Cardiovascular Fitness

The ability to sustain prolonged activity that elevates the heart rate and benefits the heart and lungs is different for everyone. The previous statement is the definition of aerobic capacity, sometimes called cardio respiratory endurance. Ordinarily, the benefits of increased aerobic activity include decreased resting heart rate, decreased resting blood pressure, more efficient heart function, improved circulation, increased muscular endurance, increased bone density and mass, increased elasticity of the skin and decreased % of body fat with a parallel increase in lean tissue.

People with cardiovascular disease may not experience some of the responses described above because of the medication they take keeping blood pressure and cardiac functioning controlled. Impaired circulation as seen in people with diabetes may not improve as dramatically as in people without diabetes. Individuals with brittle bone disease (osteoogenesis imperfecta) may not be able to exercise vigorously using any high impact activity such as jogging to gain the health benefit of increased bone mass, due to the fragility of the bones under stress. Swimming or cycling, however, may be possibilities for use by these people. In all cases, a physician should be consulted regarding the intensity and frequency of exercise and the effects one can expect based on the condition.

The Surgeon General of the United States (1996) has reported that adults should exercise 20-30 minutes most days, but at least three days each week. The modification of that recommendation for children is 30-60 minutes in developmentally appropriate activity that is meaningful for the child (COPEC, 1998). Remember, all types of physical activity can be considered, so even if done in shorter sessions such as wheeling the wheelchair down to the corner for lunch, transferring from the wheelchair into the car and then playing 20 minutes of wheelchair basketball after work, there will be greater benefits gained than if these lifestyle behaviors were not developed at all.

When heart rate formulas are used to establish appropriate intensity of activity, modifications can be made. Individuals with high level spinal cord injuries should subtract 20-40 beats from 220 before subtracting age to adjust for the changes in the autonomic nervous system from the injury to the spine (Shephard, 1990). Persons with Down syndrome often do not reach their THR due to lack of motivation or understanding of the concepts involved. They may also be limited by lower cardiac output resulting from damaged heart valves. Individuals with prosthetics or progressive neuromuscular disorders such as multiple sclerosis may fatigue easily and thus may not reach the THR. They should be carefully monitored in order to avoid exhaustion. Persons with quadriplegia are unlikely to be able to sustain a maximal heart rate higher than 120-130 bpm because of impairment to the sympathetic nervous system. For these people, rating of perceived exertion (RPE) is the best indicator of intensity of the exercise (Rimmer, 1998). A method used frequently for people with disabilities is RPE-Rating of Perceived Exertion (Borg, 1982). Some people with disabilities and others, who cannot meet the heart rate level because of fatigue, have difficulty in monitoring HR or restrictions caused by cardiac medication, do better with RPE.
Muscular Strength

The term "muscular strength" is generally accepted to mean increased capacity to move weight and results from muscular development. Muscular development occurs as a result of using free weights, variable resistance equipment, isokinetics or isometrics. Athletes have been using strength development techniques for years to enhance sport performance. Only recently the summary of health benefits has been brought together through the Surgeon General's Report (1996). Health benefits such as increased physical function, increased independence in daily living activities and fewer medical complications have been documented for older adults and people with disabilities (Stone, 1988). Resistance training additionally contributes to increased heart muscle thickness, decreased resting heart rate, greater stroke volume (amount of blood pumped with each beat), more efficient heart muscle, increased circulation, increased muscle mass (lean body tissue), increased bone density and decreased body fat. Performance benefits include: slower heart rate during activity; increased coordination, accuracy, precision and balance; increased self-esteem; easier performance of activities of daily living (ADL); increased ease of propulsion; decrease or elimination of pressure sores; decreased injury from overuse; greater joint stability and decreased risks of cardiovascular disease.

There are some special considerations for resistance training by people with disabilities. Safety is, of course, a primary factor with anyone using weight training as a form of exercise. It is even more critical for individuals with disabilities who may have poor posture, limited range of motion in joints or problems with joint stability. All who lift weights using a barbell should use a spotter. People with problems of joint stability or managing the barbell should definitely use a spotter.

Muscle development should be balanced. Exercise both sides of the joint when using weights. People who use wheelchairs should develop the musculature that counter-balances the anterior muscles used for daily ambulation. Spasticity from cerebral palsy, stroke, a closed head injury or multiple sclerosis can also cause muscle imbalance. Stretch and strengthen the opposing muscles being careful not to increase abnormal muscle tone.

A person's coordination, control and strength should determine whether he or she should use machines or free weights. While machines move in only a predetermined path, they tend to be safer.

Free weights can provide a wider range of resistance, since they can be obtained in less than 1 pound up through hundreds, in many increments. They do, however, require balance and control of the weight, a good grip or special gloves to keep the weight in the hand and the availability of equipment in increments that are appropriate for any given person.
Free weights can also be used in different ways such as in gravity-reduced exercise training. This technique, described by Lockette & Keyes (1994), utilizes gravity to reduce the effects of gravity of the weight and exercising limb by doing the exercise in a position in which gravity aids the movement.

Another method used with individuals with very limited strength as in multiple sclerosis, is manual resistance. This method (often used in a rehabilitation setting) calls for another person to provide the resistance. It, of course, cannot be calibrated like free weights or a weight machine, but working with the same person all the time is beneficial in that they can tell when they are giving more resistance than previously. Positioning and strapping is also useful for stabilizing the trunk and extremities to assure an aligned, secure and stable position for performing exercises (Lockette & Keyes, 1994, p. 19). This technique is very useful for persons with amputations who lack the counter-balancing effect of the missing extremities. A wide strap (29+) should be used so as not to cut the skin. Any sign of skin sensitivity or breakdown should be monitored. Resistance training for individuals with cerebral palsy can be very useful when strengthening the muscles that oppose spasticity. Not only can it increase strength, but the abnormal muscle tone in the spastic muscles can be decreased achieving better balance between the two muscle groups.

Research has shown that for some neuromuscular conditions such as muscular dystrophy, strength training can be beneficial in maintaining strength and cardio respiratory function if: 1) the degree of weakness is not severe, 2) the rate or progression of the disease is relatively slow, 3) consideration is given to the individual's total daily activity demands and 4) the rate of increasing the intensity of the exercise is slow and supervised (Lockette & Keyes, 1994). Strength training should be approached very cautiously and only after medical consultation for individuals who have conditions that directly affect the muscle. Such conditions are muscular dystrophy, neurological conditions such as multiple sclerosis, polio or other progressive, degenerative diseases that result in gradual loss of muscle mass.

The development of muscular strength is considerably important for individuals who use wheelchairs or other assistive devices. Miller and others (1984) reported that circumventing architectural barriers requires up to 15 times the energy expenditure for persons with disabilities when compared with persons without disabilities. People with mental retardation usually have very poor muscle tone and muscular strength. Furthermore, the work environment for many people with mental retardation is likely to demand greater physical exertion requiring muscular strength.
Flexibility

The ability to move a body part around a joint is one of the most critical elements in keeping people moving independently. As implied earlier, one of the main benefits of flexibility is improved movement proficiency. In addition, flexibility means increased range of motion, reduced muscle soreness, improved posture, reduced musculoskeletal injuries, increased relaxation, reduced neuromuscular tension and controlled spasticity. Being able to tie one's own shoes, reach a plate on a shelf overhead or bend down to pick up a dropped spoon means so much to the independence of every one of us.

Exercising for flexibility is an imperative component of any exercise program, especially for those whose disabilities are severe. Joints that do not move, including those in the spine, eventually become rigid and inflexible and the quality of life diminishes measurably.

Stretching and bending exercises are ones that can be done several times a day and should be if one is sedentary. Flexibility exercises should be done at the beginning and ending of any exercise period. The length of the stretch determines the intensity of flexibility exercises. For example, when seated with one leg straight and the other flexed, the stretch is toward the foot of the straight leg. If, at first, only the knee is reached, the reach should be a little closer to the toes with each subsequent attempt until the toes are reached. It may take several weeks. The amount of time to hold the stretch varies with a goal of 10 seconds for warm-up and longer for warm-down. Muscles that are spastic should be stretched for a longer period of time, possibly 20-30 seconds until the muscle is relaxed. If spasms, abnormal muscle tone or nonfunctional primitive reflexes result from either stretching or resistance training, the exercise should be discontinued and re-evaluated.

Caution should be exercised if the condition is one that would be aggravated by stretching. Medical advice should be sought before including stretching exercises in a program to learn how this component can be included and whether or not it should be. Exercise programs should be re-evaluated on a regular basis as one's condition changes. The exercise program must be geared to the person with disabilities and his or her needs at any point in time, not shaping the person to fit the program (Lockette & Keyes, 1994).

Some special techniques utilized in both rehabilitation and athletics include passive and active range of motion and proprioceptive neuromuscular facilitation (PNF). This technique may be used in instances in which the person is unable to achieve the full range of motion themselves due to contractures or abnormal muscle tone around the joint. These techniques should only be used at the direction of medical personnel and by a trained assistant.
Body Composition

The last element effecting physical fitness is body composition. This is the relationship between lean and fat tissue in the body, usually expressed in terms of percentage of body fat. This is compared with body density that gives a measurement of lean body tissue and bone. Regardless of the way one looks at body composition or the means for measuring it, the goal is to have a balance between body fat and lean tissue to support healthy living as identified in research findings.

Whereas, the desirable thing to do with the other three components of fitness is to increase them, with body fat the goal is often, but not always, to decrease it to healthy levels in people with disabilities. Disadvantages of having excess body fat include greater risk of atherosclerosis, hypertension and increased stress on the heart and lungs. The increased body weight that often accompanies increased body fat also places severe strain on joints, adversely effects posture, decreases self-esteem and can affect interpersonal relationships. These drawbacks of obesity are no different for people with disabilities than for people without disabilities.

While all types of disabilities do not directly affect body composition, some play a significant role in at least influencing if not determining body composition. For example, wheelchair users with paraplegia tend to experience a decrease in lean tissue due to muscular atrophy and an increase in connective tissue, lipids and water (Shephard, 1990). Most research supports the notion that there is an inverse relationship between body fat and the degree of mental retardation for people living in the community. That is, the lower the IQ, the higher the percentage of body fat. This relationship reverses itself, however, for people with severe mental retardation residing in institutions. The body composition of other types of disabilities has been sparsely studied. A Canadian study of blind children found males to be slightly lower in body fat than peers and both sexes slightly lower in lean body mass (Canadian Fitness Survey, 1983). This was quite the opposite of findings in a New Zealand study in which both sexes were found to have twice the subcutaneous body fat as their peers. When testing deaf children ages 10-17, Winnick & Short (1985) found that they had increasing percentages of fat when compared with children who hear, the more hearing loss they had. For both sensory disorders, speculation is that these findings may relate more to social factors such as opportunity to participate, rather than having any direct cause-effect relationship with the disability.

Several techniques for measuring adiposity have been used successfully with populations of people with disabilities. The most popular methods are: underwater weighing, height-weight tables, body mass index and skin fold thickness. The nature of the condition may dictate which technique will be most accurate. For example, individuals with severe contractures from cerebral palsy...
may not be accurately compared with height-weight tables, but underwater weighing can be used successfully. People with spinal cord injuries may have significant muscle atrophy in the lower extremities, so the site selection for measuring skin fold thickness would be critical with this population. For extremely obese individuals, height-weight tables are recommended since skin fold calipers may not be large enough.