

PHYSICAL FITNESS (SpSc 1011)

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❖ INTRODUCTION

- Holistic wellness involves all those aspects of life and more. Maintaining physical fitness and ever stayed conditioned has a lion share for wellness though.

This unit explains the concepts of physical fitness which might assist you to stay fit to exude/show confidence, optimism, and self-efficacy; they have the energy reserves to do what needs to be done today and to plan for a better tomorrow.

The most effective and transformative goals are those designed to achieve the highest level of personal wellness.

Meanings and Definitions of Terms

❖ Physical fitness

- ✓ It is an ability to meet the ordinary, as well as unusual demands of daily life *safely* and *effectively* without being *overly fatigued*.
- ✓ It is the body's ability to *function effectively* and *efficiently*, and contributes the ***total quality of life***.
- ✓ The totally fit person has a *healthy* and *happy outlook towards life*.
- ✓ Physical fitness is essential for human beings to *adjust well with his environment* as *his mind* and *body* are in complete harmony.
- General fitness implies the ability of a person to live most effectively with his and her potentials, which depend upon the *physical, mental, emotional, social* and *spiritual* components of fitness which are highly interrelated.

❖ Physical Activity

- It is bodily movement produced by **skeletal muscles** that results in energy expenditure.
- The term, physical activity, **does not** require or imply any **specific aspect or quality of movement**.
- The term encompasses all types, intensities, and domains.

Although the term “**physical activity**” has been used often as a short-hand description for moderate-to-vigorous-intensity forms of physical activity, given current interest and discussions about physical activity of intensities less than moderate-intensity, the term “physical activity” should be used when discussing the full range of intensities.

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- Aerobic physical activity includes forms of activity that are **intense enough** and performed **long enough to maintain or improve an individual's cardiorespiratory fitness**.

Aerobic activities such as **walking, basketball, soccer, or dancing**, commonly require the use of large muscle groups.

- Anaerobic physical activity refers to **high-intensity activity** that exceeds the capacity of the cardiovascular system to provide oxygen to muscle cells for the usual oxygen consuming metabolic pathways.

Anaerobic activity can be maintained for only about **2 to 3** minutes.

- **Sprinting** and **power lifting** are examples.

❖ Physical Exercise

- The term "exercise" has been used interchangeably with "physical activity", and, in fact, both have a common elements.

For example, both physical activity and exercise involve any bodily movement produced by skeletal muscles.

- Exercise, however, is not synonymous with physical activity: it is a subcategory of physical activity.

Generally, Exercise describes as planned, structured and repetitive bodily movement.

- Exercise is usually goal related and designed in the sense that the improvement or maintenance of one or more components of physical fitness (i.e., endurance, strength, flexibility etc...).

$$\text{kcal}_{\text{Exercise}} + \text{kcal}_{\text{Nonexercise}} = \text{kcal}_{\text{Total daily Physical activity.}}$$

❖ Sport

- It is an **organized, competitive** form of play.
- Sport is, above all, **competitive activity**.
- We cannot think of sport without thinking of competition, for **without the competition, sport becomes simply play or recreation**.
- **Play can at times be sport, but strictly speaking, sport is never simple play; the competitive aspect is essential to the nature of sport.**

❖ General Principles of Fitness Training

- The **human body adapts well** when exposed to **stress**.
- The term *stress*, within the context of exercise, is defined as an exertion above the normal, everyday functioning.

Knowing a little about these principles provides valuable insights **needed for organizing an effective fitness plan.**

❖ General Principles of Fitness Training

- Principle of overload
- ✓ To improve, one must perform more than one's normal amount of exercise.
- ✓ As a result of the adaptation, more stress must be applied to the system in order to stimulate improvements.

- **FITT Principle**

- ✓ **Frequency:-**

- ❖ Number of sessions each week.

- Frequency relates to how often exercises are performed over a period of time.

- A beginner may determine that 2-3 exercise sessions a week are sufficient enough to stimulate improvements.

3-5 days For CVE.



FITT...

✓ Intensity:-

- Intensity, the degree of difficulty at which the exercise is carried out, is the most important variable of FITT.
- More than any of the other components, intensity drives adaptation.
- Because of its importance, it is imperative for those beginning a fitness program to quantify intensity, as opposed to estimating it as *hard, easy, or somewhere in between.*

Heart rate is one of the best ways to measure effort level for cardiorespiratory fitness. It's a percentage of maximum lifting capacity with the measure used for resistance training.



FITT...

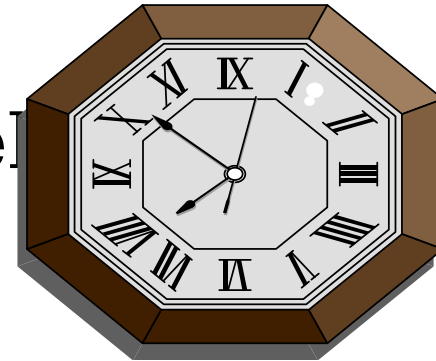
✓ Time:- Duration of activity.

- The duration of exercise, or time, also contributes to the amount of stress experienced during a workout.
- For example, when attempting to create a jogging plan, you may organize 2 weeks like this:

Week 1: three days a week at 30 minutes per session.

Week 2: four days a week at 30 minutes per session.

- 20-30min For CVE.



FITT...

✓ Type / specificity :-

- Mode of exercise being performed.
- Simply put, the type of exercise performed should reflect a person's goals.
- Aerobic activities (Jogging, Running, Walking, Dancing, Cross Country Skiing, Biking, Swimming).
- Others For F,MS, ME, CVE...



Target Zone

$$HR_{MAX} = 220 \text{ bpm} - \text{age}$$

$$\text{Target zone} = 60\% \text{ to } 90\% HR_{MAX}$$

Lower threshold target

$$HR = HR_{MAX} \times 60\%$$

Upper threshold target

$$HR = HR_{MAX} \times 90\%$$

Calculations for a 20-year-old

$$HR_{MAX} = 220 - 20 = 200 \text{ bpm}$$

$$\text{Lower threshold} = 200 \text{ bpm} \times 60\% = 120 \text{ bpm}$$

$$\text{Upper threshold} = 200 \text{ bpm} \times 90\% = 180 \text{ bpm}$$

Fitness Training principles

- Principle Individual differences
 - ✓ Individual's work, diet, lifestyle, and management of stress should be taken into consideration.
- Warm-up, workout, cool down components
 - ✓ Helps prevent injury and prepares body for exercise as well as returns it to a normal state.
- Principle of Safety
 - ✓ Information collected from medical screening, and informing individual of environmental conditions.

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- Principle of specificity
 - ✓ Programs should be designed in relation to *specific goals in mind.*
- Individual's initial fitness level
 - ✓ Assess initial level of fitness to *design realistic program and a starting point.*
- Progression of program
 - ✓ Increase program as individual becomes adjusted. Doing too much, too soon, will almost certainly lead to *burnout, severe fatigue, and injury.*

Principle of Rest, Recovery, and Periodization

- The principle of rest and recovery (or principle of recuperation) suggests that rest and recovery from the stress of exercise must take place in proportionate amounts to avoid too much stress.
- The principle of periodization suggests that training plans incorporate phases of stress followed by phases of rest.
- Training phases can be organized on a **daily**, **weekly**, **monthly**, and even multi-annual cycles, called **micro-**, **meso-**, and **macro cycles**, respectively.

Principle of Rest, Recovery, and Periodization

Table 1.1:- Periodization Example

	Week	Frequency	Intensity	Time	Type
As table 1.1 shows, the intensity increases from week 1 to week 4. But, in week 4, there is a significant decrease in the chart. This is because of the weeks and week 0 would be another test week.	1	3 days	40% HRR	25 min	Walk
	2	4 days	40% HRR	30 min	walk
	3	4 days	50% HRR	35 min	walk
	4	2 days	30% HRR	30 min	other

Cont'd

- Without periodization, the stress from exercise would continue indefinitely eventually leading to **fatigue**, possible **injury**, and even a **condition** known as **overtraining syndrome**.
- However, experts agree that a decline in performance resulting from **psychological** and **physiological** factors **cannot be fixed by a few days' rest**.
- Instead, **weeks**, **months**, and sometimes even years are required to overcome the symptoms of overtraining syndrome.
- ❖ Symptoms include the following:
 - **weight loss**, **loss of motivation**, **inability to concentrate or focus**, **feelings of depression**
 - **lack of enjoyment in activities** normally considered enjoyable
 - **sleep disturbances**, **change in appetite**

❖ Principle of Reversibility

- Chronic adaptations are not permanent. As the saying goes, “Use it or lose it.”
- The principle of reversibility suggests that activity must continue at the same level to keep the same level of adaptation.
- As activity declines, called detraining, adaptations will recede/go back.

*All **E**, **MS**, **ME**, **CVE** and **F** all show similar results after a period of detraining.*

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In cardiorespiratory endurance, key areas, such as **VO₂max**, **stroke volume**, and **cardiac output** all declined with detraining while submaximal heart rate increased.

In one study, trained subjects were given bed rest for **20 days**.

At the end of the bed rest phase, **VO₂max** had fallen by **27%** and **stroke volume** and **cardiac output** had fallen **by 25%**.

The well-trained subjects in the study had to train for nearly **40 days following bed rest to get back into pre-rest condition**.

❖ UNIT SUMMARY

Physical activity: any activity that requires skeletal muscle and requires energy aimed at improving health.

Exercise: a subset of physical activity that is planned and structured aimed at improving fitness.

Health related components of fitness: types of activities dedicated to improving physical fitness categorized as cardiorespiratory endurance, muscular strength and endurance, flexibility, and body composition.

Skills related components of fitness: types of activities dedicated to improving physical skills categorized as speed, agility, coordination, balance, power, and reaction time.

Principles of adaptations to stress: guidelines related to managing the application of stress during physical activity/exercise.

Overload Principle: a principle of adaptation to stress suggesting the amount of stress applied during exercise must exceed a threshold level to stimulate adaptation.

Volume: the term used to describe “how much” stress is being applied by combining the duration and frequency of exercise.

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Progression principle: a principle relating to how much additional stress that can safely be introduced to gradually improve fitness without risking injury or overuse.

Specificity: the principle of stress suggesting activities should be closely centred around the primary outcome goal, i.e. train the way you want to adapt.

Reversibility: the principle that adaptations to stress can be lost over time if training is modified or stopped.

Principle of rest and recovery: the concept that adaptation not only requires overload but also requires rest to avoid oversteering the body.

Periodization: a method of organizing workouts into blocks or periods. These cycles consist of work/stress periods and rest periods.

Overtraining syndrome: a condition of chronic stress from physical activity affecting the physical and psychological states of an individual or athlete.

Detraining: the act of no longer training at all or decreasing the amount of training.

UNIT TWO

THE HEALTH BENEFITS OF PHYSICAL ACTIVITY

- ❖ **Physical Activity and Hypokinetic Diseases/
Conditions**
- ❖ **Physical Activity and Cardiovascular Diseases**
- ❖ **Physical Activity and Postural Deformity**
- ❖ **Unit summery**

Effects of fitness training

- Lower oxygen consumption
- Lower pulse rate
- Larger stroke volume
- Lower rise in blood pressure
- Slower respiration rate
- Lower rate of lactic acid formation, Faster return to “**normal**”
- Greater cardio respiratory efficiency.
- Greater endurance.
- More “work” can be performed at less cost.
- Improvement in fitness components.
- Coordination and timing of movements are better.

Effects of Exercise on Muscle

- Results of increased muscle use
- Increase in muscle size
- Increase in muscle strength
- Increase in muscle efficiency
- Muscle becomes more fatigue resistant

❖ Physical Activity and Hypokinetic Diseases/ Condition

Hypokinetic diseases are conditions related to inactivity or low levels of habitual activity, poor fitness such as those conditions outlined in Physical Activity and Health:

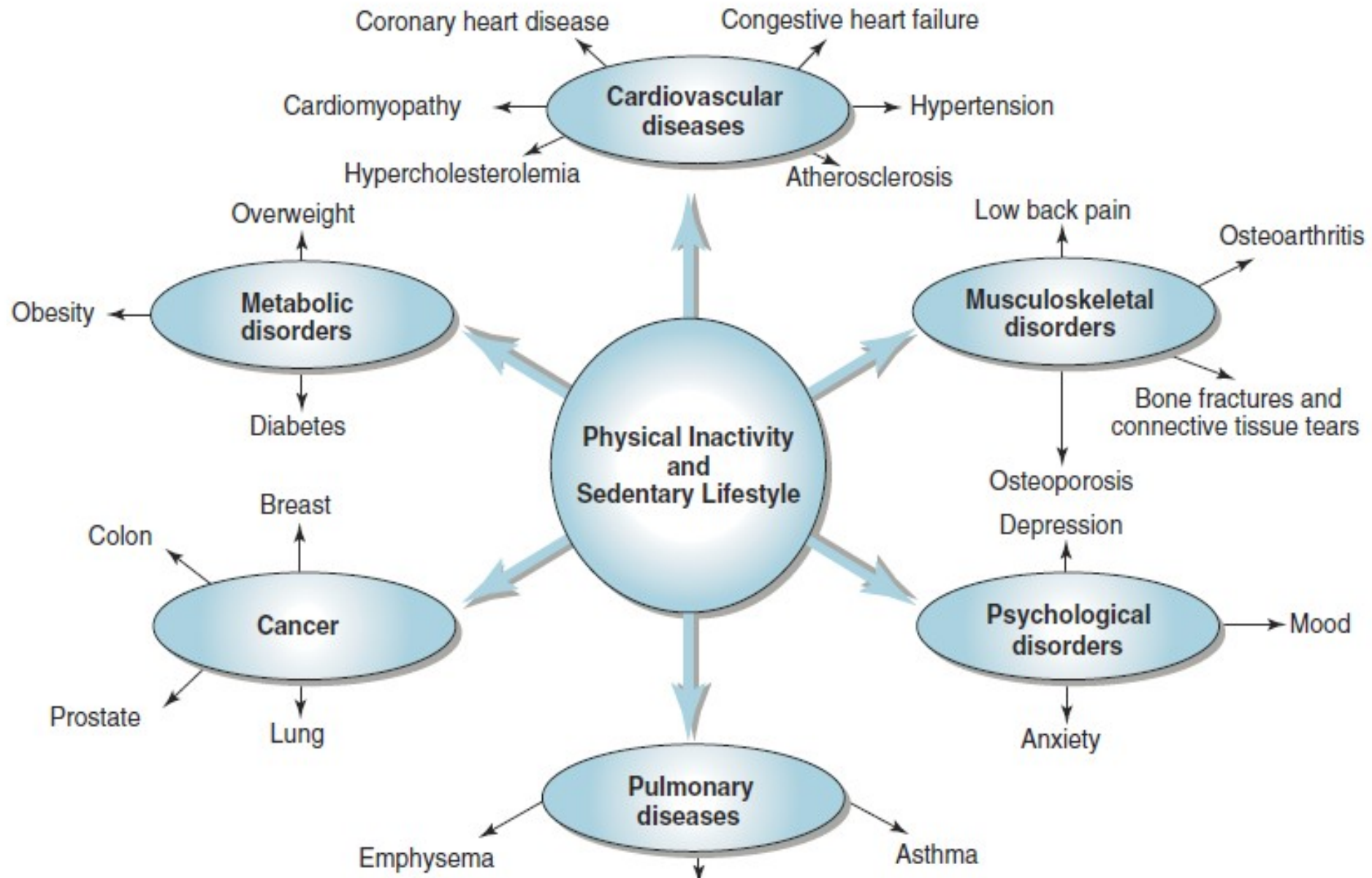
- In fact Many individuals do not engage in physical activity during their **leisure time**.
- Human body is designed for movement and active physical activity.
- Physical inactivity lads to **chronic diseases**.
- Some experts believe that physical inactivity is the most important public health problem in the 21st century.

Each year at least 1.9 million people die as a result of physical inactivity.

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- ❖ Individuals who do not exercise regularly are at a greater risk for developing chronic diseases such as
 - Coronary heart disease (CHD),
 - Hypertension,
 - Hypercholesterolemia, cancer, obesity, and
 - Musculoskeletal disorders.

Cont'd...



Summary of the American collage of sport medicine (ACSM) and American heart association (AHA) **physical activity recommendations for adults.**

	AEROBIC ACTIVITY ^a			MUSCLE-STRENGTHENING ACTIVITY			FLEXIBILITY/ BALANCE ACTIVITY
Population group	Duration ^b (min/day)	Intensity	Frequency (days/wk)	Sets	Intensity or # of exercises	Frequency (days/wk)	
Healthy adults 18-65 yr	30	Moderate (3.0–6.0 METS)	Minimum 5	1	8- to 12-RM; 8–10 exercises for major muscle groups	≥2 noncon- secutive days	No specific recommendation
	20	Vigorous (>6.0 METS)	Minimum 3				
Older adults >65 yr	30	Moderate (5 or 6 on 10 pt. scale)	Minimum 5	1	10- to 15-RM; 8–10 exercises for major muscle groups;	2 nonconsec- utive days	For flexibility at least 2 days per wk for at least 10 min each day; include balance exer- cises for those at risk for falls.
	20	Vigorous (7 or 8 on 10 pt. scale)	Minimum 3		Moderate intensity (5 or 6 on 10 pt. scale) Vigorous intensity (7 or 8 on 10 pt. scale)		

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- For substantial health benefits, **adults** should engage in aerobic exercise at least **150 min per week** at a moderate intensity or 75 min per week at a vigorous intensity.
- In addition, adults and older adults should do **muscle-strengthening activities at least 2 days per week**.
- **Children** should do at least **60 min** of physical activity every day.
- Most of the **60 min per day** should be either moderate or vigorous aerobic activity and should include ***vigorous aerobic activities at least 3 days per week***.
- Part of the **60 min or more of daily physical activity** should be muscle strengthening activities (at least 3 days a week) and bone-strengthening activities (at least 3 days a week).

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- Improvements in health benefits depend on the **volume** (i.e., combination of **frequency**, **intensity**, and **duration**) of physical activity.
- ✓ Persons who wish to improve their personal fitness,
 - Reduce their risk for **chronic diseases** and **disabilities**, or
 - Prevent **unhealthy weight** gain will likely benefit by exceeding the minimum recommended amount of physical activity”.

Physical activity lowers the risk of hypokinetic conditions **Cont'd**
including:-

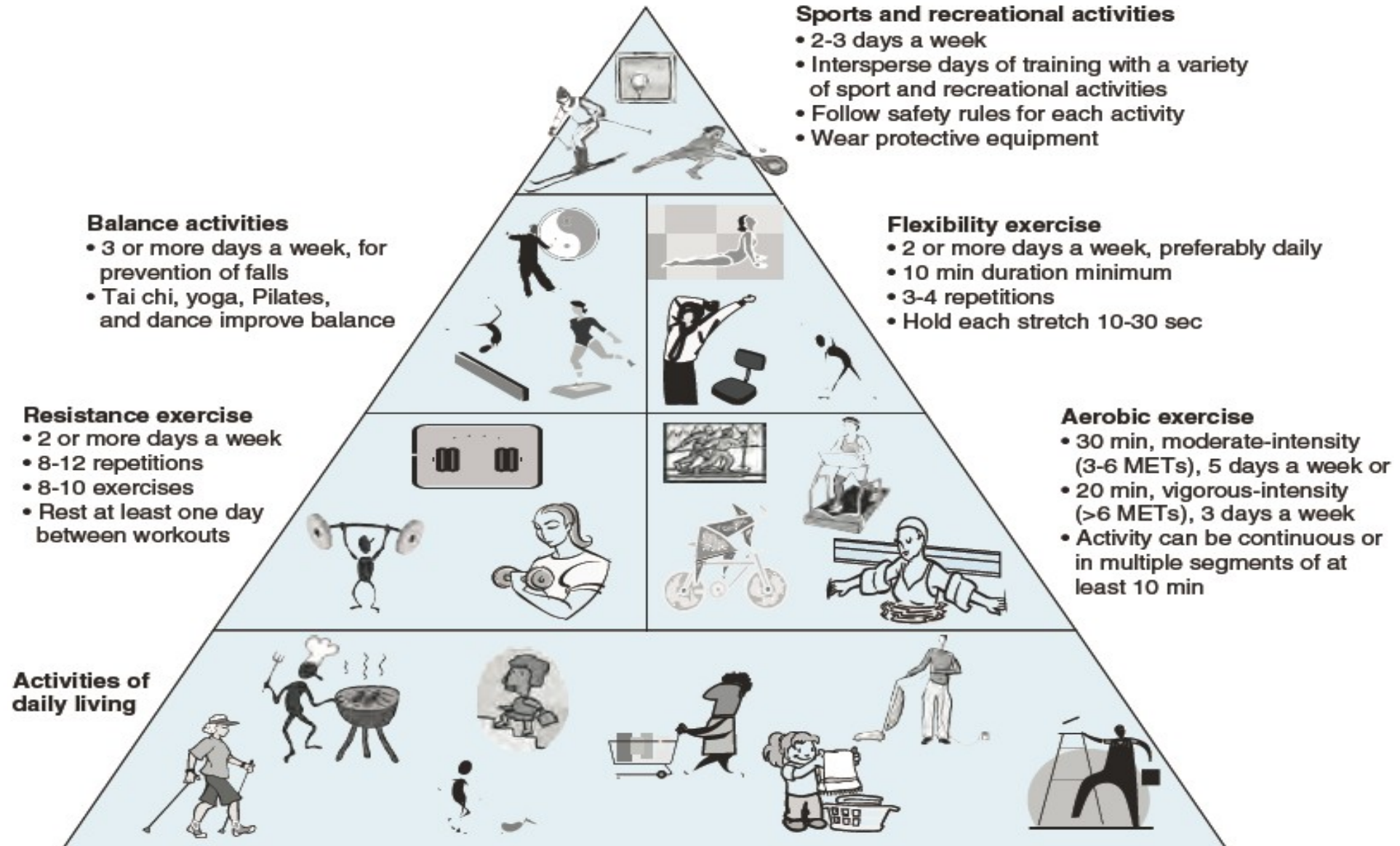
- Failing ahead of time,
 - A. Coronary artery disease,
 - B. Stroke
 - C. Type 2 diabetes
 - D. Metabolic syndrome
 - E. High blood lipid profile,
 - F. Cancers (colon, breast, lung, and endometrial),
 - G. Hip fractures.
- It also reduces **abdominal obesity** and feeling of depression and anxiety.

Physical activity helps in **weight loss, weight maintenance and prevention of weight gain, prevention of falls,** and improved

For an active lifestyle

- Should perform **aerobic** activities a minimum of **3 days/wk**;
- They should do **weight-resistance exercises** and **flexibility** or **balance exercises** at least **2 days per week**.
- **Recreational sport** activities are recommended to *add variety to the exercise plan*.
- High-intensity training and competitive sports require a **solid fitness** base and **proper preparation** to prevent injury.

The Exercise and Physical Activity Pyramid. Adapted from “Exercise and Activity Pyramid” Metropolitan Life Insurance Company, 1995.



Physical Activity and Cardiovascular Diseases

- According to World Health Organization (WHO, 2011) cardiovascular disease ***(CVD) caused 17.3 million deaths (30%) worldwide in 2008, and it is projected to cause more than 26 million deaths by 2030.***
- More than 80% of those cardiovascular deaths occurred in low- and middle-income countries.

Coronary Heart Disease (CHD)

- CHD is caused by a **lack of blood supply to the heart muscle** (myocardial ischemia) resulting from a progressive, degenerative disorder known as **atherosclerosis**.
- **Coronary Heart Disease Risk Factors**: Epidemiological research indicates that many factors are associated with the risk of CHD.

The greater the number and severity of risk factors, the greater the probability of CHD. The positive risk factors for CHD are:

- Age,
- Hypercholesterolemia,
- Tobacco use,
- Overweight and Obesity,
- Family History,
- Hypertension,
- Diabetes Mellitus or Pre-diabetes,
- Physical Inactivity.

Physical Activity and Coronary Heart :

Disease Approximately **6%** of CHD deaths worldwide can be attributed to a lack of physical activity (WHO, 2010).

- Physically active people have ***lower incidences of myocardial*** infarction and mortality from CHD and tend to develop CHD at a later age compared to their sedentary counterparts.
- Individuals who exercise regularly reduce their relative risk of developing CHD.
- Leading a physically **active lifestyle** may prevent **20% to 35% of cardiovascular diseases.**

Hypertension

- **Systolic:** The blood pressure when the heart is contracting
- **Diastolic** is the pressure in the arteries when the heart rests between beats This is the time when the heart fills with blood and gets oxygen
- Hypertension, or high blood pressure, is a chronic, persistent elevation of blood pressure that is clinically defined as a systolic pressure ≥ 140 mmHg or a diastolic pressure ≥ 90 mmHg. Individuals taking antihypertensive medicine also have this diagnosis.
- **Prehypertension** is a term used to describe individuals with a systolic pressure of 120 to 139 mmHg, a diastolic pressure of 80 to 89 mmHg, or both.

Hypertension is also the primary risk factor for all types of stroke. About 15% to 40% of the global adult population has hypertension.

Exercise Prescription for Individuals with

Mode: Primarily endurance activities supplemented by resistance exercises

Intensity: Moderate-intensity endurance (40–60% VO_2R)* and resistance training (60–80% 1-RM)

Duration: 30–60 min or more of continuous or accumulated aerobic physical activity per day, and a minimum of one set (8–12 reps) of resistance training exercises for each major muscle group.

Frequency: Most, preferably all, days of the week for aerobic exercise; 2 or 3 days/wk for resistance training.

* VO_2R is the difference between the maximum and the resting rate of oxygen consumption.

Hyper-cholesterolemia and Dyslipidemia

- ✓ **Hypercholesterolemia**, is an raise of total cholesterol (TC) in the blood, is associated with increased risk for CVD.
- ✓ Hypercholesterolemia is also referred to as **hyperlipidemia**, which is **an increase in blood lipid levels**; dyslipidemia refers to ***an abnormal blood lipid profile***.
- ✓ Approximately **18% of strokes** and **56% of heart attacks** are caused by high blood cholesterol (WHO, 2002).
- ✓ **Age, gender, family history, alcohol, smoking** are risk factors for hypercholesterolemia and ***regular activity reduced the chance of getting hypercholesterolemia and dyslipidemia.***

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Cholesterol is a waxy, fatlike substance found in all animal products (meats, dairy products, and eggs).

- The body can make cholesterol in the liver and absorb it from the diet.
- Cholesterol is essential to the body, and it is used to build cell membranes, to produce sex hormones, and to form bile acids necessary for fat digestion.

Physical Activity and Lipid Profiles:

- Regular physical activity, especially habitual aerobic exercise, positively affects lipid metabolism and lipid profiles.
- Cross-sectional comparisons of lipid profiles in physically active and sedentary women and men suggest that physical fitness is inversely related to TC and the TC/high density lipoprotein- cholesterol (HDL-C) ratio (Shoenhair and Wells 1995).
- The research on the effect of resistance training on cholesterol levels continues to remain inconclusive.

Diabetes Mellitus

Diabetes is a **global epidemic**. More than **346 million** people worldwide have the disease (WHO, 2011).

➤ Factors linked to this epidemic include:

- **Urbanization**, **Aging**, **Physical inactivity**, **unhealthy diet**, and **obesity**.
- At least **65% of people** with diabetes mellitus **die** from some form of heart or blood vessel disease (AHA, 2008).
- Diabetes is a major contributor toward the development of **CHD** and stroke.
- Also, diabetes is among the leading causes of **kidney failure**; **10% to 20%** of people with diabetes die of kidney failure (WHO, 2008).

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- **Type 1**, formerly referred to as insulin-dependent diabetes mellitus (IDDM), usually occurs before age 30 but can develop at any age.
- **Type 2**, previously known as non-insulin-dependent diabetes mellitus (NIDDM), is more common; 90% of individuals diagnosed with diabetes mellitus worldwide have type 2 diabetes (WHO, 2011).
 - ✓ Risk factors for developing diabetes are:-
- Age, gender, family history, calorie intake, physical inactivity

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- *Type 1* diabetes may be caused by autoimmune, genetic, or environmental factors, but the specific cause is unknown. Unfortunately, there is no known way to prevent **type 1** diabetes (CDC, 2011).
- *Healthy nutrition* and *increased physical activity*, however, can reduce the risk of type 2 diabetes by as much as 67% in high-risk individuals (Sanz, Gautier, and Hanaire 2010).

Nearly **90% of cases of type 2 diabetes** worldwide may be related to obesity (Wagner and Brath 2012).

Effect of exercise

- Additionally, no adverse effects or diabetic complications resulting from exercise were reported (Thomas et al. 2006).
- Research that associates physical activity with weight loss, fat loss, and glycemic control suggests that *regular physical activity reduces one's risk of developing type 2 diabetes.*
- ***The frequency of exercise is crucial for those with diabetes.***
- If daily exercise is not possible, it should not be skipped 2 days in a row.

Obesity and Overweight

- Adult overweight and obesity are classified using the body mass index;

(BMI) (BMI = weight [kg] / height squared [m²]).

- Individuals with a BMI between ***25 and 29.9 kg/m²*** are classified as **overweight**;
- Those with a BMI of ***30 kg/m² or more*** are classified as **obese**.
- ❖ Actually, they define overweight and obesity as having ***abnormal or excessive fat accumulation that may impair health***.
- ❖ Regardless, overweight and obesity ranks as the **fifth** leading **risk factor for death** worldwide (WHO, 2012).

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Globally, more than 1 in every 10 adults is obese (WHO, 2012).

- Originally overweight and obesity were considered to be problems of high-income countries; now, these conditions are on the rise in the low- and middle-income countries.
- Nearly **35 million children** living in developing countries are **overweight**.
- In developed countries, approximately 8 million children are overweight.

The major factors associated with increased risk of obesity are:

- Age, gender, family history, cholesterol intake, and physical inactivity.
- Although obesity is strongly associated with CHD risk factors such as hypertension, glucose intolerance, and hyperlipidemia, the contribution of obesity to CHD appears to be independent of the influence of obesity on these risk factors.

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- Restricting **caloric intake** and **increasing caloric expenditure** through *physical activity* and *exercise* **are effective ways of reducing body weight and fatness** while normalizing **blood pressure** and **blood lipid profiles**.

Metabolic Syndrome

- **Metabolic syndrome** refers to a combination 3 or more of CVD risk factors associated with hypertension, dyslipidemia, insulin resistance, and abdominal obesity.
- **Age** and **BMI** directly relate to metabolic syndrome (National Cholesterol Education Program 2001).
- The prevalence of this syndrome is higher (>40%) for **older** (>60 yr) adults than for younger (20–29 yr) adults (7%).
- Also, the prevalence of metabolic syndrome is **much higher for obese (BMI > 30 kg/m²) individuals (~50%)** than for **normal weight (BMI ≤ 25 kg/m²) individuals (6.2%)**.

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- ***Lifestyle must be modified*** in order to manage metabolic syndrome.
- The ***combination of healthy nutrition and increased physical activity*** is an effective way to increase HDL-C and to reduce blood pressure, body weight, triglycerides, and blood glucose levels.

Aging

- A **sedentary lifestyle** and lack of physical activity reduce life expectancy by predisposing the individual to **aging-related diseases** and by influencing the aging process itself.

With aging, a progressive loss of physiological and metabolic functions occurs:

- ✓ With aging and diseases associated with increased oxidative stress (e.g., **CHD**, **diabetes** mellitus, *osteoporosis*, and **heart failure**), telomere length decreases.

Thus, regular exercise benefits in *retarding the aging process* and diminishing the risk of aging-related diseases.

❖ Physical Activity and Postural Deformity

❖ *What Is Posture?*

- **Posture** is the position from which **movement begins** and **ends**.
- Having proper postural alignment enables the body to perform movements quicker with less joint and muscular strain.

❖ *Why Good Posture Is Important?*

- The body is designed to work at the **most economical level**, thus saving energy for future use.
- We spend more energy maintaining **misaligned posture**, which can cause muscle and joint pain.

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- ❖ Women in general tend to **develop poor posture** because of many factors:
 - Have more clerical and **computer oriented jobs** that require sitting in a chair, eyeing a computer screen for long periods of time.
 - Wear **high-heeled shoes**,
 - The development of **breast tissue** or the augmentation /**growth of breasts**
 - Have **less musculature** to maintain **proper alignment**, leading to rounded shoulders, **forward head posture**, **hyper-extended knees**, and increased thoracic and lumbar curves.

Men can also develop all of these postural problems but at a different degree and rate depending on their situation.

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- To improve your posture and reduce structural damage, you should adhere to **a corrective postural exercise program.**

This simple yet productive program will combat the **effects of bad posture** and help **alleviate joint and muscle pain.**

Exercises for correcting posture:

- ☐ Prone Cobra
- ☐ Axial Extension Trainer
- ☐ Wall Leans
- ☐ Cervical Extension using a blood pressure cuff

Musculoskeletal Diseases and Disorders

- Diseases and disorders of the musculoskeletal system, such as *osteoporosis*, *osteoarthritis*, *bone fractures*, *connective tissue tears*, and *low back syndrome*, are also related to physical inactivity and a sedentary lifestyle.
- **Osteoporosis** is a disease characterized by the ***loss of bone mineral content*** and ***bone mineral density*** due to factors such as aging, amenorrhea, malnutrition, menopause, and physical inactivity.

Osteopenia, or low bone mineral mass, is a precursor to osteoporosis.

- ❖ Adequate ***calcium*** intake, ***vitamin D intake***, and ***regular physical activity help counteract age-related bone loss.***

Exercise Prescription for Preserving Bone Health of Adults

Mode: *Weight-bearing endurance activities* (e.g., stair climbing, jogging), activities that involve jumping (e.g., basketball, plyometrics), and resistance training.

Intensity: Moderate to high, in terms of ***bone-loading forces***.

Frequency: **3-5 times per week** for *weight-bearing endurance activities*; **2 or 3** times per week for resistance exercise.

Duration: **30-60 min/day** of a combination of weight-bearing endurance activities, activities that involve jumping, and resistance training that ***targets all major muscle groups***.

Low back pain

- More than 80% of all low back problems are produced by muscular weakness or imbalance caused by a lack of physical activity.
- If the muscles are not strong enough to support the vertebral column in proper alignment, poor posture results and low back pain develops.
- Excessive weight, poor flexibility, and improper lifting habits also contribute to low back problems.

Because the origin of low back problems is often functional rather than structural, in many cases, the *problem can be corrected through an exercise program* that develops strength and flexibility in the appropriate muscle groups.

Also, people who remain physically active throughout life retain more **bone**, **ligament**, and **tendon strength**; therefore, they are *less prone to bone fractures and connective tissue tears*.