WEIGHT TRAINING STUDY GUIDE

BENEFITS OF REGULAR EXERCISE
Improve appearance, improved alertness, improved performance, increased efficiency of the heart and lungs, increased muscular strength and endurance, improved ability to handle stress, possible delay in aging process, maintenance of proper body weight, improved confidence and self-esteem, fewer sleep problems, improved quality of life by minimizing the risk of disease and disability, better posture, greater efficiency in performing motor tasks and sport skills, establishment of fitness as a lifetime interest, stronger heart muscle, lower heart rate, lower blood pressure, reduce body fat, possible resistance to atherosclerosis, improved circulation, increased oxygen carrying capacity of the blood, greater work efficiency, less chance of osteoporosis, reduced risk of certain cancers, relief depression.

FITNESS COMPONENTS
1. cardiorespiratory endurance
2. muscular strength
3. muscular endurance
4. flexibility
5. body composition

CARDIORESPIRATORY ENDURANCE
Cardio = heart and respiratory = lungs. It is the ability of the heart, blood vessels, blood, and respiratory system to deliver oxygen to the entire body and remove waste. This component is often considered the most important, because the function of these 2 systems is vital to healthy living.

Terms:
AEROBIC – Means with oxygen. These are whole body activities involving large-muscle groups that are continuous and last for an extended period of time. Fat is the source of fuel for endurance activities.
ANAEROBIC – Means without oxygen. Activity is performed at intensity so great that the body’s demand for oxygen exceeds its ability to supply it. These are things like interval bursts of activity. Carbohydrates or glucose is the primary energy source. *The higher the intensity the more calories burned. You should do as much or as little cardio as it takes for you to reach your goal.
*With interval training, alternate high interval periods for 30-120 seconds with 30-120 second periods of lower intensity (recovery). In interval training your metabolic rate stays elevated longer after the workout is over, than steady cardio, hence you burn more calories all day long.

ANEROBIC THRESHOLD – That percent above 85% of maximum where the energy source switches over from fat to carbohydrate. You become breathless, your jaw drops and you can only have a 1-2 word conversation.

CALCULATING HEART RATE
Formula: 220-age= maximum heart rate (MHR) find 60% of the MHR and 80% of MHR
MAXIMUM HEART RATE- Working at 100% (220-age)
RESTING HEART RATE- (RHR) Check this in the morning before getting out of bed. Count the pulse for 1 minute.
TARGET HEART RATE ZONE- This is the zone between the 60-80% of the MHR.
WORKING HEART RATE- (WHR) This is the actual number of times the heart beats per minute during exercise.

MUSCULAR STRENGTH
It is the ability of a muscle group to exert maximum force against a given resistance. Lift more weight and do less reps. There are 3 types of muscle contractions:
Concentric- A contraction where the muscle shortens. Example: when a dumbbell is lifted from an extended position to a flexed one. Eccentric- A contraction where the muscle lengthens. Example: when a dumbbell is lowered from the flexed position to the extended one. Isometric- A contraction where the muscle stays the same length. No observable movement. Example: If the dumbbell is held half way between full flexion and full extension the muscles are exerting force but there is no observable movement.

Terms:
PRIME MOVER/AGONIST- The muscle that contracts concentrically.
ANTAGONIST- Muscles that produce the opposite action. Example: In a bicep curl the bicep is the prime mover and the triceps is the antagonist, during the flexing. During the lowering phase the triceps is the prime mover and the bicep is the antagonist.
FLEXION- A decrease in the angle of a joint.
EXTENSION- An increase in the angle of a joint.
PROGRESSIVE RESISTANCE EXERCISE (PRE)- This is the most effective type of strength training. It is a practical application of the overload principle. Gradually increase the resistance as strength is gained.
ATROPHY - A decrease in muscle size.
FREE WEIGHTS - barbell, dumbbells
HYPERTROPHY - An increase in muscle size.
REPETITION (reps) - The number of times an exercise is done.
SET - A specific number of repetitions.
WEIGHT LIFTING - A sport in which the participant attempts to lift maximum weight in 1 single effort.
WEIGHT TRAINING - Performed with a series of at least 3-4 consecutive repetitions.

THREE TYPES OF STRENGTH TRAINING EXERCISES
Isometric exercises - There is no movement (static). The force is exerted against an immovable object. Example: pressing against a held ball.
Isotonic exercises - Muscle shortening and muscle lengthening against a constant resistance. These are most commonly used.
Isokinetic exercises - These are the best, but it is impossible to perform without special machines. These devices keep the speed constant and vary the resistance through the full ROM.

Terms:
RANGE OF MOTION (ROM) - From full flexion to full extension.
POWER - The speed at which muscular force can be generated.

ADVANTAGES OF STRENGTH TRAINING
-increased bone mineralization may help prevent osteoporosis
-strengthened abdominals, back, and leg muscles may facilitate proper posture, prevent low back problems and muscle imbalances
-the development of muscle mass increases energy requirements
-improved muscle tone enhances appearance, self-esteem, and body image
-more muscle...burn more calories

MUSCULAR ENDURANCE
Muscular endurance is the ability to contract repeatedly over a period of time. Higher reps, less weight. Weight should be slightly greater than 50% of max. Benefits of endurance workouts: increased high-density lipoprotein cholesterol (HDL=good cholesterol) with a decline in low-density lipoprotein cholesterol (LDL=bad cholesterol)

STRENGTH AND ENDURANCE TRAINING GUIDELINES AND SAFETY PRECAUTIONS
-Each workout should be properly supervised.
-Proper posture and technique should be used.
-Use it or lose it. If a muscle is not used you will lose size.
-Warm-up and stretch thoroughly before training begins.
-Do not hold your breath. Exhale as you raise or push the weight away and inhale as you lower it.
-Raise and lower the weight or body part through a full ROM smoothly and slowly.
-Avoid locking the joints.
-Small muscles fatigue quickly. Begin the workout with the larger muscle groups (legs, back, chest), and then go to smaller ones (shoulders, arms).
-Cool down and stretch after lifting.
-Begin with a weight that can be lifted at least 8 times. Gradually add one repetition at a time until 10 are achieved for strength training.
-Always work the antagonist muscle.

**ANTAGONIST MUSCLES**

<table>
<thead>
<tr>
<th>Strong</th>
<th>Weak</th>
</tr>
</thead>
<tbody>
<tr>
<td>biceps</td>
<td>triceps</td>
</tr>
<tr>
<td>quadriceps</td>
<td>hamstrings</td>
</tr>
<tr>
<td>erector spinae</td>
<td>abdominals</td>
</tr>
<tr>
<td>pectorals</td>
<td>rhomboids/trapezius</td>
</tr>
<tr>
<td>adductors</td>
<td>abductors</td>
</tr>
<tr>
<td>gastrocnemius</td>
<td>tibialis anterior</td>
</tr>
<tr>
<td>deltoids</td>
<td>lats</td>
</tr>
</tbody>
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**Terms:**
Reciprocal Innervation- Muscles operate in pairs so that when one set is contracting, the opposing muscles are relaxing.

**FLEXILITY**

Flexibility is the range of motion in a joint and its surrounding muscles. Flexibility is a measure of the ROM at a joint or group of joints. The degree of flexibility varies and is specific to each joint in the body. It is limited by bone and cartilage shape in the joint and length of the muscles, tendons, and ligaments that cross the joint. By performing regular flexibility exercises there is greater chance for improved posture, and overall efficiency at daily activity, and less chance for low back, muscle, and joint pain and injury.

**Terms:**
**STRETCH REFLEX**- The muscles respond to a sudden, unexpected increase in its length. The stretch reflex is a basic operation of the nervous system that helps maintain muscle tone and prevent injury. Stretching a muscle lengthens both the muscle fibers and the muscle spindles, and this change in the shape of the muscle spindles results in firing of the stretch reflex. The muscle that is being stretched contracts to minimize the increase in its length.

**4 METHODS OF STRETCHING**

**BALLASTIC**- This is a bouncing or pulsing movement. This is not recommended except for those trained athletes that perform ballistic type movements.

**STATIC**- This involves stretching the muscle to a point of mild tension and holding for 5 seconds or longer. This is the safest method of stretching.

**DEVELOPMENTAL**- To stretch the muscle to the point of tension and hold and then stretch farther.

**PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION (PNF)** – 2 types: Contract-Relax (CR) technique. A stretching where the muscle is contracted, then
relaxed. Contract-Relax-Agonist-Contract (CRAC) technique. Using this method there is more discomfort and perceived pain.

**Benefits of Stretching:**
- can increase an athlete’s mental and physical relaxation
- can promote development of body awareness
- can reduce risk of joint sprain or muscle strain
- can reduce muscle soreness
- can reduce muscle tension
- can reduce the severity of painful menstruation for female athletes

**STRETCHING GUIDELINES**
- always warm up
- use developmental stretching
- stretch the entire body
- avoid locking the joints to prevent tearing ligaments and connective tissue
- avoid stretches that require a bouncing motion unless required in physical activity
- do not stretch injured or swollen joints
- stretch regularly to achieve flexibility

**BODY COMPOSITION**

Body composition is the amount of fat cells compared to lean cells in the body. Heredity, eating habits, and the level of physical activity determine a person’s percent of body fat.

**Terms:**
FAT- An important energy source; stored for future use when excess calories are ingested; 9 calories/gram. A certain amount of body fat is essential for good health, but an extremely high or low amount of body fat contributes to health problems.

LEAN BODY WEIGHT- The weight of the body minus the fat. (muscles, bones, ligaments, and tendons). Lean muscle weighs more than the same amount of fat tissue, so don’t confuse actual body weight with body composition.

**THREE BODY TYPES**

**ECTOMORPH**- Strong bone structure slender body characteristics. Tend to be tall and skinny with small joints and a small waist. They have overly efficient metabolisms. They have a difficult time gaining muscle.

**MESOMORPH**- Naturally lean and muscular with small waist, broad shoulders, medium-sized joints and large, round muscle bellies. Natural born athletes. Gaining strength and muscle is easy, so is controlling fat. Respond quickly to any type of training.

**ENDOMORPH**- Large body structure; higher percentage of body fat. Slow metabolism, store fat easily, usually large boned, large joints, large frame, short, tapering arms and legs, wide hips and waist. Often have slow thyroid or other hormone imbalance. Fairly good strength levels. A lot of cardio is necessary to lose weight and body fat.
WARM- UP AND COOL DOWN

_Always warm-up._ Perform gentle activity that uses the large muscles of the body. This type of movement increases respiration, heart rate, and the internal temperature which improves blood and oxygen flow to the working muscles. **Benefits of a warm-up:** increase in body and tissue temperature, increase blood flow, increase in heart rate, increase in the rate of energy release in the body (metabolic rate), decrease in muscular tension, increased muscle elasticity, increased flexibility of tendon and ligaments, improved muscle contraction and relaxation, faster transmission of nerve impulse to muscles, and to mentally prepare the body for exercise. The second necessary part of the warm-up is to do the first set at a lower weight before you start with your real weight.

_Always cool-down._ This is just as important as the warm-up. Once intense activity has stopped, blood may pool in the lower extremities resulting in dizziness. Irregular heartbeats most often occur after the cessation of vigorous activity. Continue to move around so that you force the blood to the heart and remove the waste products. Stretching is thought to be both safer and more productive during cool down.

NUTRITION: THE FOOD PYRAMID

The requirements of good nutrition include eating adequate amounts of protein, carbohydrates, fat, vitamins, minerals and water. No single nutrient or food can provide all that is required for the body to function efficiently. Protein, carbohydrates and fat provide energy. Vitamins, minerals, and water are essential for body function, but do not provide energy. Imagine a pie divided into 6 sections. Fill up 3 sections with carbohydrates, 2 sections with lean protein and 1 section with fat.

- Bread, cereal, rice, and pasta 6-11 servings
- Vegetable 3-5 servings
- Milk, yogurt and cheese 2-3 servings
- Meat, poultry, fish, dry beans, eggs, and nuts 2-3 servings
- Fats, oils, sweets use sparingly

It is better to eat 5-6 small meals every 3-4 hours to increase your metabolism.

EXERCISE TRAINING PRINCIPLES (5 FACTORS)

OVERLOAD

In order for a muscle to get stronger, it must be stressed (overloaded) beyond normal use. This principle applies to the first 4 fitness components. By increasing the FIT principles, the muscles will strengthen in a gradual manner with less chance for muscle soreness or injury.

F- **Frequency** – how **often** you exercise
I- **Intensity** - how **hard or strenuous** you should exercise
T- **Time**- how **long** you should exercise

PROGRESSION

The amount of overload should be applied gradually to prevent muscle soreness and possible injury.
REGULARITY
Exercise must be performed regularly to be effective. Use it or loss it.

SPECIFICITY
Training must be specific to the desired outcome. Example: by performing hamstring stretches the hamstrings will become more flexible.

INDIVIDUAL DIFFERENCES
Each one of us is unique and should be encouraged to progress at your own rate.

TREATMENT OF INJURIES
R = Rest
I = Ice
C = Compression
E = Elevation

WEIGHT TRAINING GUIDELINES AND PRINCIPLES
-it increases your lean body mass, which speeds up your metabolism so you burn more calories at rest
-if you stop lifting your muscles will shrink (atrophy)
    -if you perform weight training through full range of motion you will increase your flexibility

-you should not lift for more than one hour, as it becomes counterproductive
-it is best to split your lifting and cardio workout, but if you can’t lift first
-train hard then rest, as your muscles grow during the resting phase, not the working phase
-don’t work the same muscle on consecutive days
-work each muscle group two times per week
-do three sets for beginners (this does not include the warm up set)
-do 8-12 reps (rep is a single execution of one exercise) for strength training
-increase weight when you can do 12 and decrease the weight if your can’t do 8
-rest between sets (longer for large muscle groups)
-work to muscle failure, which means you cannot do any more reps in good form
-far better to use a weight that allows you to perform the movement correctly than to cheat with a heavy weight that will eventually result in an injury
-take about 2 seconds to lift and the same to lower
-lift through full range of motion (full flexion to full extension)
-exhale when you lift and inhale when you lower the weight
The Muscular System: The body has both fast and slow-twitch muscle fiber types. Slow-twitch are capable of producing submaximal force over extended periods. They are used in aerobic or endurance activities. Slow-twitch fibers are responsible for the stabilization and posture the athlete needs when performing any movement. Fast-twitch fibers are capable of producing maximal force for brief periods. They are used in anaerobic activities where power and speed are characteristics. Fast-twitch fibers give the athlete the ability to move quickly and explosively.

Training Muscle Fibers: While you cannot change the muscle fiber type, the athlete can train a fast-twitch fiber to behave like a slow-twitch fiber and vice versa. This is called motor learning. The muscular system works like a computer system in that whatever an athlete puts into it is what the athlete gets out of it. If an athlete only teaches the muscles to complete the task slowly, that’s what the athlete will get back. If an athlete needs to compete at higher speeds they need to train the muscles to function optimally at these higher speeds. Training at lower speeds will not be effective for developing power. Example: A tennis player would not make a six-mile run a regular part of their workout; it serves little purpose in a sport with such a large anaerobic demand.

FUNCTIONAL TRAINING

Functional training is more accurately represented as sports-general training. It is training with a purpose. How many sports are played sitting down? Not many, hence training muscles in a seated position is not functional for most sports. Second, how many sports are played in a rigid environment where stability is provided by outside sources? None. Most sports are contested on fields or courts. The athlete provides the stability, not some outside source. Reasoning again tells us that most machine-based training systems are not by definition functional, because the load is stabilized for the lifter by the machine. Although machine-based training may result in fewer injuries in training, the lack of proprioceptive input (internal sensory feedback about position and movement) and the lack of stabilization, will more than likely lead to a greater number of injuries during competition. How many sport skills are performed by one joint acting in isolation? Again, the answer is zero. Functional training attempts to focus on multi-joint movements as much as possible. In it’s simplest form, functional training teaches athletes how to handle their own body weight. It incorporates balance and proprioception (body awareness) into training. Functional training programs need to introduce controlled amounts of instability so that the athlete must react in order to regain their own stability. It is a system that encourages the training of balance and the balancing of training. It is best described as a continuum of exercises that teach athletes to handle their own body weight in all planes of movements. Functional training trains movement, not muscles.

The Functional Continuum: You must always combine some basic strength exercises that are less functional with exercises that are higher on the functional continuum. The program is never an either/or program, but rather an integrated approach of developing strength and making that strength more relevant to sport.
UNDERSTANDING THE POWER TRAINING WORKOUTS

In power training, you will want to train multi-joint exercises as much as possible. Examples will be shown for a full body sequence and a push pull sequence. You will note that you should train a bilateral exercise one day and a unilateral one the next workout. It is important to regularly change exercises, not only to fight boredom and plateaus, but also to improve muscle balance and strength. Don’t get stuck in a particular routine.

TEMPO TRAINING

Tempo training is deliberately controlling the cadence of each phase of a strength training exercise. Lifting at different speeds will give your muscles different kinds of strength.

4 phases of strength training:
1. eccentric phase – lowering the weight
2. isometric phase – pause in the stretched (down) position
3. concentric phase – lifting the weight
4. 2nd isometric phase – pause in the contracted (up) position

Slow Tempo: All portions of the lift are done under control. This is best used for: injury recovery and rehabilitation, and single-joint exercises.

Normal Tempo: The eccentric phase and the pause at the bottom of the lift should take about 2 seconds. The concentric phase should be as quick as possible. This is best used for: muscle growth and absolute strength, fat loss, and sports performance.

Fast Tempo: Fast tempo lifts exploit the stretch-shortening cycle, allowing you to lift maximal weight while developing real world and sports specific explosive strength. The eccentric phase is rapid and controlled (1-2 seconds) with no pause at the bottom. The concentric phase should be as fast as possible with a pause at the top of the lift only if needed. This is best used for: sports performance and injury prevention.

Sources:
