination of maximum power and explosive movements is called Max workout.

You need to pay particular attention when combining maximum power exercises with power trainings, since although these exercises are various, they must be designed in an easy way so that the athlete does

not get complicated and appropriate adjustment is made by focusing on developing the main characteristic. Below you may find examples of Max workout:

1) An example of Max workout using a slow extrovert muscle contraction and a fast introvert muscle contraction can be seen in the following picture.



Recommended program for this workout is as follows:

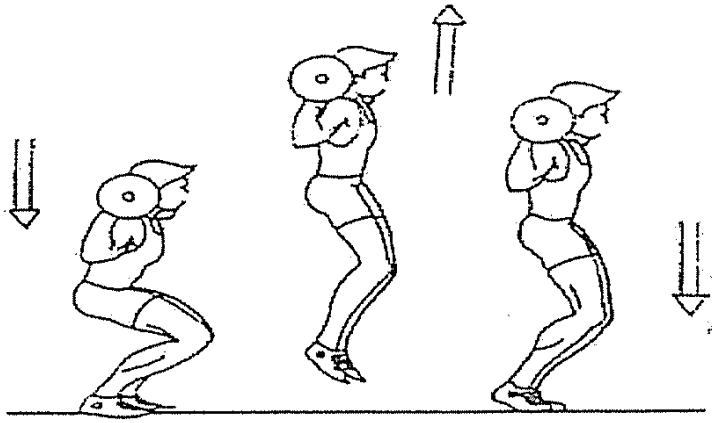
Endurance 60-80 percent

Reps 6-8

Turns 1-3

Rest time per turn 2-4 minutes

2) Another example of Max workout using a slow extrovert muscle contraction and half-sitting up jump can be seen in the following picture.



Recommended program for this workout is as follows:

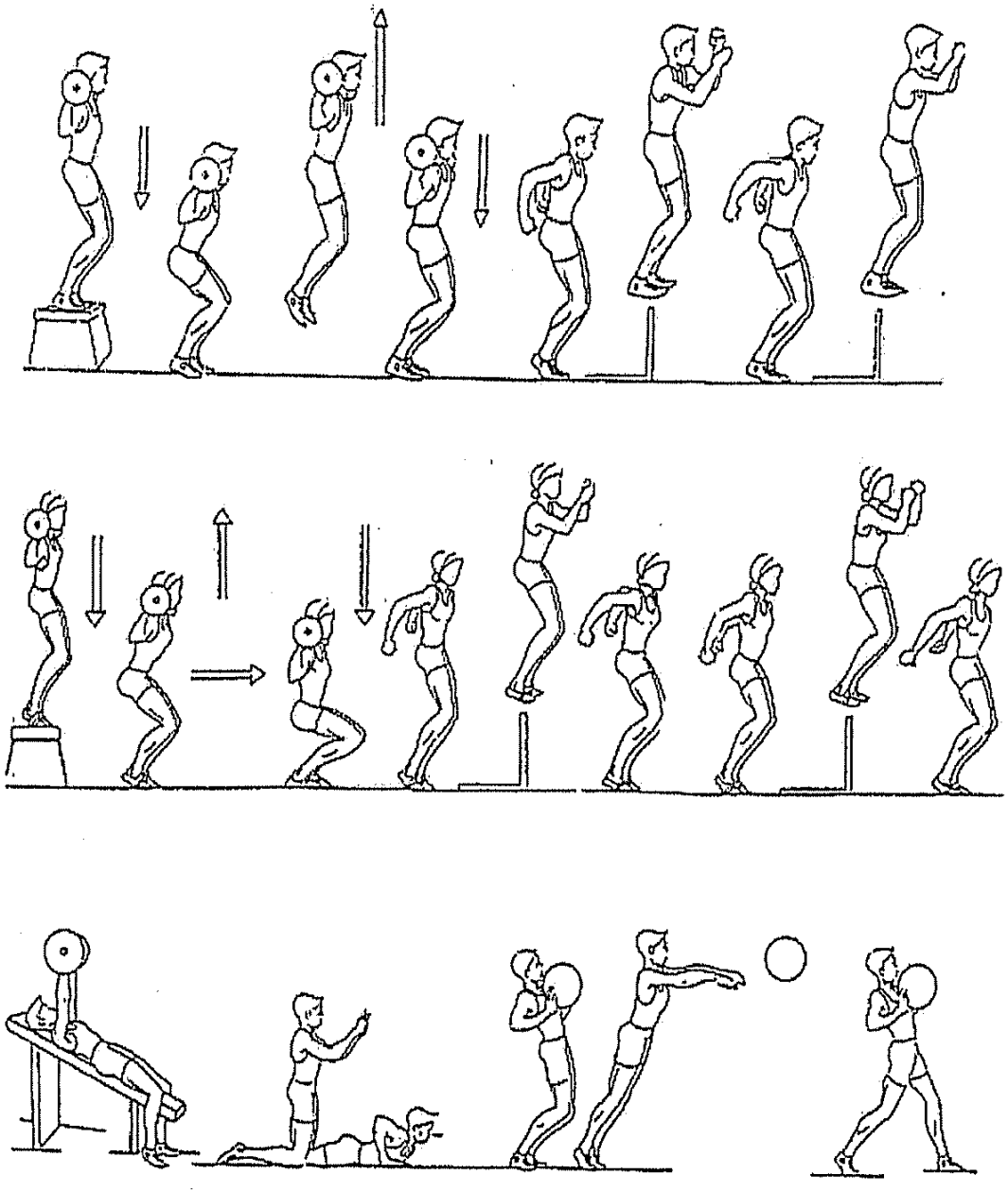
Endurance 40-60 percent

Reps 4-6

Turns 1-4

Rest time per turn 2-3 minutes

3) Other examples of Max workout are illustrated in the following pictures.



Fourth stage: Change

At this stage, athletes must change the power they gained in the previous stage to the specific power they need through special training. A major problem for many athletes is that they cannot use their power in a movement although they are powerful enough. Therefore, specific attention should be paid to this stage during power training programs. General power is indirectly influential in performance so it worth noting that the main goal of this stage is to change power training attitude to need of exercise, i.e. explosive exercises (power) or muscular endurance. An athlete can never jump higher, run faster, throw further, or punch quicker without ability training. Increase in power must be a result of development in power, pace or a mixture of both factors according to the specific needs of exercise. During change stage, athletes must be well aware of energy consumption in a way that they use maximum energy for tactic and

technique training and minimum energy for power training. Trainers should design trainings with the least possible movements which are similar to the main skill training.

3. Chapter three: Understanding energy mechanism

Energy is the most suitable term that we deal with in different phases of physical education. Therefore, it is considered as one of the most important concepts that we should confront it with knowledge. Energy release causes the muscle to contract. The way that energy savings will be evaded and is absolutely dependent to individual's readiness and physical activity. Food is the indirect resource of our energy. This resource is influenced by a group of chemical reactions in our body that are known as metabolism. These reactions produce a combination named adenosine triphosphate (ATP) which is considered as the direct energy resource of body, therefore saving ATP in muscular cells depends on rebuilding it which again needs energy for itself. To meet this need there are three systems which produce necessary energy for muscular cells.

1- ATP-PC or Phosphagen system

Sum of ATP and PC or phosphocreatine is known as Phosphagen energy system. Necessary energy to rebuild ATP is made out of this system only by decomposing one chemical bound and with phosphate. This system can produce maximum muscular power for 8 to 10 seconds.

2- Lactic acid system or anaerobic glycolic or glycogen system- lactic acid

In this system, where glycogen and glucose are broken and energy is released to produce ATP, it is known as anaerobic metabolism because it does not consume oxygen. In this process, much of the muscle glycogen is actually converted to lactic acid.

Excessive accumulation of lactic acid in the muscle causes temporary fatigue. This phenomenon leads to dysfunction of enzymes and reactions such as the reaction to produce energy, and therefore causes more muscle contraction and function.

3- Oxygen system or glycolic (aerobic system)

Glycogen is completely decomposed into carbon dioxide and water in the presence of oxygen. ATP-PC system and lactic acid are anaerobic, i.e. reproducing ATP is done via chemical reactions which do not need oxygen. Phsophagen system is the fastest producer of ATP and the number of molecules is limited and low in comparison with aerobic system.

In order to produce energy out of carbohydrate and fat, aerobic system needs oxygen. ATP production happens unlimitedly in a large amount but in a slow way.

Sport activities which depend on anaerobic system have quick or normal pace of oxygen consumption. In this case, lack of oxygen will be faced with but in activities which are dependent to aerobic system we have increase in gas exchange i.e. used oxygen of body in anidrid carbonic which is brought back in time is increased but they can last for a proper time since activity does not let oxygen to go low. Body uses anaerobic system at the beginning of exercise and all the necessary energy of the body is produced through the aerobic system at rest. Activity time, energy producing systems, sport fields and their common energy systems are inserted in the following tables.

Time to do the activity	Main energy producer system	Type of activity
Less than 30 seconds	Phosphagen	All throwing and explosive activities
30-90 seconds	Phosphagen and lactic acid	200 & 400 speed running-100 meter freestyle swimming, etc.
1.5-3 minutes	Lactic acid and oxygen	800 meter running
More than 3 minutes	Oxygen	Marathon-slow running-walking

Table Error! No text of specified style in document.**-7 Activity time, energy systems**

Type of sport	ATP-P lactic acid	Lactic acid & oxygen	Oxygen
Basketball	85	15	-----
Gymnastics	90	10	-----
Soccer keeper-forward-wings Halfback- center	80 60	20 20	----- 20
Swimming & diving 50 meter 100 meter 200 meter 400 & 500 meter 1500 & 1600 meter	 98 85 30 20 10	 2 15 65 40 20	 ----- 5 5 40 70
Tennis	70	20	10
Track and field 100 & 200 meter Field sports 400 meter 800 meter 1500 meter 3000 meter 5000 meter 10000 meter desert running Marathon	 98 90 80 30 20 20 10 5 -----	 2 10 15 65 55 40 20 15 5	 ----- ----- 5 5 25 40 70 80 95
Volleyball	60	10	-----
Wrestling	90	10	-----
Fencing	90	10	-----
American football	90	10	-----

Table Error! No text of specified style in document.**-8 Energy producing systems, sport fields and their common energy systems**

4. Chapter four: Immunity and hygiene in sports

Sports shoes:

Commonly, it has been seen that some use the same shoe they wear daily for activities like mountain climbing, jogging and such sports as well. As you may know, the ankle ranges and toe conditions differ in activities such as running, playing or daily walking. Therefore, it is necessary to use special shoes for different activities.

The imposed pressure on the muscles and joints as well as the range of movements increase during sport exercises. Of course, leg, pelvis and spine movements increase too but we don't discuss it here. In such cases, physical condition of shoes such as its bottom, tightness and material is very crucial. Moreover, using specific shoes for specific sports help the health of the feet.

For instance, there are many differences between soccer, volleyball, basketball, gymnastics, wrestling or track and field shoes and each have been made based on the type of sport. Shoes for sports such as volleyball and basketball and the like should have lighter toes because movements are mostly centered on toes. Shoes that cover shins are to better to be used for mountain climbing to avoid ankle sprain. However, sneakers perform better than regular shoes, which must transform different forces and reactions. Most foot pain is not caused by certain diseases but by pain that is imposed on the foot due to the wrong choice of shoes or the wrong way of doing things.

In short, sport shoes must have the following characteristics:

1) They should stop hit and absorb the imposed forces on foot and distribute them so that extra pressures do not reflect on nerves and vessels.
2) Smoothness and flexibility should be in a way that metatarsal bends almost 30 degrees. If the sports shoes are hard, the body weight will not go to toes and bending muscles of metatarsal will suffer from stress. Furthermore, shoe bottom must have a normal curve.
3) If shoes are too heavy, muscles and joints cannot move easily and energy consumption would be increase and efficiency will lower.

It should be mentioned to socks should have a tube rubber at shin so not to stop blood flow. This will keep feet warm.

Sport location:

Training locations for exercises must be in accordance with hygienic principles.

If the location is roofed, windows should be open a flow of air is necessary.

Roofed swimming pools where chlorine and other disinfectors are used for cleaning are suitable places for bacteria and fungi to grow and this can cause dermal diseases.

The capacity of swimming pools and the presence of water storage tanks must be observed when using such places. Allowing swimmers to exceed the pool capacity will reduce water hygiene and increase damage to other swimmers.

Sports floors of roofed arenas should always be smooth and without ups and downs, furthermore all safety measures must be implanted. Material of floors are better not to be very hard so this way feet are not harmed and bone-muscular pains are avoided.

Sauna:

Observing the following points can help us benefit from saunas better:

- Not having heavy meals before going to sauna
- Noting the most appropriate time to stay in sauna
- Taking a shower before sauna
- Using a cover like a towel to sit in sauna
- Adjusting the temperature between 80-90 Celsius
- Adjusting humidity by splashing some water on heater or stones
- Cooling the body (leaving the sauna or cold shower) when you feel too much heat
- Not throwing competitions of heat and steam in the environment
- Staying in the sauna until you feel comfortable
- Not switching environment suddenly (from sauna to a freezing place like iced pool
- Ending the sauna by taking a shower
- Using water to replace missed water and stop dehydration
- Wearing clothes when perspiration is stopped
- A little rest after sauna

Ultimately, you can find some points about hygiene of athletes in the following:

1) Never participate in any sport event with your daily clothing.
2) Wash your sport clothes (shirt, sweat pants, socks) and towel after exercise and let it dry under sunshine.
3) Try to use shoes which are comfortable and fit your feet. Loose or tight shoes might hurt your feet during exercises.
4) Do not use plastic clothing to perspire more, such coverings are not hygienic and does not allow skin to be cooled and brings tiredness as a result.
5) Take a shower after exercises and use slippers during shower.

5. Chapter five: Knowing the correct daily movements

Sitting:

Each person's sitting time is either longer than when standing or doing something. And this can be very effective for the formation of the body, especially in adulthood. In general, the purpose of sitting is to save energy and reduce the pressure that enters the body when standing and helps to perform better and more dominant activities.

Correct sitting posture reduces abdominal breathing and pressure on guts and it rationalizes blood flow.

Imposed pressure on spine discus during sitting (especially on L4 and L5) is more than standing posture.

Sitting and standing can be divided into three phases:

1. Landing way
2. Sitting and settling way
3. Standing way

First and third phases or of the highest importance.

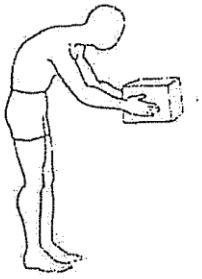
In the first stage it is necessary to land slowly and with control and not to fall from the height. As office chairs have appropriate lean point and are less flexibility and have less height, sitting on them is easier than sitting on armchairs. Office chairs also have appropriate handles and distance from wheels to the desk. Moreover, upright postures of upper part of body and natural curving are better maintained because of the stiffness of seat and having back support and footstool. In such seats it is better to put a foot back and maintain a distance between two feet then body weight should land on the seat with a curve and calmly so that joints and buttock are not hurt. Chair handles are used to reduce acceleration and transfer body weight to back foot (back foot is called active foot). Body front will be pushed forward and buttock backward if there are no chair handles. In the second phase it is important to observe proper angles and distance. The best sitting posture is believed to be on a saddle where thighs are bend and far from each other and upper part of body is upright. Abstinence from long and continuous sittings is an important point to be considered and changing and so is moving body weight on the seat.

In the third phase, the sitting rules must be respected, i.e. a foot must be forward and the other backward while standing. Using chair handles, pushing the upper part of body forward can make the standing process easier.

Sitting on the floor has different methods based on the body posture, culture and society. The higher and heavier the upper part of body and less flexibility of person, the less appropriate will be the sitting posture. Points to be considered during sitting are keeping upper part of body upright, keeping the body away from bending, abstinence from long and continuous sittings, choose appropriate standing point, changing sitting position and doing flexibility movements as well as muscle growth.

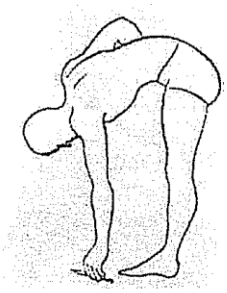
Lifting and carrying:

When you want to lift something, you need to keep your back straight and upright, bend your knees and then hold the objects firmly between your legs. When you have mastered things, lift them inward. Lastly, keep your feet close to your body when your legs are straight. You have to bend straight to lift light objects on the ground.



هیچ گاه به این ترتیب عمل نکنید.

Never act like this.



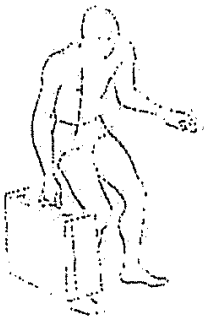
برای برداشتن اشیاء سبک از روی زمین به حالت فوق به طور مستقیم خم شوید.

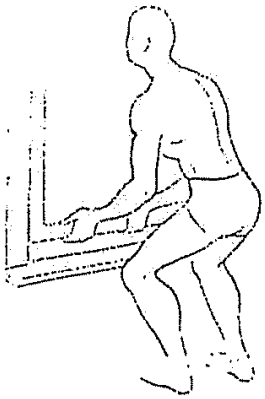
To lift light stuff on the floor you should act as the picture and pick it directly.

روش درست بلند کردن اشیاءسنگین کمر نباید خم شود.

Correct lifting posture of heavy stuff. Back must not be bent.

When you want to open a blocked window, you should keep your back as close to the window as possible. When you want to carry stuff from sides of your body (suitcase, luggage), knees must be bent, hold the handle tightly, then open the knee and pick the stuff. Back must be upright with waist bent.

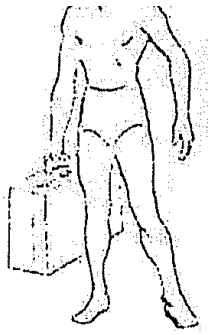




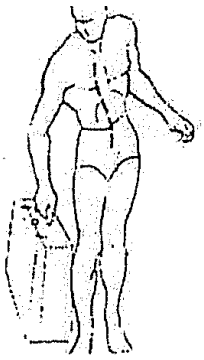
Correct posture of opening a window or lifting heavy stuff (back is upright and body is not bent)

Correct posture of lifting a suitcase

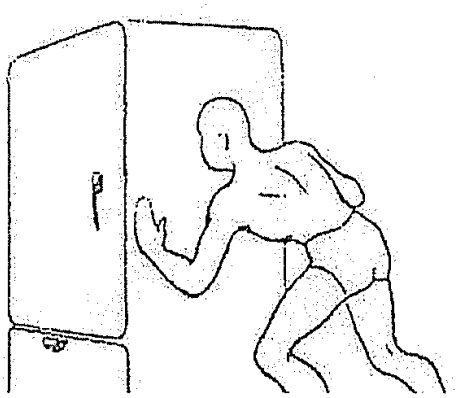
When carrying the stuff in front you, you should keep it close to the standing point of your body and keep back upright. When carry something on both sides, you need to keep a short distance between the spine and the stuff so to keep your balance. When pushing or pulling something, you have to open your feet wide because they are your standing point. This reduces the risk of falling to the ground.



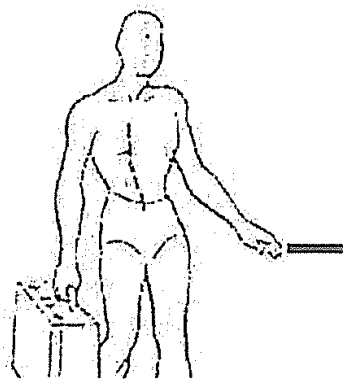
Correct posture of carrying heavy stuff from side



You must not bend the spine to carry heavy stuff



Correct posture of pushing heavy stuff



Wrong posture of carrying heavy stuff from sides due to bending spine

When sleeping or resting, it is better to sleep on your side so that your back does not bend obliquely and your back does not hurt.

Correct posture of sleeping on side