

MILLER STRENGTH AND CONDITIONING

ATHLETIC WEIGHTS (APC)

The Athletic Weight Training class is designed to provide an opportunity during the school day for athletes to participate in a structured strength and athletic enhancement program that will not interfere with after school activities, jobs or homework. In-season, it prevents extended practice time and allows for recovery before practice and games. The class is geared toward the student who shows an above average interest and ability in physical education through participation on an athletic team. In order to get the full benefit of the program, all athletes should enroll in the class both semesters every year.

Every athlete in every sport is on the same program. The justification for this philosophy includes the following:

1. All sports require a base of strength that includes all major muscle groups.
2. Most "sport specific" programs utilize a similar selection of lifts.
3. Lifts that are done too close to the movements involved in the technical skills of some sports can negatively effect the actual skill.
4. "Sport specificity" occurs during practice, conditioning, and athletic enhancement workouts.
5. Multiple sport athletes benefit when everyone is on the same page and is sent the same message.
6. The structure of the class and utilization of the equipment works best with a unified program.

At Warren Central, Pike, and Ben Davis we have seen a dramatic increase in the success of the athletic programs since the implementation of the advanced class. The athletes have shown an improvement in strength and athleticism. Additionally, the program has helped to prevent injuries, reduce the recovery time of those athletes that are injured, improve self-confidence, and prevent late-season staleness.

The lifting portion of the class succeeds because of the organizational structure that is used, and the basic strength principles that are followed. Listed below are some of the important components of the program:

Workout Cards: Workout cards are used for organizational and motivational purposes. From an organizational standpoint, the numbering system and the color-coding allow athletes to be assigned to starting stations where they can be sure that a machine is available. The cards also allow the athlete to know what weight has been used in the past, how many reps have been completed, and therefore, how much progress is being made. It is important that the athlete only write down the actual number of reps that have been completed on each set at every station.

Set/Rep. Scheme: The best means of continued progress is to periodically change the amount of weight being used and the number of reps. that are attempted. If an athlete stayed with the same number of sets and reps. for every workout, they would make some initial gains, but then reach a plateau. The terms that are frequently used to describe this practice are periodization and cycling. Every two weeks the number of reps. that are attempted on the major three lifts are changed. For the other lifts, changes occur every four weeks. For this process to work most effectively, each athlete must have the self-discipline to add weight once the targeted reps. have been reached on all three sets. Minimal or no progress will be made if the same amount of weight, and the same number of reps. are used in every workout.

Warm-up: If an athlete came into the weight room and started lifting right away, without warming up, he/she would not be able to lift as much weight, and would be more likely to get injured. The simulated jumping rope, push-ups, and air-squats, get blood flowing to the muscles and increase body temperature to ready the body for lifting.

Selection of Lifts: The lifts that are used in the class cover all of the major muscle groups of the body with a major emphasis on the use of free weights. Free weights include barbells, dumbbells, and curl bars, and require more supporting and stabilizing muscle groups than occur with the use of machines. Free weights also require more balance and neuromuscular coordination.

The three primary lifts that are tested and used in the class are the bench press, the squat, and the power clean. The bench press has historically been the lift that is used to measure upper body strength.

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The reasons for including the squat in the program are: 1. The squat develops the large muscle groups in the body's "power zone" composed of the lower back, hips, buttocks, and thighs. 2. The squat requires a great amount of neuromuscular efficiency, making for excellent transfer of power to other biomechanically similar movements or sports requiring a powerful thrust from the hips and thighs such as jumping for height or distance, all forms of running, throwing, and lifting and pushing with the lower body. 3. The use of the back squat will allow an athlete to maintain or gain hip ankle and hamstring flexibility which is necessary in so many athletic movements. 4. The squat leads to increased bone density together with a corresponding increase in ligament and tendon strength leading to greater joint stability.

The reasons for using the power clean in the program are: 1. The power clean compliments the other intermediate speed strength movements with an explosive or "quick" lift. 2. The power clean involves all of the major muscle groups and many of the minor supportive muscles. 3. The power clean requires an instantaneous sequential contraction and relaxation of many muscles which conditions the nervous system to perform in a manner most conducive to the development of speed.

Emphasis on Technique: The use of correct technique on all of the lifts is necessary in order to ensure that injuries do not occur, and that the targeted muscles are worked completely. Understanding the full range of motion for each lift will allow for the improvement of flexibility that occurs when strength training technique is performed correctly.

Time Clock: The programmable clock is an important means of teaching time management. The seven minute time blocks allow for one and a half to two minutes rest between each set. The rotation system used ensures that all lifts are being performed and that a machine is available for each athlete at each station.

Partner System: Each athlete is assigned a partner. Partners are chosen based on previous max testing results. An attempt is made to find athletes that are fairly similar in strength in order to allow for less weight changes from set to set. The partner serves as a personal coach as well as being available when spotting is necessary for safety. A good spotter will watch for correct technique, motivate his partner to use the proper amount of weight, and help with assisted repetitions at the end of the third set.

Program Variables: In order for continued progress to be made, there needs to be some variety within a strength program. The use of a split routine (where two days per week are devoted to upper body lifting, and two days per week are devoted to lower body lifting), the change in the reps. used, the amount of weight used, and the lifting order help accomplish this principle. One of the main reasons our summer routine changes to a three day total body routine is to provide variety within the year round program.

Testing: The set rep scheme is cycled in a way that allows for testing every nine weeks. If an athlete does not follow the program, and is constantly doing one rep max tests on their own, they will not progress at the same rate as those who adhere to the routine. Between testing sessions, set/rep charts should be used to evaluate progress. There are many different factors that determine each athletes strength potential. Everyone is born with a certain percentage of muscle fibers that are best suited for strength or power activities, and a certain number that are suited for endurance activities, so an individuals genetic make-up will help determine the rate of improvement. Even such factors as arm, leg and torso length can have an influence on strength tests. Physical maturity occurs at different ages from person to person, and is another contributing factor in strength gains. If an athlete has not been getting enough sleep, not been eating correctly, or is facing other stresses in his/her life, the testing results will be affected. Mental factors such as a belief in one's self and one's ability also come into play during testing. However, even with all of those factors to consider, everyone should show improvement each nine weeks. The average sophomore improves 20-25% on each lift from the first nine weeks to the last nine weeks. The average junior and senior improve 10-15% in that same time. The range of improvement is greater for those who follow the program and work hard on a consistent basis. The vertical jump and forty-yard dash test are done in addition to the strength testing to measure speed and lower body power improvement. These tests are influenced by the strength work, and the athletic enhancement routine on Wednesdays.

Injured Athletes: The athletic trainers at Noblesville should be aware of any injuries that occur. With every injured athlete there is an attempt to find a substitute lift for any lift that is not possible due to the injury. As soon as the injury has healed, the athlete should get back on the regular routine.

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Athletic Enhancement Workout: The Wednesday workout is designed to improve the general athleticism of an athlete as well as aid in the prevention of injury. The plyometric jumps help develop explosive power in the lower body, which will improve first step quickness, running speed, and jumping ability. The medicine ball passing is designed to improve upper body power, hand-eye coordination, as well as forearm/wrist/grip strength. The footwork ladders are used to improve agility, balance, coordination, and foot speed.

Functional Movement Screen

7 step test that identifies and scores an athlete's imbalances and asymmetries. Once these imbalances are identified the athlete is given corrective exercises to perform.

1. DEEP SQUAT
2. HURDLE STEP
3. IN-LINE LUNGE
4. SHOULDER MOBILITY
5. ACTIVE STRAIGHT LEG RAISE
6. TRUNK STABILITY PUSH-UP
7. ROTARY STABILITY

Strength Training Issues

1. Lifting on Days of Competition

In order to continue to develop throughout the competitive season, it is necessary to continue to lift on the days of contests. Athletes who take days off tend to lose many of the benefits of the strength program as the season progresses (especially come tournament time) and put themselves at risk of injury. The five station lifting program requires approximately seven and a half minutes of work per day. Any athlete who has been a part of a lifting routine, and who is a part of an athletic team should be able to compete without any detrimental fatigue. Athletes participate in practice sessions that sometimes last even longer than the competitive events on a daily basis, yet are not negatively affected by the lifting workout that occurs earlier in the day. The most important factor is the mind set that the athlete takes. If an athlete understands the rationale for continuing the lifting program, and tells himself how much stronger he feels by staying on his normal routine then he can perform at a very high level. If the self-talk is negative, then the performance will suffer.

2. Female Issues

“Any fear that women may have regarding bulking up through resistance training is basically unfounded since they possess testosterone hormonal levels 10 – 20 times less than men. Essentially, for women to bulk up to the level exhibited in some popular magazines requires the use of artificial anabolic steroids such as testosterone injections. Women do adapt to resistance training in similar patterns as men just not to the same magnitude.”

NSCA Performance Training Journal Vol. 1 Number 3

“A common misconception among female athletes is that weight training will cause them to become larger and heavier to their disadvantage. A substantial amount of data has demonstrated the inaccuracy of this belief. Each of the studies demonstrated a reduction in fat weight, and increase in lean weight, and either no change or only a slight increase in total body weight. All demonstrated significant increases in strength, and in most cases these changes were associated with no change or a decrease in lower body girths and only minimal increases in upper body limb girth.”

NSCA Journal Vol.11 Number 4 “Strength Training For Female Athletes – A Position Paper”

“In reality, women don't have the genetic potential to develop large muscles because, except in very rare instances, they don't have enough of the hormone testosterone, which is needed for the development of muscle bulk.”

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ACSM Health & Fitness Journal Jan./Feb. 2000

“Strength Training improves body composition by helping to reduce body fat while increasing lean weight. Consequently, women should strength train in the same way as men, using the same program design, exercises, intensities, and volumes relative to body size and level of strength.”

Strength & Conditioning Dec. 1998

“It is difficult for women to add excessive muscle mass. Resistance training programs typically result in a reduction of the amount of fat over the existing muscles along with a moderate increase in muscle size. The overall effect is that more muscle definition is observed.”

Penn State Sports Medicine Newsletter Vol. 3 No. 5

3. Strength Training and the Long Distance Runner

“The objective of strength training for the distance runner is the same as for any athlete: to strengthen the area that are necessary to improve performance and prevent injury. Somehow the mistaken notion has developed over the years that it is not necessary for the distance runner to strengthen the legs. Nothing could be further from the truth. The legs are the main propulsive mechanism in running. Therefore, a good multi-joint leg program will significantly help performance and prevent injury by better preparing the body for the forces incurred, particularly landing.”

Training & Conditioning October 2000

“Athletes who strength train appear to have a lower incidence of overuse injuries. These resistance-trained endurance athletes also seem better able to complete their events without dramatic decreases in speed as the event progresses.”

Strength and Conditioning Journal October 2000

“The results of this study suggest that implementing a vigorous strength training program in previously untrained (strength) female distance runners may yield positive results in running economy. Upper and lower body strength improvements are evident and expected in a program of this type. Also, this improved strength is not associated with significant changes in body composition. The improvement in running economy would be significant for a competitive distance runner. It could shave vital seconds off her time and it is these seconds that determine a runner’s placement in a race.”

Journal of Strength and Conditioning Research 1997 11(4)

“As an example of the benefits strength training can provide, recent studies have shown that as few as six weeks of proper weight training can significantly reduce or completely relieve kneecap pain or “runners knee.” It also reduces the recurrence of many other common injuries, including nagging hip and low back pain. By strengthening muscle, as well as bone and connective tissue, weight training not only helps to prevent injury but also helps to reduce the severity of injury when it does occur. In addition to injury prevention, weight training improves performance. Studies show that with as little as ten weeks of weight training, 10K times decrease by an average of a little over one minute. The research has also shown that running economy defined as the steady-state oxygen consumption for standardized running speed will be improved due to weight training. By improving running economy, a runner should be able to run faster over the same distance due to a decrease in oxygen consumption. Improved running economy could also increase a runner’s time to exhaustion.”

Running & Fit News Vol. 10 Number 6

4. Lifting Belts

Lifting belts have been a part of the strength training scene for some time. The purpose of the belt is to add support to the lumbar spine during heavy lifting. The main mechanism by which a belt supports the spine is the pressurization of the abdominal cavity. An increase in intra-abdominal pressure allows all of the contents within the abdominal cavity to share compressive loads on the spine. Wearing a weightlifting belt has been shown to increase intra-abdominal pressure by as much as 40%, which has been shown to reduce compressive forces acting on the spine by as much as 50%.

In the class, belts are only to be worn during the squat and the power clean. Wearing a belt during the other lifts would not allow the core musculature to develop, and if kept on and never loosened would

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elevate the blood pressure. There are a growing number of professionals within the strength training community that are questioning the ideal usage of lifting belts. Most would agree that during max attempts, during sub-maximal repetition ranges to failure, and during periods of back rehabilitation lifting belts are recommended. Research pertaining to the use of belts is still ongoing.

Misc. Issues

1. Dynamic Warm-up

For many years static stretching was used as a means of warming-up before exercise. The general consensus was that static stretching would reduce the likelihood of injuries, and allow for greater range of motion when performing athletic skills. However, there is no research evidence that stretching before exercise prevents injuries, and recent findings indicate that static stretching before exercise may decrease muscle strength, cause tiredness, decrease coordination, and actually increase the risk of injury. As a result, the trends have changed, and more and more coaches and fitness professionals are using dynamic flexibility routines as a means of warming up. Dynamic routines consist of taking the body through active movements similar to ones that are encountered in the physical activity to be performed. The following are statements and research done by experts in the field of strength, conditioning, and flexibility.

“Static stretches before warm-up or competition can actually cause tiredness and decrease coordination. In addition, static stretching improves static flexibility, while dynamic stretching improves dynamic flexibility; therefore, it is not logical to use static stretches to warm up for dynamic action.

The optimum time to develop flexibility is post-workout. Muscles are already warmed up; consequently the greatest gains can be made at this time. Post-workout flexibility training also has a regenerative effect, calming the athlete, restoring the muscles to their resting length, stimulating blood flow, and reducing spasm.”

Vern Gambetta

“The traditional inclusion of static stretching exercises in warm-up routines may be detrimental to performance.”

Study done at the University of Massachusetts- “Effects of Five Different Warm-up Routines on Power Performance and Range of Motion”

“Doing static stretches before a workout consisting of dynamic actions is counterproductive. Use dynamic stretches first and static stretching when the major part of the workout is completed and it is time for cool-down.”

Tom Kurz, a leading flexibility instructor challenging the generally accepted belief that static stretching should be employed after an initial warm-up routine.

“Incorporate stretching immediately after the main part of a workout and cool-down period because tissue temperatures are highest, making stretching both safer and more productive.”

Sapega, from Sport Stretch

The dynamic flexibility routine that is used at Warren Central goes from forward to lateral to backward movements, and includes the following:

1. High Knees
2. Glute Kicks
3. Forward Lunge Walk
4. Side Shuffle (both directions)
5. Carrioca (both directions)
6. Side Lunge (both directions)
7. “A” Skip
8. “B” Skip
9. “C” Skip
10. Walking March

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2. Nutritional Considerations

There has always been a search for the magic supplement, pill, diet, etc. that will allow an athlete to gain weight, lose weight, get stronger, look better, or play better. Many companies have taken advantage of the athlete looking for that “extra edge”. Most companies use a little bit of science, or research done by their company, to convince athletes of the need to use their product. Very few products hold up to actual scientific studies done by reputable researchers.

Losing Weight

There are many myths and misconceptions about weight loss. The weight loss industry makes a lot of money off of the general population’s lack of knowledge about weight reduction and their desire to lose weight quickly and easily. Many diet aids contain speed in the form of caffeine or certain herb products. Athletes need to make sure that they are attempting weight loss for the right reasons. Many female athletes have developed eating disorders due to the pressure from unrealistic body image issues. In order to lose weight, an athlete needs to make weight loss a priority, and have the self-discipline to do it the correct way. Listed below are some basic concepts that should be understood by an athlete that is attempting to lose weight.

1. In order to lose weight you must reduce the amount of calories (food) that you consume and/or increase the amount of calories that you burn (through exercise).
2. Weight loss that occurs strictly by reducing how much you eat (without exercise) is not as likely to stay off and is more likely to cause both fat and muscle to be lost.
3. A reduction in caloric intake by too much can slow down the resting metabolism, which will slow down the weight loss and again, will also make the likelihood of muscle loss to occur.
4. Skipping meals will cause a drop in the metabolism, a loss of energy, and increase the likelihood of binge eating.
5. Muscle weighs more than fat, so a change in body composition (loss of inches) can occur without a resultant change on a scale.
6. A pound of fat consists of 3500 calories. In order to lose two pounds per week, the caloric change (diet restrictions combined with exercise) has to be 1000 calories per day.
7. Any change on the scale of one pound or more per day is most likely the result of the water loss that occurs when a restrictive diet is started. The water loss is not an indication of an actual loss of body fat.
8. The most efficient way to exercise to lose weight is to combine both strength training and aerobic activities. (aerobic activities are those that are performed with a steady supply of oxygen – jogging, riding a bike, using a rowing machine or elliptical trainer, etc. anaerobic activities are those that are performed without the need for oxygen – jumping, short sprints, throwing, hitting etc.) The muscle that is developed through strength training will cause a rise in the metabolism and will result in more calories being burned in every day activities. Strength training will also help ensure that lean muscle will be maintained rather than lost. Aerobic activities are the most productive means of burning up calories.
9. Spot reducing is not possible. (as an example: people that want to lose the fat around their midsection cannot do a certain abdominal exercise that will get rid of the fat – once the muscles have been toned underneath the fat, the most efficient way to lose the fat is to do general aerobic activity)

Additional suggestions for weight loss:

- Don’t skip meals (as mentioned above, metabolism will slow down, energy will be lost, and binge eating is likely)
- Avoid drinking high calorie drinks (many people do not realize how many calories are in things like sport drinks, juices, milk, and soft drinks)
- Avoid eating late at night
- Avoid fast food, fried foods, and foods high in sugar
- When eating on the run, try to make healthy choices, or plan ahead and take healthy food with you)
- Learn proper portion sizing of food (moderation is important)

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Gaining Weight

Many of the concepts that are listed above for weight loss can be reversed for those trying to gain weight. More calories have to be consumed than are burned off. For many high school age athletes weight gain is very dependent on body type (which is influenced by genetics), maturity, having a typically high metabolism, and being very active. In order to gain good weight (muscle) there are some basic guidelines that should be followed.

-increase the volume (number of exercises, sets, reps) of lifting –include after school or evening workouts to your advanced weight training program.

-increase the amount of calories that are consumed throughout the day –eat snacks between meals and add an extra meal in the evening.

Pre-game Meal

Different sports require different energy systems, and as a result, the significance of the eating habits of athletes varies from sport to sport. However, there are some basic pre-game meal strategies that should be followed by all athletes.

-pre-game meals should be eaten 3-4 hours before the event (it takes 3-4 hours for food to be processed by the stomach)

-it takes fats and proteins longer to digest than carbohydrates, so a majority of the pre-game meal should consist of complex carbohydrates.

-avoid foods that are unfamiliar, or that are high in spices or difficult to digest

-eat moderate portions.

-drink plenty of liquid in the form of water or a sport beverage.

3. Terminology

Listed below are some terms that are commonly used when discussing strength training:

Flexion- decreasing the angle of the joint (ex. the upward movement of the bicep curl)

Extension- increasing the angle of the joint (ex. the downward push of the tricep push down)

Abduction- moving a body segment laterally away from the body (ex. upward phase of the lateral raise)

Adduction- lateral movement of a body segment toward the center line of the body (ex. hip adduction machine)

Concentric Contraction- shortening of the muscle; bringing bony attachments closer together as in the lifting phase of the arm curl.

Eccentric Contraction- lengthening of the muscle as in the lowering phase of the arm curl.

Hypertrophy- an increase in the cross-sectional size of the muscle fiber.

Atrophy- a decrease in the cross-sectional size of the muscle fiber.

3. Lifetime Health Benefits

The use of weights or other resistance devices should not be limited to athletes. Weight training should be an integral part of anyone's lifetime fitness plan. The use of resistance exercises should be combined with aerobic or cardiovascular work. Weight training has been shown to prevent much of the muscle atrophy that has long been associated with aging. Health groups are now coming to realize that the continued use of resistance exercises can change the quality of a person's life and the amount of activity that they can continue to participate in.