COMPONENT(MODE) OF EXERCISE:

ART OF PRESCRIPTION TO GOOD HEALTH

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Content

- Aging
- Strength and Balance Training
- Stretching and Relaxing technique
- Breathing and Pulmonary
- Aerobic Training: Make it fun!

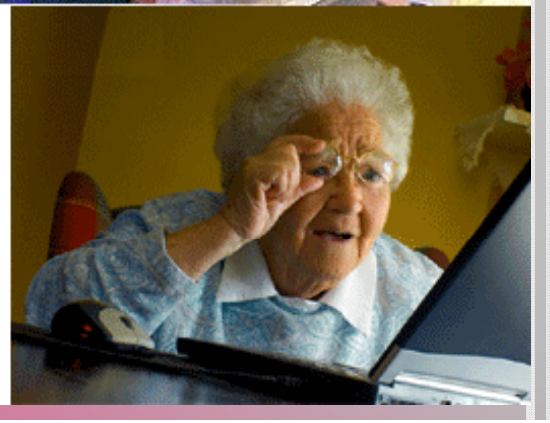
Aging

1. **Aging is not stagnant, dull, and/or unattractive.**
2. **Aging is very dynamic, perhaps to fluctuating, with a wide range of responses.**
3. **Aging is very diverse – a hallmark is the variability of individuals.**
4. **Aging is very challenging.**
5. **Aging is very complex.**
6. **The study of aging is the study of life – it starts in the uterus and our intervention must be life long.**
7. **Aging and living are synonymous.**
8. **Above all else, aging is venerable and valued.**

- Aging is a maturation process include
  - Genetic program
  - Influence by **external factors**
- Normal aging / modified aging

Rehabilitation's role

- Maintenance or restoration of function
- Modify functional implication
- Categorization
  1. Normal aging
  2. Pathophysiology
  3. Disuse



Nervous system

- Cognition
- Tone
- Reflexes

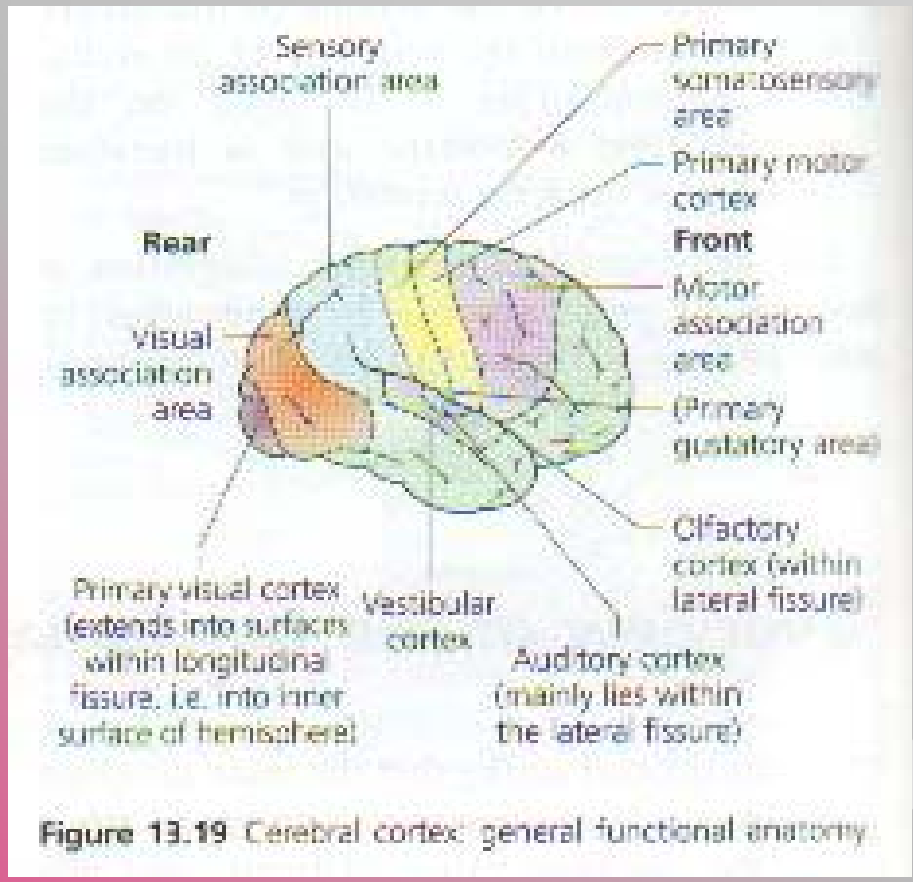


Figure 13.19 Cerebral cortex: general functional anatomy.

MUSCULOSKELETAL SYSTEM

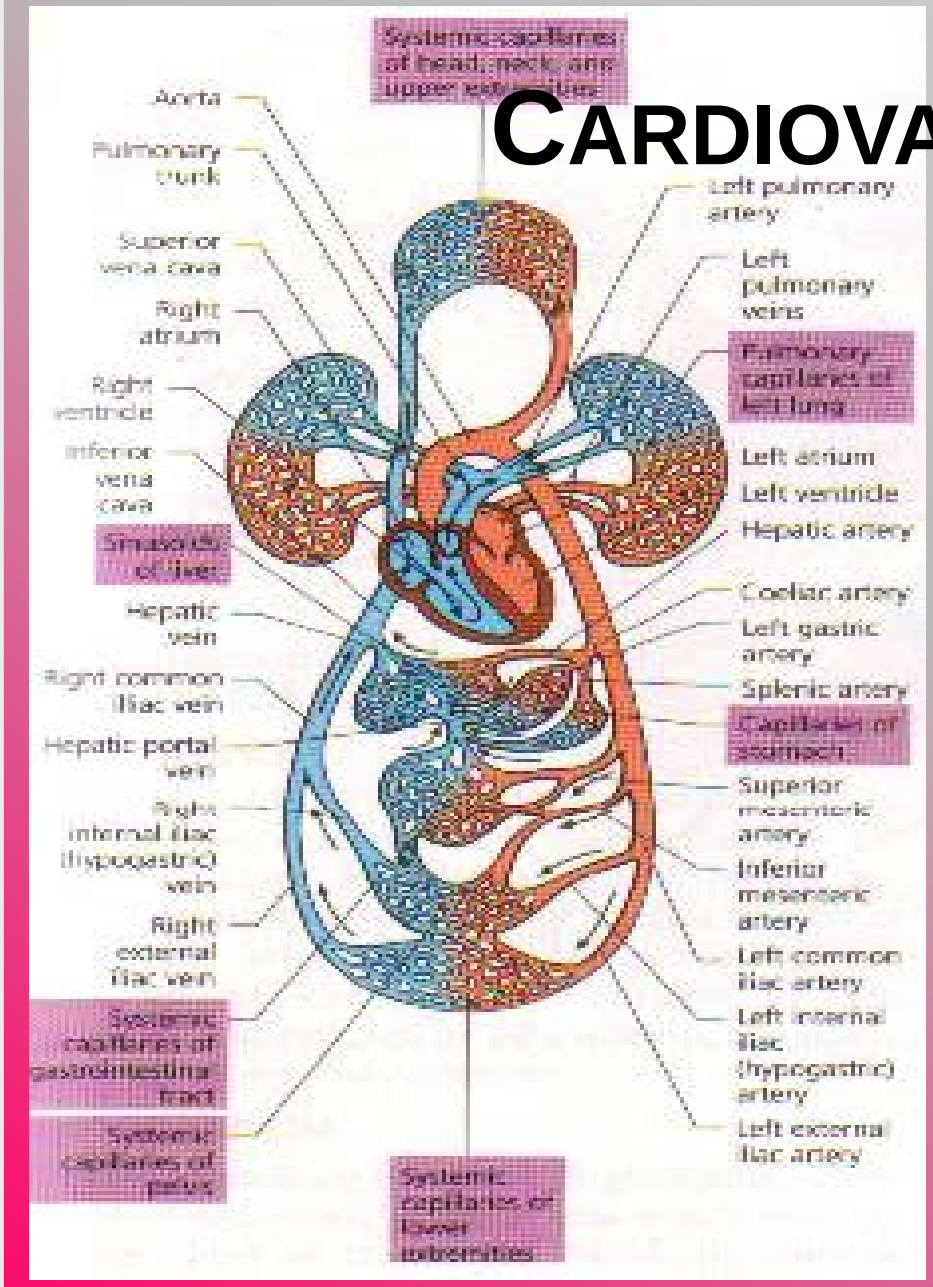
- Muscle strength and endurance
  - Dec. muscle mass and strength
  - Peak strength at 30 yrs.
  - Rapidly dec. after 50 yrs.
  - Greater dec. in back and LEs (proximal>distal)
  - Dec. 4% per decade, 25-50 yrs.
  - Dec. 10% per decade, >50 yrs.

Musculoskeletal system

- Muscle strength and endurance
  - Aerobic capacity dec. 1% per yr. since 30 yrs.
  - Aging is not synonymous to disuse.

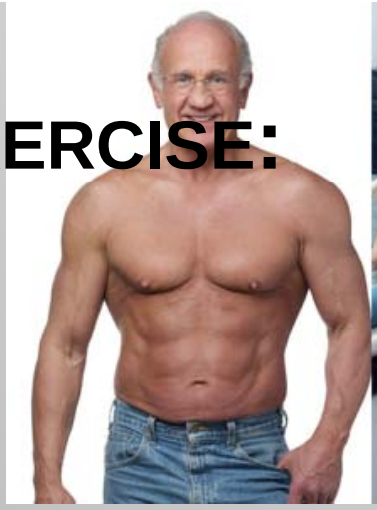
Variable	Aging	Training
Muscle mass	Decrease	Increase
Type I %	No change	No change
Type II %	Decrease	No change
Type I area	No change	Increase
Type II area	Decrease	Increase
Oxidative capacity	Decrease	Increase
Glycolytic capacity	No change	No change
Capillary density	Decrease	Increase
Contraction time	Increase	Decrease
Relaxation time	Increase	Decrease
Shorthening velocity	No change	Increase

CARDIOVASCULAR SYSTEM



- Heart
- Vasculature: BP
- Cardiovascular function
  - CO = SV x HR
- Effect of exercise
  - Central hemodynamic
  - Peripheral hemodynamic

Rejuvenation Through Exercise: Anti-aging Effect?



10 keys to Prolonging Vitality

- Lean body mass
- Strength
- Resting metabolism
- Body fatness
- Aerobic capacity
- Insulin sensitivity
- Blood fats
- Blood pressure
- Bone density
- Body temperature

Exercise does!!

Rejuvenation Through Exercise: Anti-aging Effect?

Human Nutrition Research Center on Aging: NHRCA

- 10 Frail Elderly Men and Women 87-96 years old
- 8 weeks program
- High intensity of strengthening of LE
- 9/10 complete

- ⇧ muscle strength 174%
- ⇧ walking speed 48%
- ⇧ size of mid thigh muscles 9%

Rejuvenation Through Exercise: Anti-aging Effect?

- 100 elderly
- 4 study groups

1. LE resistance exercise
2. MTV
3. Exercise and MTV
4. Placebo

- 8-12 METs (Bruce stage3-4)
- 5-8 METs Older, unfit and heart patients
- 15-20 METs Athletes

- Greater Energy Reserve = one can accomplish strenuous tasks of daily living with less fatigue

Rejuvenation Through Exercise: Anti-aging Effect?

- Cardiac patient
- Extremely low aerobic capacity of 4 METs (Bruce stage I, 2nd mins)
- 3 months supervised program
- 6 METs(Bruce stage II, 4th -5th mins)
- As the result: relative oxygen cost of 4.8km(3mile)/hr decrease from 75% of that men capacity to 50%

- A classic study in the late 1960s
- **3 weeks of bed rest** = ⇓ 27%VO2max = ⇓ Fitness normally occur from age 30 to 60.

= ⇓ Heart-Lung fitnessas **aging 30 year!!!**

AGING : PREDICTED MORTALITY

- Blair and colleagues at Cooper Institute: ACLS (The Aerobics Center Longitudinal Study, based in Dallus, Texas)
- **Low level aerobic fitness is an important risk factor for death from all causes.**
- Higher METs lower death rates from cancer and heart disease

- Franklin BA, Gordon NF.
- **⇧ Each 1 METs in Cardiorespiratory fitness = ⇩ 8-17% Cardiovascular and All cause mortality**

Fitness and Mortality in Men, ACLS Fitness Categories

Fitness Group	*20-39*	*30-49*	*50-59*	*60+*
Low	≤10.5	≤9.9	≤8.8	≤7.5
Med.	10.6-12.7	10.0-12.1	8.9-10.9	7.6-9.7
High	>12.7	>12.2	>10.9	>9.7

Fitness and Mortality in Women, ACLS Fitness Categories

Fitness Group	*20-39*	*30-49*	*50-59*	*60+*
Low	≤8.1	≤7.5	≤6.5	≤5.7
Med.	8.2-10.5	7.6-9.5	6.6-8.3	5.7-7.5
High	>10.5	>9.5	>8.3	7.5

Table values are maximal METS attained during the exercise text

RECOMMENDATIONS

- Focus on: not only on **LIVING LONGER** but also **LIVING BETTER**
- **Exercise programming in the Elderly**
  - **Highly individualized**
  - **Comprehensive program**
  - **Include:**
    - **AEROBIC**
    - **STRENGTHENING**
    - **FLEXIBILYTY**
    - **BALANCE EXERCISE**

PRINCIPLES OF TRAINING

- 2 MAJOR PRINCIPLES

1. OVERLOAD
   - " FOR A TISSUE OR ORGAN TO IMPROVE ITS FUNCTION, IT MUST BE EXPOSTED TO A LOAD TO WHICH IT IS **NOT NORMALLY ACCUSTOMED** "
   - INTENSITY, DURATION, AND FREQUENCY → **CUMULATIVE OVERLOAD** → **ADAPTATION**

PRINCIPLES OF TRAINING

2. SPECIFICITY

" TRAINING EFFECTS DERIVED FROM AN EXERCISE PROGRAM ARE **SPECIFIC TO EXERCISE PERFORMED AND MUSCLES INVOLVED**

OVERVIEW OF THE EXERCISE PRESCRIPTION

- Based on
  - Individual interest
  - Health needs
  - Clinical status

- Essential component

1. **Modes**
2. **Intensity**
3. **Duration**
4. **Frequency**
5. **Progression**
6. **Precaution**

EXERCISE PRESCRIPTION FOR: **MUSCULAR FITNESS**

- **RESISTANCE TRAINING** OF MODERATE INTENSITY
  - MUSCULAR STRENGTH AND MUSCLE MASS
  - ↑BONE MASS
  - STRENGTH CNT

  - RHYTHMIC, MODERATE TO SLOW SPEED, FULL ROM, **NORMAL BREATHING**

- MUSCLE STRENGTH: **HIGH INTENSITY, LOW REPETITION**
- MUSCLE ENDURANCE: **LOW INTENSITY, HIGH REPETITION**

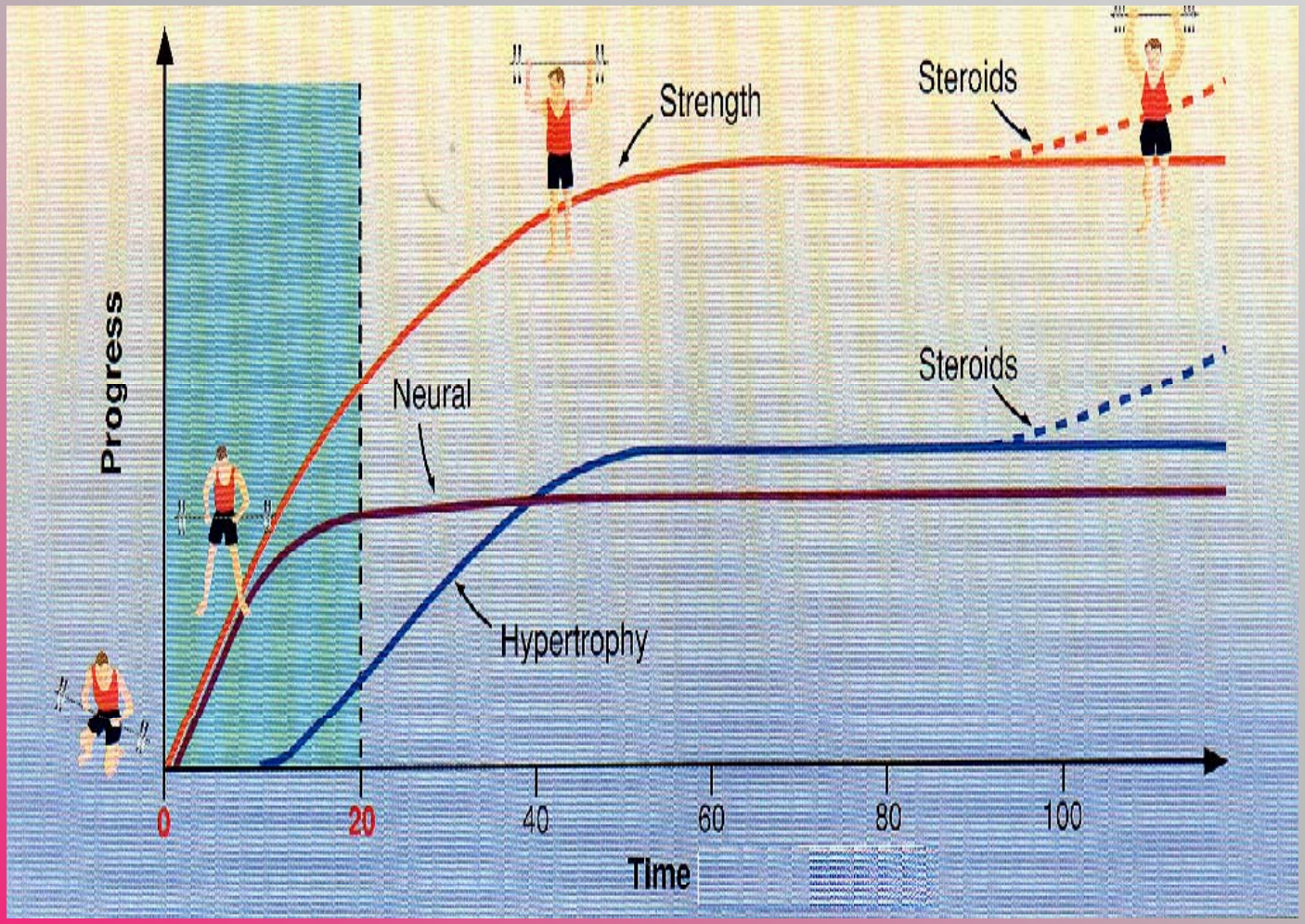
EXERCISE PRESCRIPTION FOR: **MUSCULAR FITNESS**

- MUSCLE STRENGTH & ENDURANCE:
  - 8-12 REPETITION, <50-60 YEARS
  - 10-15 REPETITION, >50-60 YEARS

- CONCENTRIC/**ECCENTRIC**
- STATIC/**DYNAMIC**

Peak strength developed in **6-8 wks**
Large muscle first, small ones later
High training volume first, High training intensity later

Strength Improvement



Strength and Balance Training

- Preservation of muscle mass and bone density
- Balance
- Prevent falls
- Functional independence
- Lean body mass
- Basal metabolism
- Improve glucose tolerance
- Insulin sensitivity
- Lipoprotien profile
- Sarcopenia

Strength and Balance Training

- Cardiovascular benefit
- ⇧Submaximal exercise
- Lessen cardiac demands during daily activities ex. carrying packages

Strength and Balance Training

Safety of Resistance training

- Gordon et al. documented the safety of maximal strength testing in 6653 study participants
- Expert panel reviewed 12 studies : safety and effectiveness of resistance traing in rehabilitation of patient with coronary disease
- No signs and symptoms of MI, threatening ventricular arrhythmias and cardiovascular events including patients soon after acute MI, stable CHF
- Suggest that resistance testing and training is safe for **selected coronary patients.**

Strength and Balance Training

Participation Criteria and Contraindication

- Unstable angina
- Stages 2 and 3 hypertension

(>160/>100 mmHg)

- Uncontrolled arrhythmias
- Recent history of CHF
- Severe stenotic or regurgitant valvular disaerobic exercise program for at ease
- Hypertrophic cardiomyopathy

Patient Eligibility

- Cardiac patients: should have participated in a traditional exercise program for at least 3 months
- An aerobic capacity of < 6-7 METs during symptom-limited exercise testing (Completion of stage III Bruce protocol)
- Moderate to good LV function(EF>45%)

Organizing the strength-training program

- **Selecting** the exercise
- **Ordering** the exercise
- Determine **repetitions**
- Determining **sets**
- Determining **resistance level**
- Limiting the **time** between exercises
- Allowing time between workouts

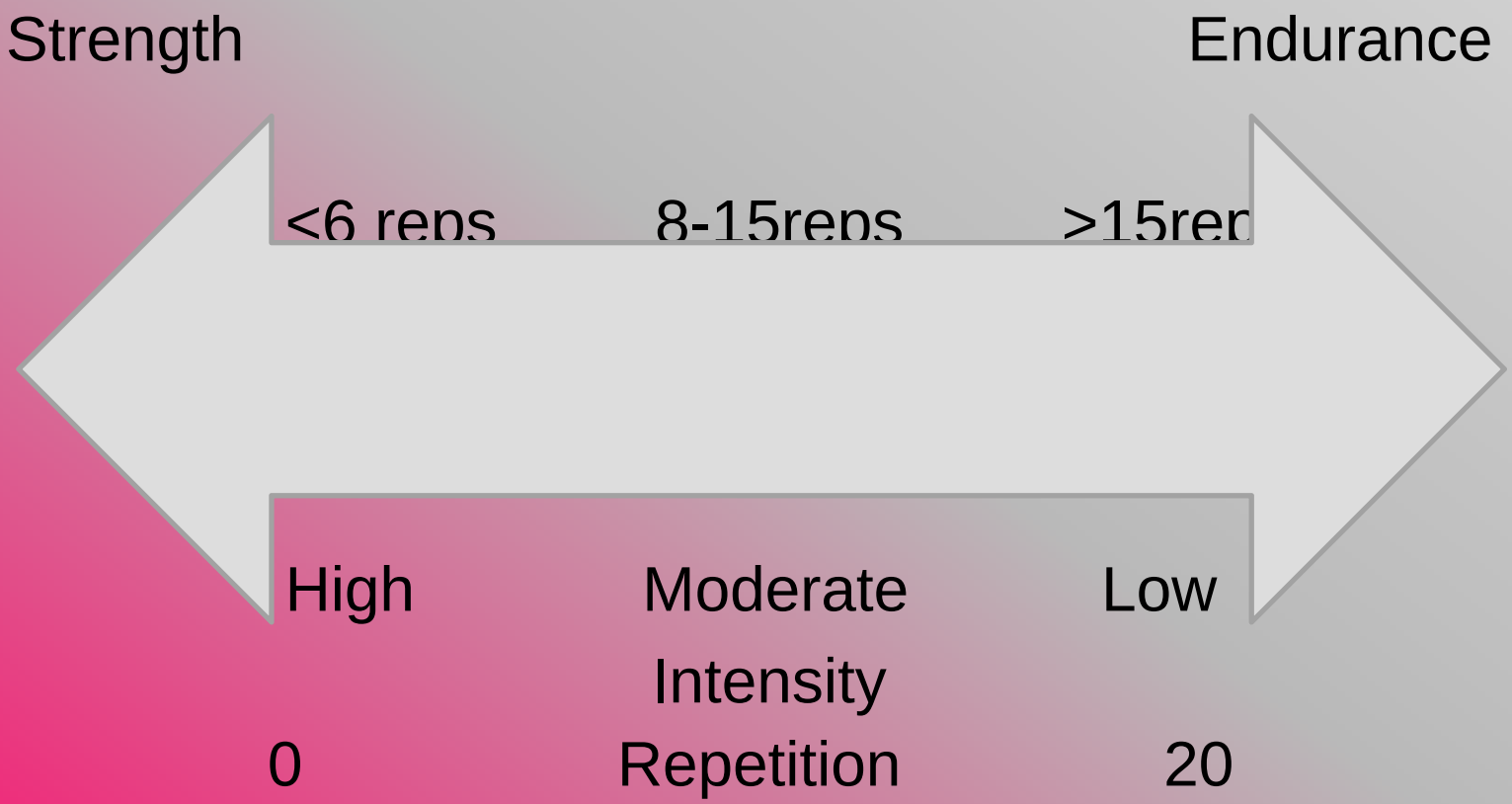
Repetitions, Sets and Resistance level

Tradition approach

- 3 sets of 5-8 repetitions to develop muscle strength
- 3 sets of 9-15 repetitions to develop muscle endurance
- Initial intensity
  - UE: 30-40% of 1 RM
  - LE: 50-60% of 1 RM
- RPE 11-14(fairly light to somewhat hard)
- Minimum 1 set of 8-10exercises of major muscle groups

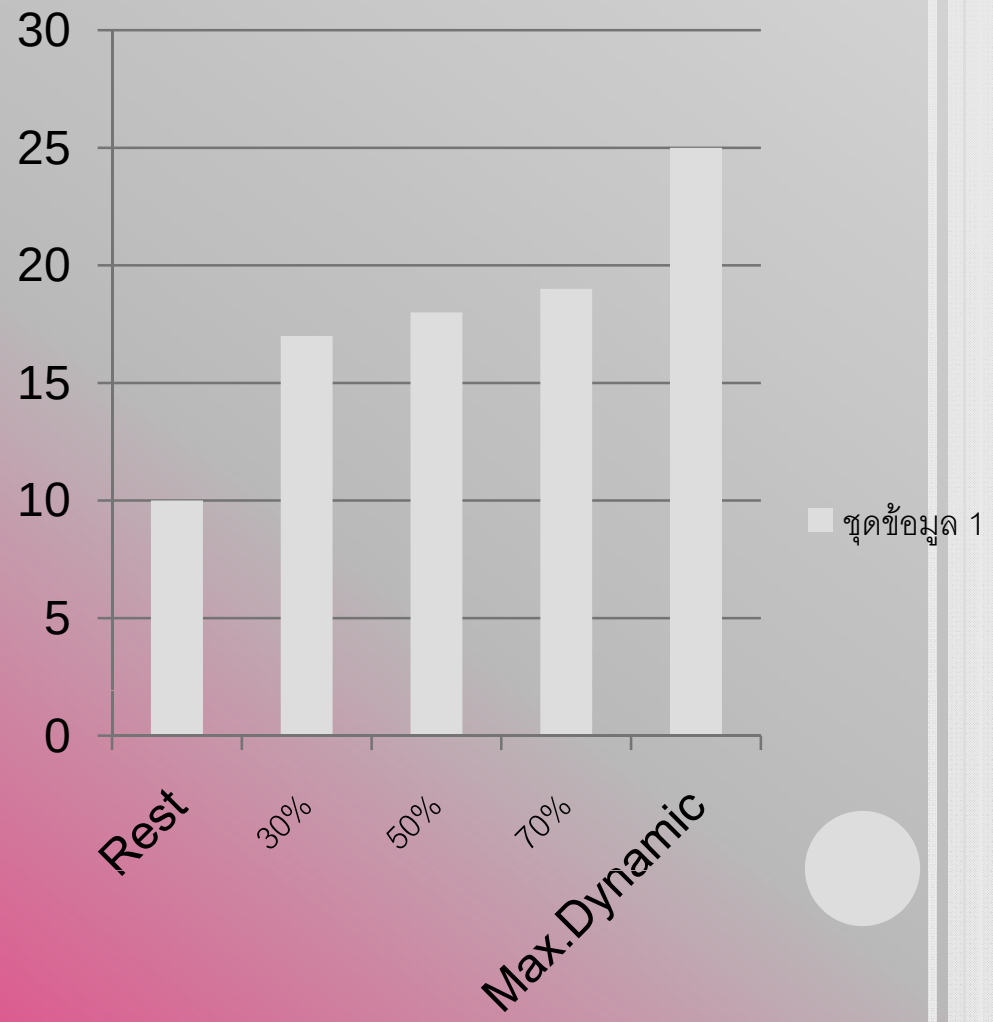
Adapted from Dingwall et al.

Approximate load repetition relationship	
% 1 RM	No. repetition
60%	17
70%	12
80%	8
90%	5
100%	1


Strength
Endurance
<6 reps
8-15reps
>15rep
High
Moderate
Low
Intensity
0
Repetition
20

Isometric or Isodynamic exercise

- Cardiac patient with good LV function
- Several studies: isometric exertion regardless of %MVC used, fails to elicit angina pectoris, ischemic ST segment displacement , or ventricular arrhythmia.
- RPP, MVO2, coronary flow requirements are lower during max. isometric exercise than during max. isotonic exercise



Mode of Strengthening exercise

Equipment

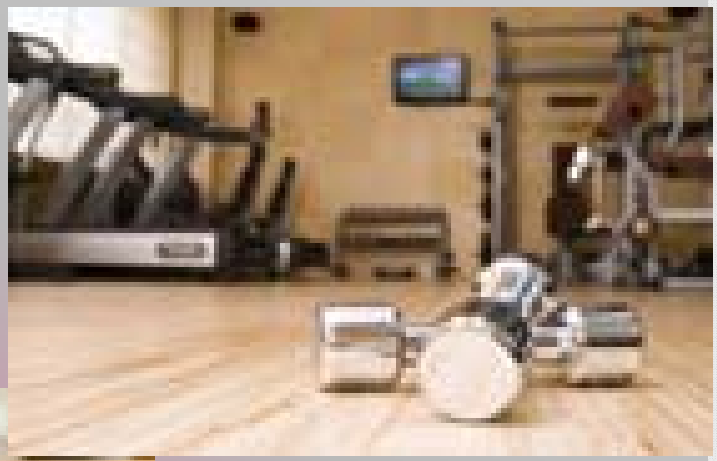
- Cost
- Complexity
- Operation skill
- Load setting
- Time efficacy
- Safe
- Effectiveness
- accessible

Weight machines

1. Reduced injuries to hands, feet, and loer back
2. Attenuation of lifting-induced hypertensive responses
3. Adjustment of weight
4. Application of resistance through ROM
5. Greater stability, encourage proper technique, and alleveate the need for a spotter

Strength and Balance Training

- Frequency:
  - 2-3 day/wk
  - at least 48 hours of rest between workouts
- Duration:
  - 20-25 mins
  - >60 detrimental effect on adherence
- Progression
- Precaution



Balance assessment

BALANCE ASSESSMENT

A balance assessment typically contains the following items:

- The **subjective** assessment
- The functional **mobility** and **gait** assessment
- The **musculoskeletal** assessment
- **Movement** strategies for balance
- **Sensory** organization for balance

Balance assessment

- Part 1: The Subjective Assessment
  - Past medical history/family history
  - Recent history of falls
  - Review of medications

- Part 2: Functional Mobility and Functional Gait Assessment
  - Functional mobility (Berg Functional Mobility Test)
  - Functional gait (Tinetti Mobility Assessment Scale, the Dynamic Gait Test, the Three-Minute Walk Test and the Performance-Oriented Mobility Test)

Balance assessment

- Part 3: The Musculoskeletal Assessment
  - Strength
  - Range of motion
  - Pain
  - Posture
  - Abnormal tone

Balance assessment

- Part 4: Movement Strategies for Balance
  - **Strategies** are automatic reactions that have evolved over time taking into **account biomechanical and environmental constraints**. Strategies are automatic reactions, slower than reflexes but much faster than voluntary movements.
  - **The ankle strategy**
  - **The hip strategy**
  - **The stepping strategy**

BALANCE ASSESSMENT

- The ankle strategy
  - Ankle strategy. Our nervous system employs the ankle strategy in response to **small losses of balance and to adjust balance in quiet standing.** The ankle strategy is also called ankle sway and uses the length of the foot as a lever to correct for minor losses of balance. In the ankle strategy, activation of the leg muscles is from the floor up or distal to proximal. A small loss of balance in the forward direction causes contraction of the gastrocnemius, hamstrings and lower back muscles in that order to bring the body back into balance.

  - A small loss of balance in the backward direction causes contraction of the anterior tibialis, quadriceps and lower stomach muscles in that order to bring the body back into balance. Our bodies are constantly using this strategy to adjust for minor losses of balance. For example, you would use the ankle strategy to maintain your balance when standing on a bus to correct for losses of balance and to prevent yourself from falling as the bus changes speed. You might also use the ankle strategy to maintain your balance on a very soft surface such as thick grass or a piece of foam.

BALANCE ASSESSMENT

- The hip strategy
  - Hip strategy. The hip strategy describes movement about the hip in response to **larger losses of balance** or when the support surface does not allow the use of the ankle lever such as on a icy surface or when the surface is shorter than the length of the foot. In the hip strategy activation of muscles is from the trunk down or proximal to distal. A loss of balance in the forward direction will cause contraction of the lower back and hamstring muscles in that order to regain balance.
    When the hip strategy is used the muscles of the lower leg (anterior tibialis and gastrocnemius) are almost silent. Studies have shown that when a walker is used the body largely abandons the ankle strategy and relies heavily on the hip strategy for balance. This dependence on the hip strategy for balance paradoxically may lead to a decrease in ankle sway and contribute to further decline in balance due to loss of ankle strength and flexibility. For this reason the pros and cons of walker use should be carefully considered before a walker is recommended for fulltime use.

Balance assessment

- Stepping strategy
  - The third strategy employed by the nervous system for balance is the stepping strategy. This strategy is used when **the loss of balance exceeds the area of stability** and the person is forced to step or fall.

Balance assessment

- Part 5: Sensory Organization for Balance
  - Visual input for balance
  - Vestibular input for balance
  - Somatosensory input for balance

Balance assessment

- Visual input for balance
  - Visual input for balance.Vision is a critical part of our balance system and tells us where our bodies are in space and where we are in relation to other objects. Vision also provides information about the movement of the head in relation to objects in the environment. Vision works in conjunction with the vestibular system - comparing information about velocity and rotation from the vestibular system with actual visual information. The visual system may provide inaccurate information to the nervous system.

Balance assessment

- Vestibular input for balance
  - The vestibular system is responsible for processing information about movement with respect to gravity - specifically rotation, acceleration/deceleration and head stabilization during gait. The vestibular system works in conjunction with the visual system to stabilize the eyes and maintain posture during walking (vestibulo-ocular reflex). Vestibular disorders cause a feeling of dizziness and unsteadiness. Vestibular dysfunction also affects the ability of the nervous system to mediate intersensory conflicts such as the example given above.

Balance assessment

- Somatosensory input for balance.
  - Somatosensory input consists of touch and proprioception. Input from these two sensory sources provides critical feedback to the nervous system regarding positioning in space, body sway and changes in terrain. The sensory input from touch and proprioception allows the muscles to make constant, automatic adjustments to maintain balance and avoid falls

Age Related Changes in Balance

1. Slowed response to losses of balance and decreased righting responses.
2. Muscle force that is too strong or too weak.
3. Abnormal sensory selection or weighting - i.e., overuse of vision or under use of proprioception.
4. Loss of confidence (changes in the perceived limits of stability).
5. Loss of ankle sway and increase in the use of the hip and stepping strategies.
6. Decreased range of motion.
7. Decreased strength - particularly in the lower legs.
8. Abnormal sensation (peripheral neuropathies, abnormal tone, effects of drugs, hemianopsia).
9. Declining visual ability (loss of visual acuity, dark adaptation, increased sensitivity to glare, loss of peripheral vision and depth perception).

The following risk factors should be assessed by a nurse:

- Postural hypotension: drop in systolic blood pressure >/=20mm Hg or to <90mmHg on standing
- Use of any benzodiazepine or other sedative/hypnotic agent including antipsychotics, antianxiety, antidepressants, cardiovascular medications and diuretics
- Use of 4 or more prescription medications
- Use of medications that may cause muscle rigidity, impaired balance, decreased alertness or extrapyramidal symptoms (e.g. tremors)
- Inability to transfer safely
- Environmental hazards such as clutter, poor lighting, poorly arranged furniture
- Poorly maintained or improperly fitting wheelchairs and/or assistive devices
- Incontinence

The following risk factors should be assessed by a physical therapist:

- Gait impairment or abnormalities
- Inability to transfer safely
- Balance deficits
- Impairment in strength or range of motion affecting balance
- Poorly maintained or improperly fitting wheelchairs and/or assistive devices
- Environmental hazards such as clutter, poor lighting, poorly arranged furniture

Motion analysis measurement

- In balance studies, optical systems have been utilised, first, to track the position of the body segments (Benvenuti et al 1999) and, then, to calculate the COG position. This can be done by measuring the positions of the light-emitting markers. Then, by knowing the positions of the centres of the body segments, the COG value can be calculated. This method requires modelling of the body, and although the control of balance in human upright standing is particularly well suited for modelling (Kuo 1995), it is also a popular experimental paradigm (Nashner

BODY SWAY MEASUREMENT

- "body sway" is used to describe the extent of the centre point of pressure (COP) or the centre of gravity (COG) excursions.
- For example, by using a "swaymeter" (Lord *et al.* 1991a) or Wright's ataxiameter
- The swaymeter measures displacements of the body at the waist level, whereas the ataxiameter can be used to define sway as an angular movement of the body around the ankle joint.

Body sway measurement

- The basic principle of the force platform test is to measure the movements of the COP that reflect both the horizontal location of the COG and the reaction forces due to muscular activity (Era *et al.* 1996). The aim of data processing is to compute selected parameters of total body sway from the time series of COP positions.

Functional balance measurement

- Get up and Go test
- Berg balance score
- Reaching test
- Step test (Dynamic single-limb stance)
- Romberg test
- Single-limb stance test

FUNCTIONAL BALANCE MEASUREMENT

- Romberg test

The simplest timed test is the Romberg test, which assesses whether a patient can stand with feet together and eyes open and then closed for 60 s. The tester observes the amount of body sway and judges whether it increases to an abnormal extent when the eyes are closed.[4] A more clinically relevant variation is the Sharpened Romberg Test[5] which tests the patient's ability to stand with feet in tandem (heel-toe) with arms by their side and eyes open for 60 s, it also uses subjective judgement about whether balance is 'normal'. Neither of the Romberg tests have reported reliability and given the subjective nature of the test it may be expected to be limited. Another

FUNCTIONAL BALANCE MEASUREMENT

- Single stance test

variation of the Romberg test is the Single Stance Test[6] which tests the ability to stand on one leg for 30 s with eyes open and closed. A further variation notes the length of time the subject can stand on one leg with eyes open and the arms across their chest, which is reported to have inter-rater reliability for the elderly.[7] The face validity of these tests is questionable for stroke patients and the reliability is limited.[8]

FUNCTIONAL BALANCE MEASUREMENT

- Sensory Organisation Test

A more recent and more objective development is the Sensory Organisation Test.[9] It is designed to assess ability to maintain static standing balance under a series of conditions that are claimed to test the different sensory factors contributing to balance. The primary aim is to identify the relative contribution of these factors to balance ability, not to assess balance function overall. The original test assesses whether the subject can maintain standing balance for 30 s under six different conditions:

FUNCTIONAL BALANCE MEASUREMENT
SENSORY ORGANISATION TEST

- On a firm surface with eyes open (baseline)
- On a firm surface with eyes closed (visual input)
- On a firm surface while wearing a paper dome over the head and face (vestibular input)
- On a soft surface (a piece of medium density foam) with eyes open (reduced proprioceptive input)
- On a soft surface with eyes closed (reduced visual and proprioceptive input)
- On a soft surface while wearing a paper dome over the head and face (reduced vestibular and proprioceptive input)

If the subject is unable to maintain balance for 30 s, then the time before moving the feet is taken.

FUNCTIONAL BALANCE MEASUREMENT

Confusingly this test is also known as the Clinical Sensory Integration Test (CSIT) and the 'foam and dome' tests. Another form of the test uses a force platform to assess postural sway under the same conditions and is also called the Sensory Organisation Test (SOT), or the Equitest, after the commercial equipment used to measure it. The test has been adapted for fit elderly people;[10] testing was for 20 s only and they recommended that each condition be repeated three times and mean scores taken. If this is done, inter-tester and test–retest reliability is high ($\kappa = 0.99$). A small pilot study using the SOT with ten stroke patients with standing balance has shown good inter-rater reliability ($\kappa = 0.77$), but there was an apparent floor effect for this group of patients as all the patients could perform the first three conditions for 30 seconds.[11]

FUNCTIONAL BALANCE MEASUREMENT

- Get up and go test

A final timed walk test is the Timed Up & Go Test,[20] which measures the time taken for a subject to rise from a chair, walk 3 m, turn, walk back to the chair and sit back down. It was designed originally as a basic mobility test for the frail elderly and has not been assessed specifically for people with stroke. It is reliable (inter and test–retest reliability kappa = 0.99), valid[20,21] (correlation with the Berg scale $r = 0.81$, walking speed $r = -0.61$, Barthel Index $r = 0.78$) and can predict risk of falls.[22] Measurement error and sensitivity to change have not been addressed but it appears quick and easy to use and suitable for different settings.

Section 10: 8 ft Up and Go Test[1,7]

✶*Score > 8.5 seconds is associated with high fall-risk in community-dwelling older adults.*✶

10. 8 Feet Up & Go:

Section 10: 8 Feet Up & Go (in Seconds)							
Sex / Age	60-64	65-69	70-74	75-79	80-84	85-89	90-94
Normal Range of Scores for Men*[1]	5.6 - 3.8	5.9 - 4.3	6.2 - 4.4	7.2 - 4.6	7.6 - 5.2	8.9 - 5.5	10.0 - 6.2
Normal Range of Scores for Women*[1]	6.0 - 4.4	6.4 - 4.8	7.1 - 4.9	7.4 - 5.2	8.7 -5.7	9.6 - 6.2	11.5 - 7.3

*Normal range of scores is defined as the middle 50 percent of each age group. Scores above the range would be considered "above average" for the age group and those below the range would be "below average."
Scores reprinted with permission of the authors.

Rikli RE, Jones CJ. Senior Fitness Test Manual. Champaign, IL: Human Kinetics. 2001. Refer to *www.humankinetics.com* for purchasing information.

FUNCTIONAL BALANCE MEASUREMENT

- Functional reach test

The reaching tests are based on the Functional Reach Test.[23] This test measures the maximum distance the subject can reach forward beyond arms length in standing, without moving their feet, using a yardstick fixed at shoulder height. The test was originally designed for and extensively tested with the frail elderly. The following have been demonstrated:

- test–retest reliability (ICC = 0.8 and 0.88[23,24]), inter-tester reliability (ICC = 0.73[7])
- construct validity[23]
- concurrent/criterion-related validity (limits of stability $r = 0.7$[23]; walk speed $r = 0.71$, ADL $r = 0.48$–0.66, social independence $r = 0.71$[24])
- predictive validity (risk of falls[25])
- sensitivity to change in response to treatment[26]
- coefficient of variation of 2.5%.[23]

FUNCTIONAL BALANCE MEASUREMENT

- Functional reach test

A number of variations of the Functional Reach Test have been reported. One study has used forward reach in sitting with stroke patients as part of a battery of outcome measures. Change due to treatment over a two-week period was detected, but further information about the reliability and validity was not discussed.[30] It has also been used with people with spinal cord injury with demonstrated test–retest reliability (0.85–0.94) and discriminate validity and it could discriminate between people with high and low level lesions.[31]

FUNCTIONAL BALANCE MEASUREMENT

- Step test

The Step Test was developed to evaluate dynamic single limb stance. It involves stepping one foot on and off a block as quickly and as often as possible within a set time.[34] High test–retest reliability has been found for people with stroke and the healthy elderly (ICC = 0.88–0.9), although this can be increased further by recording an average or best performance of three trials. It has concurrent validity with functional reach ($r = 0.68–0.73$), gait velocity ($r = 0.83$) and stride length ($r = 0.82–0.83$) and can discriminate between healthy elders and stroke patients.[34] It detects change due to treatment over a four-week period[27] and does not have a ceiling effect for people with high levels of balance function, although there may be a floor effect for people with limited standing balance.[29]

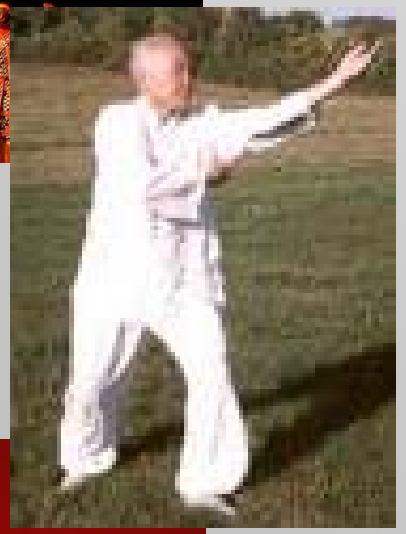
BALANCE RETRAINING EXERCISES:

- **Exercises designed to**
  - **improve coordination of muscle responses as well as**
  - **the organization of sensory information from eyes, ears and tactile/muscle receptors for balance control (measured by a computerized forceplate).**

BALANCE RETRAINING EXERCISES:

- **Frequency**
- Patients are typically seen on an outpatient basis once every 1-2 weeks and provided a specific daily home program that is upgraded as appropriate. This program addresses the specific problems and goals of the individual patient.

Flexibility



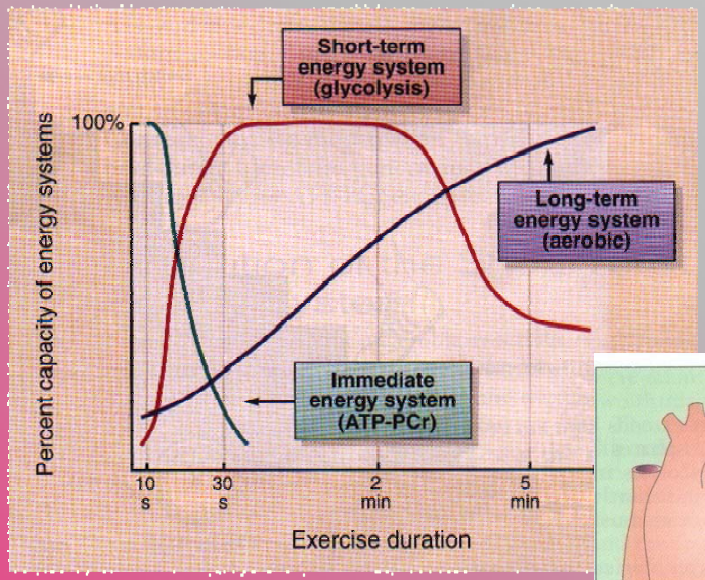
EXERCISE PRESCRIPTION FOR: **MUSCULOSKELETAL FLEXIBILITY**

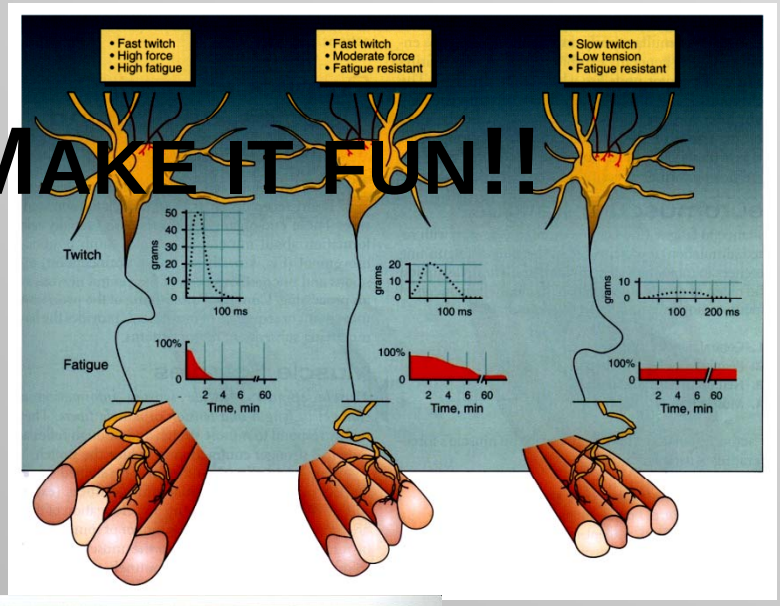
- **TYPE**: STATIC OR PNF TECHNIQUE
- **FREQUENCY**: A MINIMUM OF 2-3 D/WK
- **INTENSITY**: TO A POSITION OF MILD DISCOMFORT
- **DURATION**: 10-30 SEC. FOR **STATIC**
  6 SEC. CONTRACTION FOLLOWED BY
  10-30 SEC. ASSISTED STRETCH FOR **PNF**
- **REPETITIONS**: 3-4 FOR EACH STRETCH

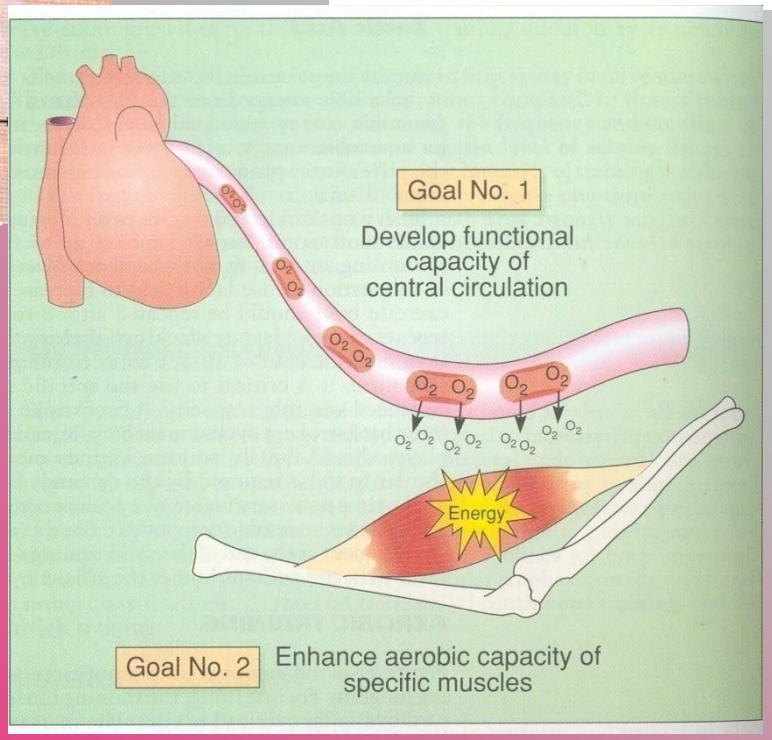
Mild soreness should be < 24 hr.

Don’t over stretch weak muscle

Aerobic exercise: Make it fun!!







EXERCISE PRESCRIPTION FOR : CARDIORESPIRATORY FITNESS

- VO2max & VO2peak

- MODE OF EXERCISE
  - LARGE MUSCLE GROUPS
  - PROLONGED PERIODS
  - RHYTHMIC AND AEROBIC IN NATURE

  → **GREATEST IMPROVEMENT IN VO2max**

EXERCISE PRESCRIPTION FOR : CARDIORESPIRATORY FITNESS

- ***EXERCISE INTENSITY***
  - INTENSITY & DURATION → **TOTAL CALORIC EXPENDITURE**
  - **ACSM RECOMMENDS**
    - **55/65% - 90% HRmax**
    - **40/50% - 85% OXYGEN UPTAKE RESERVE(VO2R) OR HR RESERVE(HRR)**

VO2R = VO2max - VO2resting
HRR = HRmax - HRresting

CARDIORESPIRATORY FITNESS: **INTENSITY**

FACTORS TO CONSIDER

INDIVIDUAL'S LEVEL OF **FITNESS**

MEDICATION : HR

RISK OF CVD, ORTHOPEDICT INJURIES

INDIVIDUAL **PREFERENCES** FOR EXERCISE

INDIVIDUAL PROGRAM **OBJECTIVES** EX. LOWER BP, LOWER BODY FATNESS, INCREASED VO2max

CARDIORESPIRATORY FITNESS: **INTENSITY**

FACTORS TO CONSIDER

INDIVIDUAL'S LEVEL OF **FITNESS**

MEDICATION : HR

RISK OF CVD, ORTHOPEDICT INJURIES

INDIVIDUAL **PREFERENCES** FOR EXERCISE

INDIVIDUAL PROGRAM **OBJECTIVES** EX. LOWER BP, LOWER BODY FATNESS, INCREASED VO2max

CARDIORESPIRATORY FITNESS: **INTENSITY**

- **HEART RATE METHODS**
  - **DIRECT METHODE** :USING A PLOT OF **HR** VERSUS **VO2** DURING GRADED EXERCISE
    - LOW FITNESS LEVELS,
    - CARDIOVASCULAR OR PUMONARY DISEASE,
    - TAKING MEDICATION (B-BLOCKER)
  - **PERCENT OF HRmax** : USING A STRAIGHT PERCENTAGE OF HRmax
    - **70-85%** HRmax ~ **55-75%** VO2max
  - **HR RESERVE METHOD**
    - TARGET HR RANGE= ([HRmax-HRrest] ***0.6 AND 0.8**) + HRrest

CARDIORESPIRATORY FITNESS: **INTENSITY**

- **RATING OF PERCEIVED EXERTION (RPE)**
  - DIFFICULT IN **HR** PALPATION
  - MEDICATION

  AVERAGE RPE RANGE → PHYSIOLOGIC ADAPTATION TO EXERCISE = ***12-16*** *(SOMEWHAT HARD TO HARD)*

CARDIORESPIRATORY FITNESS: **INTENSITY**

	RELATIVE INTENSITY		
INTENSITY	%HRR	%HRmax	RPE
VERY LIGHT	<20	<35	<10
LIGHT	20-39	35-54	10-11
MODERATE	40-59	55-69	12-13
HARD	60-84	70-89	14-16
VERY HARD	>85	>90	17-19
MAXIMAL	100	100	20

CARDIORESPIRATORY FITNESS: **DURATION**

ACSM RECOMMENDATION : **20-60 MIN. OF CONTINUOUS OR INTERMITTENT** AEROBIC ACTIVITIES ACCUMULATE THROUGHOUT THE DAY

70-85% HRmax OR 60-80% HRR FOR 20-30 MIN., **EXCLUDING** TIME SPENT WARMING UP AND COOLING DOWN

CARDIORESPIRATORY FITNESS: **FREQUENCY**

- ACSM RECCOMENDS **3-5 DAY/WEEK**
  - LOWER INCIDENCE OF LE INJURIES
  - **3 MET** : MULTIPLE BRIEFT DAILY EXERCISE **SESSION**
  - **3-5 MET** : 1-2 SHORT SESSION PER DAY
  - **> 5 MET** : 3-5 SESSION PER WEEK

- **NUMBER OF EXERCISE SESSION PER WEEK VARIES DEPENDING ON**
  - CALORIC GOALS,
  - PARTICIPANT PREFERENCES, AND
  - LIMITATIONS BY LIFESTYLE

ENERGY EXPENDITURE GOALS

- INTENSITY, DURATION, AND FREQUENCY → **NET CALORIC EXPENDITURE**
- **CALORIC THRESHOLDS** → VO2max, WT.LOSS, REDUCE RISK

- ACSM RECOMMENDS A TARGET RANGE OF **150-400 KCAL** OF ENERGY EXPENDITURE PER DAY IN PA AND/OR EXERCISE

- LOWER END RANGE → MINIMAL CALORIC THRESHOLD =1000 KCAL PER WEEK

(METs * 3.5 * BW IN KG)/200 = KCAL/MIN.

RATE OF PROGRESSION

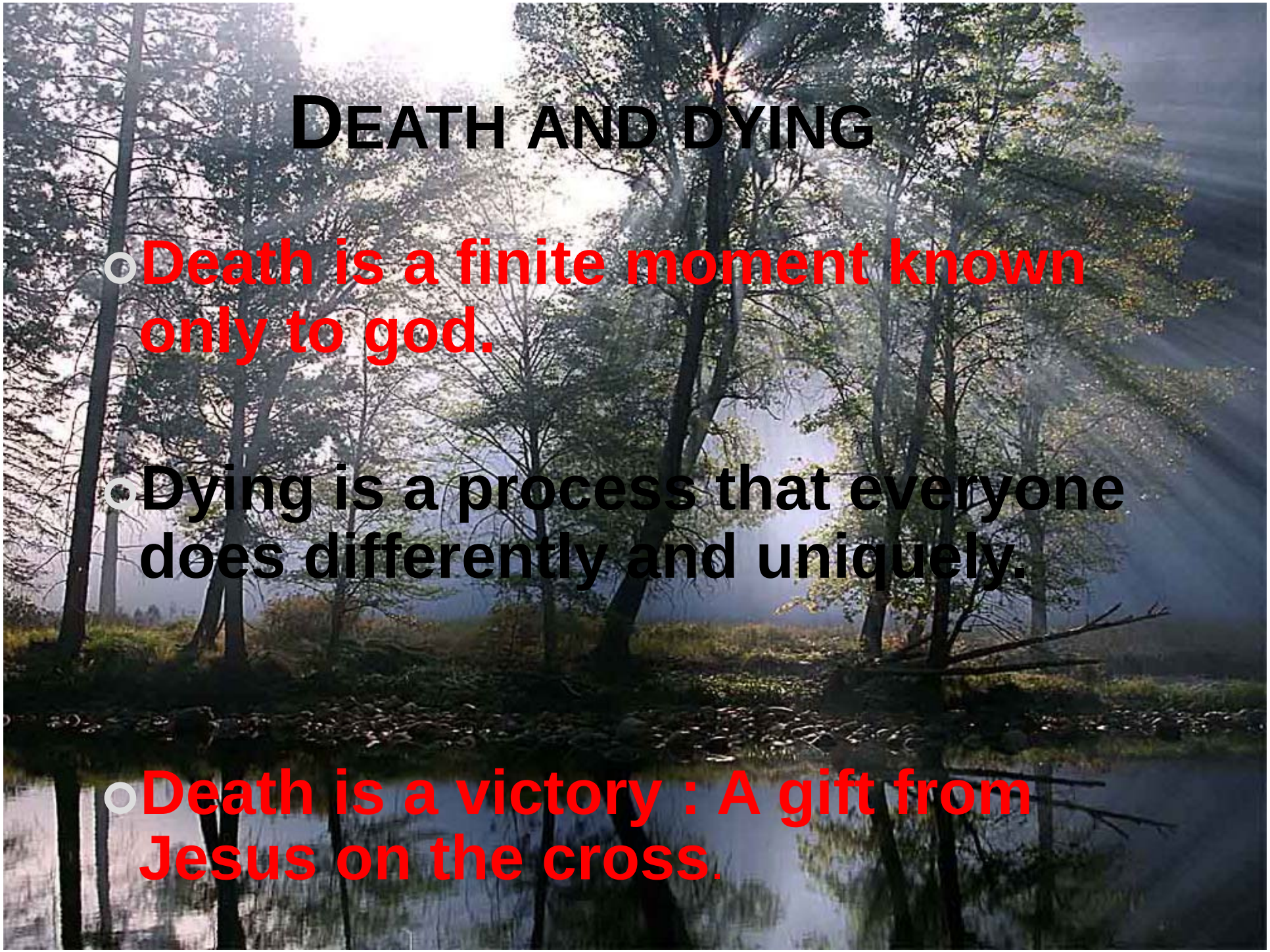
- **DEPENDS ON**
  - FUNCTIONAL CAPACITY,
  - MEDICAL AND HEALTH STATUS,
  - AGE,
  - INDIVIDUAL ACTIVITY PREFERENCES AND GOALS,
  - INDIVIDUAL TOLERANCE

- **ENDURANCE STAGE OF PROGRESSION**
  - **INITIAL CONDITIONING STAGE 1-4 wks**
  - **IMPROVEMENT STAGE 5-24 wks**
  - **MAINTENANCE STAGE 24+ wks**

Problems solving and adherence

- Too tired!
- Too much pain!
- Too far?
- Too expensive?

- Cardiac rehab. is a kind of **INVESTMENT** for your good health and quality of life.
- What do you want to do with yourself between just sit and then become disability or get up and get your life back.
- The magic is in your own hands.
- **Don’t think! Just do it!**



DEATH AND DYING

- Death is a finite moment known only to god.
- Dying is a process that everyone does differently and uniquely.
- Death is a victory : A gift from Jesus on the cross.


The End