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Great gains or weight work

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WORTH THE WEIGHT!

BY LEN KRAVITZ, MA, AND
CRAIG J. CISAR, PHD

Now we're going to change the pace and do some calisthenics with weights, so grab a mat. Remember, if you're new in the class, use the lightest weights and watch closely when I demonstrate the moves. This first exercise will do great things for your thighs, so let's go."

Can you guess who's in this class? Not necessarily the very fit young participant stereotyped in advertising. Senior women and men, teenagers, beginning and advanced exercisers and people with a variety of injuries and physical situations attend classes that use resistance, whether rubber or elastic bands, free weights, weighted balls or surgical tubing.

There are sound reasons behind the remarkable growth in variable resistance exercise, otherwise known as weight training. When introduced correctly, resistance training is a welcome addition to dance-exercise programs because it can be very beneficial in developing the muscle, tendon and ligament strength needed to balance the body structurally and help reduce overuse injuries from too much aerobics.

Positive effects in performance, rehabilitation, injury prevention and increased levels of fitness have been well documented. Both strength and muscle endurance training have been shown to increase the thickness of the ventricular walls of the heart, which results in improved heart efficiency. Resistance training using 8 to 12 repetitions has been shown to increase capillarization and result in more favorable blood cholesterol levels.

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terol levels. Changes such as tighter muscles and aesthetically contoured figures add greatly to the looks of loyal participants.

For the instructor, perhaps the greatest challenge in dance-exercise toning sections is to find an alternative to performing so many repetitions of exercises. Adding resistance limits the number of repetitions while effectively helping clients attain their goals. For example, instead of performing 60 or more leg lifts, it is possible to perform only 30 repetitions with resistance—and get better results.

CORRECTLY USED, RESISTANCE TRAINING IS A VALUABLE COMPLEMENT TO AEROBIC WORKOUTS.

All these factors have influenced instructors to incorporate more resistance exercises in their classes. However, since many training methods are based on limited research, there seems to be some confusion about the most appropriate ways to attain strength and endurance goals. After reviewing the known neuromuscular processes and adaptations, this article will help teach you how to apply that knowledge in the classroom.

How Muscles Work

Each muscle is composed of thousands of fibers that are "recruited" for action by the nervous system. Muscle fibers are composed of protein filaments called actin and myosin. They exert force, such as causing a joint to flex, by contracting. The primary theory of muscle contraction is called the sliding filament theory. It states that one protein filament (actin) slides over a stationary protein filament (myosin), which shortens the muscle and results in a contraction. When the muscle fiber contracts, it contracts completely or not at all. This phenomenon is called the "all or none principle."

The contraction is initiated by the nervous system, which can best be imagined as a vast

system of highways carrying information from one body point to another. Messages from the central nervous system (CNS) are sent to the muscles by efferent or motor nerves. The motor nerve and muscle fibers it innervates (which causes them to contract) are called a motor unit.

The CNS can vary the amplitude (strength) and frequency of the neural impulses. Lower amplitude and less frequent neural impulses tend to recruit predominantly slow-twitch motor units. These are more prevalent in aerobic activities and do not fatigue easily. Stronger, more frequent neural impulses tend to recruit fast-twitch motor units that are more involved with anaerobic activities, such as weight training. They rapidly generate a large amount of muscle tension, but fatigue quickly. The decisions about the strength and frequency of neural impulses are made by the brain based on motivational drives and needs and sensory input from organs known as the muscle spindles and Golgi tendons. This feedback directs us to modify the tension in our muscles to pick up a lightweight pencil or a heavy chair.

Strength increases as the result of 2 factors. There is a gradual increase in the contractile elements in each muscle fiber that allows it to contract more powerfully. Also, there is a gradual recruitment of a higher proportion of the total available fibers in each contraction.

Muscle Adaptation

The increases in contractile elements and fiber recruitment occur as a result of proper application of the progressive overload principle. It states that strength, endurance and muscle size increase (within limits) in response to repetitive exercise against progressively increased resistance. The key to resistance training is to create tension (overload) in the muscle by matching or overcoming the resistance created by an object, such as a band or a weight.

Once a muscle has been trained and reaches a conditioning plateau, there are

Resistance Training Tips

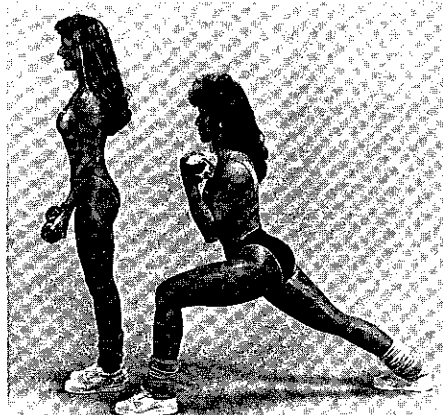
Models: Kathleen Geoghegan and Teri Wested



1. Perform isometric holds in the midrange of the movement.

Hold for 4 to 6 seconds (half the speed of an 8 count) in the midrange of the full movement. This will help fatigue the muscle where it is usually stronger and often not sufficiently challenged.

Example: Half squat



2. Combine exercises that help to challenge and work more muscle groups.

This is an excellent example of combining 2 exercises that complement one another. As you step back with one leg, you complete a biceps curl with both arms. The biceps curl brings your center of gravity slightly forward, allowing for more overload on the front thigh and no stress to the back leg. It is easy to keep the front knee from protruding forward, which happens frequently with step-forward lunges.

Example: Step-back lunge

Photography: Michael Carr



3. Change the movement patterns of the exercise.

The photo on the left shows the regular 2-arm row while the photo on the right shows the arms rotated upward with lifted elbows. By changing the movement pattern you successfully recruit more muscle fibers. **Example:** Standing row



4. Modify the body levers and vary the weights.

Change the overload of leg and arm exercises by performing the same exercise with straight and bent arms (or legs). When bending the arms, you will be able to use heavier weights. **Example:** Lateral raises

several ways to overload it if greater gains are desired:

1. Increase the number of repetitions per set.
2. Increase the amount of weight or resistance.
3. Increase the number of sets per exercise.
4. Decrease the recovery time between repetitions and/or sets.
5. Increase the number of exercises.
6. Increase the number of workouts per week.

Overload should be added in very small increments. As a rule of thumb there should be no more than a 5 to 10 percent increase.

For example, add one-half pound of weight or 3 to 5 repetitions.

How Much Resistance?

Because correct body placement and technique is critical, it is appropriate for all participants to begin with one- to 2-pound weights. Even the strongest students should start light to learn correct exercise execution. In addition, dance-exercise toning segments typically provide a lot of variation so very light weights will overload the muscles.

After correct technique is mastered, progressive overload can be safely recommended in one-half pound increments until the appropriate challenge is reached. By

watching students' performance levels and knowing their fitness goals, you can guide them in finding a safe and effective maximum weight. In Kravitz's coed classes, students use weight ranging between 2 and 12 pounds.

It is important to remember that these guidelines are for the slow-paced conditioning segment, *not* for the fast-paced aerobics portion of class.

Training Programs

There are 3 major categories to choose from when developing effective conditioning programs.

Muscle strength is defined as the ability to exert maximal force. The muscle will respond to strength training (heavy weight/low repetitions) by increasing the contractile elements (actin and myosin filaments), resulting in a greater potential of the muscle to exert force. The increase in contractile elements may be reflected in an increase in the size of the muscle itself. However, women should not be concerned about a significant increase in muscle size because they lack testosterone and their muscle is usually not as dense as men's.

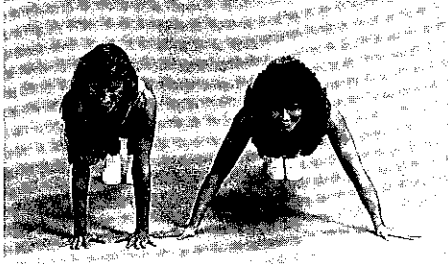
Training programs designed to improve strength use 3 to 5 sets of between 3 and 8 repetitions 3 days per week. A rest day separates workouts.

Muscle endurance is defined as the ability of a muscle to do repeated muscular contractions while resisting fatigue, and is independent of cardiorespiratory factors. The muscle will respond to endurance training (light weight/high repetitions) by increasing its capacity to produce energy anaerobically with minor increases in strength. The muscle cell increases the factors that enhance anaerobic metabolism, such as muscle glycogen (sugar) and anaerobic enzyme levels.

This is a great choice for classes in which weight control is a prime concern. The muscle endurance exercises will also supplement the aerobics program and improve the muscle tone of the major body parts exercised.

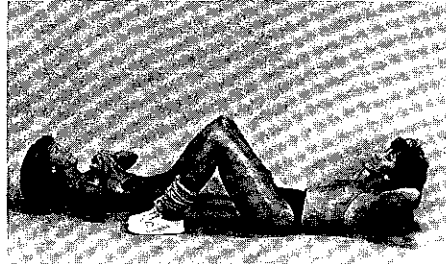
Muscle endurance programs generally involve 2 to 5 sets of 15 to 30 repetitions 3 times per week with a rest day in between.

A combination of *strength and endurance* training may be recommended for some individuals or classes. These programs usually involve 2 to 5 sets of 8 to 12 repetitions 3 times per week. This can result in substantial gains in muscle size if the exercises are performed close to maximal intensity while pushing to the point of fatigue with each set. This is why body builders are able to develop so much musculature.



5. Change the performing position of the exercise.

In this exercise, placing the hands wide apart recruits more pectoral muscles, while placing hands closer together recruits more triceps and deltoids. **Example:** Push-up



6. Vary the movement tempo of the exercise.

If you always stay at one movement tempo, the body quickly learns to become efficient and relies on fewer muscles to do the work. By changing the tempo and never going too fast the muscles will continually be challenged. **Example:** Crunch



7. Use weights and/or hand pressure to add overload.

This suggestion is primarily for outer and inner thigh work. Pressure on the thigh, whether from weights or a hand pressing against it, recruits many more muscle fibers. The closer to the knee you place the resistance, the more challenging the exercise becomes. As the exercise becomes easier, add more resistance. **Example:** Outer leg lift

Common Questions

What is the optimal speed for movements?

Performing repetitions half-time to music that is 140 to 150 beats per minute is a nice range. The slower movement will allow the muscle to activate more motor units. If the movements are too fast, the gains will not be as great since only primarily fast-twitch motor units will be recruited. (Research has demonstrated that the optimal speed of a muscle contraction for maximal strength is approximately one-fifth the speed of the fastest contraction time by that muscle group.)

Why does resistance feel so different through the range of motion?

The mechanical efficiency of the movement changes in relation to the way the bones line up with one another. As the angle changes, so does the efficiency. Also the contractile force of a muscle is greatest when the muscle is slightly stretched, but in

this position the angle of pull is not always as conducive to optimal force production. This is why you are more often stronger in the midrange of a movement pattern.

Some authors state that you only need to do one set, while others say you should perform several. Which is correct?

It is true that some authorities believe that if you overload the muscle fiber in one set, additional sets are useless. However, the human body does not change easily. Progressive overloading of muscle is needed to make necessary changes. One set will produce some positive effects in beginning resistance training, but additional sets will ultimately be needed in order to realize continued benefits.

Are there any specific ways to avoid injuries?

This should always be a major concern. One key word is control. Not allowing too

rapid acceleration or descent in the movement patterns is very important. Working with the correct amount of resistance is imperative to challenge the muscle without injuring the body. The final word is technique. Correct execution of exercises is always critical to avoid injuries.

When standing, make sure the back is well supported and straight. In any position, it should not be significantly arched, overly rounded or twisting. Buttocks should be no lower than the knees (for example, during a squat). Make sure knees are over the ankle and don't extend past the toes.

Older adults, those with high blood pressure and anyone whose profile suggests a coronary risk should be very careful not to grip a weight too tightly because of the potential to elevate blood pressure. It may not be appropriate for these students to use resistance. If there is any doubt, advise the participant to obtain a physician's permission before using weights.

How should the exercises be sequenced?

Generally, work the larger muscle groups, such as the legs and chest, before isolating the smaller muscle groups. This way the fatigue in the smaller groups will not affect the performance of the exercises that use heavier weights. Make sure opposing muscle groups are worked to keep strength balanced.

How tired should people feel after using weights?

For resistance training to work, it is necessary to somewhat fatigue the muscles. That's the challenge that makes them adapt with increased strength or endurance. However, participants should not feel exhausted, which is a sign of an excessive amount of weight. If there is no fatigue, participants can overload with weight or repetitions. ■

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Types of Contractions

Concentric Contraction. Often referred to as a positive contraction, a concentric contraction shortens the muscles through the range of motion. An example is the upward phase of a crunch.

Eccentric Contraction. An eccentric contraction, often called a negative contraction, lengthens the muscles through the range of motion. The downward phase of a crunch is an eccentric contraction.

Isotonic Contraction. This is the most familiar type of contraction, known as concentric, in which the muscle shortens while lifting a constant resistance. It is used with equipment that has a constant weight, such as free weights or rubber bands. Due to the mechanical advantage of different positions through the range of movement, the muscle varies tension through the range.

Isometric Contraction. The term isometric literally means same or constant length. A muscle develops tension, but there is no change in the length of the muscle. This is often called a static contraction.

Isokinetic Contraction. During an isokinetic contraction, an "accommodating" resistance changes to apply a constant amount of force to the muscle as it moves through the range of motion. This consistency is maintained by sophisticated stationary equipment, such as the Cybex machine frequently used by physical therapists. The machine provides resistance equal to the amount of force applied by the muscle group, and the contraction maintains a constant speed.