

Basic rules for the Rec Center

1. Always bring your MU id and present it at the front desk
2. Wear proper attire for working out. No jeans, open toed shoes, etc.
3. Be sure to re-rack your weights after use
4. Must wipe down equipment after use.
5. Maximum of 30 min on all cardio equipment.
6. Only water is allowed in the rec center and only in a no spill container.
7. Respect staff fully and listen to any advice they may have.
8. Be sure to check out all equipment behind the desk before use. If no one is present at the desk be sure and wait for someone to come and assist you. NEVER EVER, GO BEHIND THE DESK!

Muscle Physiology

Muscles are made up of two fibers, Type 1 and Type 2 muscle fibers. Everyone has both types of muscle fibers and depending on the individual he or she may have more of one than the other. Muscles are made up of contractile proteins called actin and myosin which help give the muscle size and contractility. Actin and myosin connect, and with the help of adenosine triphosphate, (ATP) contract the muscle, allowing movement. Muscle fiber types have been shown to be caused mainly by heredity, but studies show that many people can alter this depending on the kind of training he or she may do.

Type 1 Muscle Fibers The slow muscles are more efficient at using oxygen to generate more fuel (known as ATP) for continuous, extended muscle contractions over a long time. They fire more slowly than fast twitch fibers and can go for a long time before they fatigue. Therefore, slow twitch fibers are great at helping athletes run marathons and bicycle for hours.

Type 2 Muscle Fibers Because fast twitch fibers use anaerobic metabolism to create fuel, they are much better at generating short bursts of strength or speed than slow muscles. However, they fatigue more quickly. Fast twitch fibers generally produce the same amount of force per contraction as slow muscles, but they get their name because they are able to fire more rapidly. Having more fast twitch fibers can be an asset to a sprinter since she needs to quickly generate a lot of force.

Intensity- The amount of weight lifted or the effort expended

Frequency- The number of times per week you perform physical activity.

Duration- Duration of time the activity lasts.

Training Guidelines

No matter if you're a beginner or have been lifting weights for years, many things go into lifting weights. For instance, you should never just go in without a set plan, especially the beginners. You should be familiar with some basic exercises and know not to over work yourself. **DO NOT** rush to jump into any type of program. Take your time and go at your own pace. For example, the pro bodybuilder may go in the gym 5-6 times a week for up to two hours at a time. A beginner will only go 2-3 times per week for only an hr a day.

Sessions and times per week

Beginner	2-3 times per week	Duration 1 hr
Intermediate	3-4 times per week	Duration 1hr-1:15
Advanced	4-6 times per week	Duration 1hr-2hr

Overtraining

Is a physical, behavioral and emotional condition that occurs when the volume and intensity of an individual's exercise exceeds their recovery capacity. They cease making progress, and can even begin to lose strength and fitness. Overtraining is a common problem in weight training, but it can also be experienced by runners and other athletes.

Causes of Overtraining

Improvements in strength and fitness occur only during the rest period following hard training (see supercompensation). This process takes at least 12–24 hours to complete. If sufficient rest is not available then complete regeneration cannot occur. If this imbalance between excess training and inadequate rest persists then the individual's performance will

eventually plateau and decline. Mild over training may require several days of rest or reduced activity to fully restore an athlete's fitness. If prompt attention is not given to the developing state, and an athlete continues to train and accumulate fatigue, the condition may come to persist for many weeks or even months.

Over training occurs more readily if the individual is simultaneously exposed to other physical and psychological stressors, such as jet lag, ongoing illness, overwork, menstruation, poor nutrition etc. It is a particular problem for bodybuilders and other dieters who engage in intense exercise while limiting their food intake.

Fluid Replacement

Intake of fluid should take place at least two hrs before a person trains. (at least 16oz of a cool beverage.)

During any type of activity, a person should rehydrate at least every 15min up to 6 to 8oz at a time.

After workout, participants should replenish fluids at a rate or exceeding 16oz (.5L) for every pound of body weight lost.

ACSM Guidelines

The following guidelines are reproduced from the **American College of Sports Medicine (ACSM)**, a governing body that conducts research and establishes guidelines for exercise physiologists, rehab specialists, and personal trainers. This information is for healthy adults who wish to moderately increase their strength. This is not presented to contradict the other training regimes presented here. Instead, it is a supplement to the information provided and compliments a well designed training program.

- Perform a minimum of 8-10 separate exercises that train the major muscle groups.

A primary goal of the program should be to develop total body strength in a relatively time efficient manner. Programs lasting longer than 1 hour per sessions are associated with higher dropout rates.

- Perform a minimum of one set of 8 to 12 reps of each of these exercises to the

point of volitional fatigue.

- Perform these exercises 2-3 days per week, while more frequent training and additional sets or combinations of sets and reps elicit larger strength, the additional improvement is relatively small.
- Adhere as closely as possible to the specific techniques for performing a given exercise.
- Perform every exercise through a full range of motion.
- Perform both the lifting (concentric phase) and lowering (eccentric phase) portion of the resistance exercise in a controlled manner.
- Maintain a normal breathing pattern, since holding your breath can induce excessive increase in blood pressure.
- If possible, exercise with a training partner who can provide feedback, assistance, and motivation.

A final important consideration in designing a workout program is flexibility, the ability to move a joint through its full range of motion. There are three basic types of stretches; ballistic (dynamic), static, and proprioceptive neuromuscular facilitation (PNF).

Types of Stretching

Ballistic stretching increases flexibility through bouncing movements. This risk of injury is greater when you perform ballistic stretches and therefore should only be used for specific sports and under supervision.

Static stretching is the most widely recognized stretch, and during static stretching, a muscle is lengthened to the point of mild discomfort and this length is maintained for 10-30 seconds. Static stretching does not require a partner and is not associated with an increase risk of injury.

PNF is a type of stretching that makes use of the body's neurological reflex systems. Opposing muscles are alternately contracted and relaxed to facilitate stretching. PNF generally requires a trainer or knowledgeable partner and may cause more soreness than static stretching.

Warming up and stretching should precede your workout whether it is resistance

training or cardiovascular work. A warm-up period, before stretching, is recommended to increase body temperature and joint mobility making stretching more effective. The are the ACSM guidelines for static stretching.

- Frequency: At least 3 days per week
- Intensity: To a position of mild discomfort
- Duration: 10 to 30 sec. for each stretch.
- Repetitions: 3 to 5 for each stretch
- Type: Static, with a major emphasis on the lower back and thigh area

Models of Weight Training

There are 5 types of resistance training that will be covered in this class. They include:

1. Isometric, isotonic, and isokenetic weight training
2. High intensity weight training
3. Circuit training
4. DeLorme's program progression
5. Periodization

The three modes of exercise for developing muscles are **isometric, isotonic, and isokenetic**. During isometric exercises, you contract a muscle group without moving the joint to which the muscles are attached- for instance, pushing steadily against an immovable wall. Isometric exercises are beneficial to those with joint injury. Isotonic exercises, by contrast, contract a muscle through a range of motion- as you can do with movable weights. The virtue of isotonic exercises also consists of contracting a muscle through a range of movement. But isokenetic exercises, which are performed on machines, use equipment designed to apply maximum stress to the muscles through the whole range of movement.

Isotonic exercises use both free weights and machines. Free weights are barbells and

dumbbells- ordinarily used in pairs, one in each hand. The advantage of free weights is that they allow movement in any direction and so lend themselves to an enormous variety of exercise routines; and they can be relatively inexpensive.

High intensity weight training is said to overload the muscle to failure which has been shown to have greater strength gains than traditional types of weight training. A high intensity workout usually contains one to two set of ten to twelve reps. Each set uses a large weight load that cause the individual to experience muscle failure at either the tenth of twelve rep. Anywhere from five to eight exercises are performed, causing the workout session to be short. Since no Olympic lifts are used, the likelihood of injury in the weight room is lower.

Circuit training was designed as an all-purpose type of weight training program that is to be used for the development of strength, power, muscular endurance, speed, agility, flexibility, and cardiovascular endurance. The circuit training program is a very versatile program that makes it easy to adapt to an individual's intended goals.

Circuit training is a formal type of training in which one progresses around a series of stations, thus completing the circuit. There are usually six to ten stations per circuit and once one station is completed, the individual will continue on to the next station. The goal is complete the circuit as quickly as possible. Improvements are shown by decreasing the amount of time it takes to complete the circuit, being able to perform a higher amount of work at each station, or some combination of the two. This type of training also offers a number of different components of training, thus total fitness are emphasized. It provides an intense training regiment, can be done in a smaller area, and can take less time than a traditional workout.

The **DeLorme System** of weight training deal with the isometric strength training, which is usually accompanied by the use of weights and pulley systems. This system consists of three sets of ten reps, and when an individual starts to progress, more reps and sets can be added. This is progressive resistance and is most commonly used in today's fitness centers.

Periodization is the variation in training specificity, intensity, and volume organized into planned periods or cycles within an overall program. A periodized training year can be divided into smaller blocks of time, each with its own goals and priorities. This overall

schedule can include all aspects of an individual program, including general conditioning, possible sport specific training, and resistance training.

The manner in which the human body reacts to stress has been described by Canadian biologist and endocrinologist Hans Selye as the **General Adaptation Syndrome**, which is described as a three stage response to stress (alarm, resistance, and exhaustion)

Gender Differences and Weight Training

Researchers initially thought that women could not become as strong or as big as men because of the difference in hormonal levels between men and women, especially testosterone levels, which is 20 to 30 times greater in men. Although men experience a greater absolute change in muscle size because of their larger initial muscle mass there is a similar increase in muscle mass on a percentage basis between the genders. Men and women can achieve similar relative gains as a result of resistance training. Long term resistance training does show a large amount of muscle hypertrophy in women who train at an elite level. Females can train with weights at a below maximum level and increase their strength and muscular fitness without dramatically increasing muscle size. Some other important facts for females to consider and males to be aware of are issues related to the female athlete triad.

Components of the triad:

- **Amenorrhea-** By consensus, 3-6 consecutive missed menses is the requirement for diagnosis
- **Disordered Eating-** Food restriction, to bingeing and purging in order to lose weight or maintain a thin physique
- **Osteoporosis-** premature bone loss or inadequate bone formation leading to increased skeletal fragility, and low bone mass
- **Diagnosis-** Diagnosis can be difficult however, these few signs may alert physicians.
 - Fatigue
 - Anemia
 - Electrolyte Abnormalities
 - Depression

Nutrition and Body Needs

The USDA food guide pyramid is an excellent starting point to evaluate an individual's diet. As a general rule of thumb, if a diet provides the minimum number of servings from each group, it is more than adequate for vitamins and minerals. If an individual is unable to meet the requirements of the food pyramid, a multi vitamin can help provide vitamins and minerals needed in the diet.

The USDA suggests a dietary ratio of 50-35-15 being carbs, fats, and proteins.

Other groups recommend the same ratio but with proteins being 35% and fats only being 15%. Carbs help the body get the sugar it needs to run, protein helps build the muscles, and fats, good fats, can provide protection for the body.

The energy yield per gram is as follows : Carbohydrate - 4 kcal, Fats - 9 kcal and Protein - 4 kcal. (Note: 1 calorie=1 Kcal)

What does a 50 kg (110 lb.) person require in terms of carbohydrates, fats and protein ?

Let's say that their diet consists of 57% carbs, 30% fats, and 13% protein.

- Carbohydrates - 57% of 2410=1374 kcal - at 4 kcal per gram= $1374 \div 4=343$ grams
- Fats - 30% of 2410=723 kcal - at 9 kcal per gram= $723 \div 9=80$ grams
- Protein - 13% of 2410=313 kcal - at 4 kcal per gram= $313 \div 4=78$ grams

Our 50kg person requires: 343 grams of Carbohydrates, 80 grams of Fat and 78 grams of Protein

Muscle Soreness

Lactic acid is what causes the initial burning sensation and ultimately induces fatigue, but is NOT the cause of muscle soreness that one experiences after a workout. At the termination of exercise, the body quickly oxidizes the excess lactic acid in order to bring it down to resting levels. The soreness felt is from microscopic tears in the muscle tissue, inflammation, overstretching, muscle spasms, or physiological changes which cause the surrounding tissues to retain fluid.

After the body is exposed to exercise that it is not used to, muscle cells and fibers are damaged, which leads to inflammation, tenderness, and pain that can be felt for days

after exercise. This soreness that is felt the day after one lifts and can be felt for 3 or 4 days is called **delayed onset muscle soreness (DOMS)**.

Detraining

Detraining is the loss of adaptations gained through training. Studies that have been conducted on detraining indicate that strength gains can be lost over several weeks after resistance training has stopped. The rapid loss of strength can be attributed to the reversal of neuromuscular and hormonal adaptations gained while training. While it may take several weeks to lose muscular strength, cardiovascular detraining begins more rapidly.

Supplement use and Ergogenic Aids

Supplements and ergogenic aids have become a staple in weight lifting. It is a multi billion dollar business that has swept the world. High school athletes to pro and Olympic athletes have been known to take supplements and aids to help their performance. This section will only cover creatine and anabolic steroids. Anabolic-androgenic steroids are man-made substances related to male sex hormones. “Anabolic” refers to muscle-building, and “androgenic” refers to increased masculine characteristics. “Steroids” refers to the class of drugs. These drugs are available legally only by prescription, to treat conditions that occur when the body produces abnormally low amounts of testosterone, such as delayed puberty and some types of impotence. They are also prescribed to treat body wasting in patients with AIDS and other diseases that result in loss of lean muscle mass. Abuse of anabolic steroids, however, can lead to serious health problems, some irreversible.

Today, athletes and others abuse anabolic steroids to enhance performance and also to improve physical appearance. Anabolic steroids are taken orally or injected, typically in cycles of weeks or months (referred to as “cycling”), rather than continuously. Cycling involves taking multiple doses of steroids over a specific period of time, stopping for a period, and starting again. In addition, users often combine several different types of steroids to maximize their effectiveness while minimizing negative effects (referred to as “stacking”).

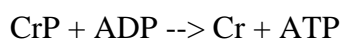
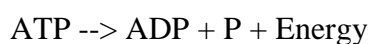
The major side effects from abusing anabolic steroids can include liver tumors and cancer, jaundice (yellowish pigmentation of skin, tissues, and body fluids), fluid retention, high blood pressure, increases in LDL (bad cholesterol), and decreases in HDL (good cholesterol). Other side effects include kidney tumors, severe acne, and trembling.

In addition, there are some gender-specific side effects:

- For men — shrinking of the testicles, reduced sperm count, infertility, baldness, development of breasts, increased risk for prostate cancer.
- For women — growth of facial hair, male-pattern baldness, changes in or cessation of the menstrual cycle, enlargement of the clitoris, deepened voice.
- For adolescents — growth halted prematurely through premature skeletal maturation and accelerated puberty changes. This means that adolescents risk remaining short for the remainder of their lives if they take anabolic steroids before the typical adolescent growth spurt.

This information was found at <http://www.nida.nih.gov/Infofacts/Steroids.html>

Creatine is a naturally occurring substance in the foods we eat and even in our bodies. We can synthesize creatine in the liver, pancreas, and kidneys from the amino acids Arginine, Glycine and Methionine. It can also be found in meat type foods such as steak, fish, pork, tuna, etc. However, the amount of creatine we get from foods is minimal compared to the amount needed to get the maximum beneficial effect. To get roughly 20 grams of creatine (the general dosage amount for the loading phase), one would have to consume roughly 16-18 steaks. Because of this, it is much more convenient to simply consume creatine as a supplement, otherwise one would have to eat a lot of meat products. The energy released from the reduction reaction of ATP (Adenosine Triphosphate) to ADP (Adenosine Diphosphate) fuels everything your muscles, as well as almost anything else in your body, do. Creatine is stored in the form of Creatine Phosphate in the body. When ATP loses one of its phosphates in the reaction to create energy, creatine donates its phosphate to regenerate ATP so that it can break apart again to provide the muscles with energy.



The creatine phosphate system is anaerobic, meaning that it does not require oxygen to

run and is the first system called upon when ATP needs to be regenerated. Therefore, supplementing extra creatine into the diet will allow the muscles to use this system longer.

This section can be found at www.creatine-facts.com

Protein is another substance that is widely used, but can also be found in many foods such as chicken, steak, hamburgers, tuna, as well as many other meats. Protein shakes can be used as meal supplements, when one doesn't have time to cook or is on the run, a protein shake can offer the same amount of protein needed for gains. Protein shakes won't make an individual lose weight, only a proper diet and exercise can do that. Supplements can be taken to help performance, but they should be taken properly and not abused. The preferred way to gain improvements is with the proper diet, and not supplements. The proper diet will always benefit an individual rather than taking extra "help" The food pyramid that was presented earlier indicates the proper nutrition recommended daily.

Diet and exercise have been shown to make people happier and more productive, just don't burn yourself out. Go at your own pace and enjoy it. There are many professionals out there that are willing to help anyone get in shape and improve their lives. In the packet there are a couple workouts that are designed for beginners who are just trying to start, but you can alternate them to your specific goals and training status.

Muscles to know

