# Exercise and Women with Physical Disabilities

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> ***"Exercise is like medicine: with the proper dose it can be a beneficial and enjoyable part of an individual's life"***
>
> ***(DeLisa, 1998).***

For women with physical disabilities, it is important to find the optimal level of physical activity that will maximize the benefits of cardiovascular conditioning, muscle strengthening and stretching without causing overuse injuries or an exacerbation of a condition. Based on the current body of literature, the principles and benefits of physical fitness appear to be the essentially the same whether the participant is disabled or not (Rimmer, Braddock and Pitetti, 1996; Cooper et al., 1999). Women with physical disabilities are at increased risk of chronic diseases related to a sedentary lifestyle (Warms and Bryant, 2001). Physiological and psychological benefits of regular activity are achievable by physically impaired women provided attention is given to individual impairments (DeLisa, 1998). Proper amounts of exercise in women with progressive disorders is clearly beneficial, during an exacerbation, however, exercise should be discontinued or significantly modified (Miller, 1995).

Due to the limited body of research using disabled women as subjects, many recommendations for physical activity are based on research using non-disabled men as subjects. Often, if research is completed using disabled women, the subject pool is small, the time frame is short, the study is retrospective and/or there is no control group, thus generalizing recommendations is somewhat difficult. It is important to recognize that medical understanding of the impact of physical activity on health is evolving, therefore recommendations may change as more information is gathered and analyzed. Also, it is impossible to predict an individual's response to physical activity and exercise. Activities that energize one person may be too demanding for another. Individualizing physical activity by accounting for likes, abilities, finances, mobility and transportation must be considered if participation and compliance are to be achieved.

## AMERICAN COLLEGE OF SPORTS MEDICINE GUIDELINES

The American College of Sports Medicine (Kenney, 1995), a leader in sports medicine and exercise science, hypothesizes that regular physical activity promotes longevity and reduces morbidity. There is an inverse relationship between physical activity and all causes of mortality (Rimmer, Rubin, Braddock and Hedman, 1999). The promotion of physical activity among the general population is essential for the prevention of sedentary living and its associated diseases and conditions. Regular participation in physical activity and exercise has been demonstrated to lower blood pressure in hypertensives, increase serum high density lipoproteins (HDL), reduce body fat, increase metabolism, improve glucose tolerance, increase muscular strength and endurance,

increase range of motion, decrease anxiety and depression, enhance a feeling of well-being, improve locus of control, improve inner-directedness, improve self-efficacy, improve sleep, decrease social isolation and enhance work performance (Kenney, 1995; Maher, Kinne and Patrick, 1999; Heath and Fentem, 1997; DeLisa, 1998, Gordon et al., 1998). One of the ACSM's missions is "getting more people more active more of the time" to decrease mortality due to sedentary living. Their recommendation is to build up to at least thirty minutes of activity all days of the week (Kenney, 1995) or expending 1000 calories per week (Cooper et al., 1999).

Physical activity is defined as bodily movement produced by the contraction of skeletal muscles that increases energy expenditure above basal level. Exercise, on the other hand, is a specific form of physical activity; a planned, structured and repetitive program that positively impacts one or more components of physical fitness: muscular strength, muscular endurance, flexibility, cardiovascular endurance and body composition (Vuori, 1998). Regular, consistent activity addressing all five areas of physical fitness have been linked to positive physiological adaptations and disease prevention, specifically, prevention of coronary artery disease, osteoporosis, stroke, diabetes mellitus and some forms of cancer (Kenney, 1995; Kinney LaPier, Sirotnak and Alexander, 1998; Rimmer, Braddock and Pitetti, 1996; Vuori, 1998; Durstine et al., 2000; Heath and Fentem, 1997).

Exercise for individuals with physical disabilities may be a useful form of palliative medicine; finding ways to cope with a disability or progression of a disease by helping to preserve function, well-being and independence. Ultimately, participation in regular exercise for this population may be fundamentally related to quality of life in addition to longevity of life. Participation in physical activity decreases the incidence of secondary complications for women with chronic disease and disabilities (Rimmer, Braddock and Pitetti, 1996; Cooper et al., 1999). Advances in medicine and technology have resulted in disabled women living longer, potentially encountering the same long term complications of inactivity non-disabled women are prone to, such as osteoporosis, arteriosclerosis, obesity and arthritis. Extended life expectancy strengthens the role physical activity plays in the pursuit of high level functioning and good quality of life (Maher, Kinne and Patrick, 1998, Durstine, 1997). Furthermore, diseases and conditions resulting from inactivity, such as obesity, osteoporosis, deconditioning and depression, may exacerbate the chronic disease or disability (Rimmer, Braddock and Pitetti, 1996; Cooper et al., 1999). Participation in regular physical activity may reverse a disabling condition or simply slow the progression of a chronic disease (Kinney LaPier, Sirotnak and Alexander, 1998; Heath and Fentem, 1997)

In addition to the well-established long-term benefits of regular physical activity, there are acute changes that take place in the general population with each episode of exercise. Exercisers experience an increase in heart rate, respiration and temperature. Blood is shunted to the working muscles for nutrient exchange and to the periphery for cooling. Additionally, hormonal changes occur. There is an increase in catacholamines, growth hormone, cortisol, testosterone, glucogon and renin-angiotensin-aldosterone for the maintenance of plasma volume. During exercise less serum insulin is necessary.

It is important to be aware that while these well known physiological responses may be beneficial, some physical impairments may be negatively affected or exacerbated by these responses. For example, heat production may increase muscle weakness in women with multiple sclerosis. Shunting blood to the periphery may result in a sympathetic hypotensive response, thus, reinforcing the need to approach each person with an individualized exercise program.

### *Exercise Prescription*

One goal of every exercise program is to promote a positive physiological adaptation response, for example, increased cardiac output, decreased body fatness, improved glucose sensitivity, increased ROM. In order for there to be an adaptation, there must be a sufficient physical stress. Lack of physical stress promotes adaptation in the reverse direction causing deconditioning. To promote a positive adaptation response and further promote compliance, an exercise program should specify: mode of activity, frequency, duration and intensity for muscular strength, muscular endurance, flexibility and cardiovascular endurance. Muscular strength is defined as the maximal force generated by a specific muscle or group (Kenney, 1995). Muscular endurance, on the other hand, is defined as the ability of a muscle group to execute repeated contractions or statically maintain a contraction against resistance (Kenney, 1995). When considering important disability issues such as mobility and one's ability to transfer, adequate upper body muscular strength and muscular endurance must be examined.

Flexibility is the ability to move a joint smoothly through a full ROM. Pain free ROM must be achieved before a strength-enhancing program is undertaken. Lack of a pain free full ROM may result in re-injury and/or a biomechanical error (Garrison, 1995). Cardiovascular endurance is the ability to persist in a physical activity requiring oxygen above resting levels. It has been suggested that disabled women exhibiting high levels of muscular strength and endurance, flexibility and cardiovascular endurance are more likely to be independent in mobility and performance of activities of daily living (ADLs) (Maher, Kinne and Patrick, 1999)

There are three primary goals for women with disabilities participating in physical activity: (1) to reverse the de-conditioning resulting from bed rest or limited activity; (2) to optimize physical functioning; and (3) to enhance overall health and well being (Durstine et al., 2000; Cooper et al., 1999). Attention must be given to progression of exercise intensity and/or duration based on: goals, physical limitations, abilities, concomitant medical conditions, pathophysiology of impairments, medications impacting metabolic and cardiovascular effects of exercise, exercise preferences and limiting abrasions, blisters and trauma to skin (Durstine et al., 2000; DeLisa, 1998).

***"If a disabled woman loses even a little bit of function, it can have a significant impact on her daily life."***

***-- Physician who treats many women with disabilities***

Behavior modifications that can prevent or limit the development of secondary health conditions, maximize independence and minimize the deleterious impact of de-conditioning on quality of life should be discussed at every opportunity. When an individual is faced with activities causing excessive fatigue, such as stair climbing, ambulating or performing ADLs, often coping strategies are called upon, either consciously or unconsciously. The health care provider should be alert to any reported avoidance of the activity that due to undue fatigue. A reduction in activity, whether reduced mobility, ADLs, or exercise, leads to weaker muscles and an earlier onset of fatigue resulting in further reduction of activity. This process is often referred to as the cycle of de-conditioning (Cooper et al., 1999). It can be especially devastating to a person hovering just above their threshold of functional independence. Even a slight decline in functional capacity can be the difference between eating, bathing, walking and dressing independently versus requiring assistance for these activities. The goal of any physical activity or exercise program should be to obtain a level of strength, flexibility and stamina well above an individual's threshold of functional independence so that the highest quality of life can be maintained and, even in the event of an exacerbation of a condition, there is a margin for loss in function that would not result in loss of

independence and autonomy (Heath and Fentem, 1997; Cooper et al., 1999; Durstine et al., 2000; Manns and Chad, 1999).

In exercise terms, the adaptation to a higher level of stress is referred to as the overload principle. Regularly stressing the body to a load higher than it is accustom to, increases the body's ability to adapt to unexpected negative stress. Exercise programs, whether designed to improve functional independence, well-being or prevent obesity and CAD, should incorporate the overload principle when clinically appropriate.

For some women, their disability may be such a challenge that exercise intensity and duration are not reasonably modifiable. Consider increasing the frequency of an exercise bout while holding intensity constant. Lancioni and colleagues (2000) evaluated two blind, mentally retarded, institutionalized women, ages 31 and 35, for changes in step width, assistance for rising, urinary calcium, body weight and bone mineral density before and after a 9 month and 4 1/2 month exercise program, respectively. Each participant spent 20 min independently walking to a destination and 10 min performing a standing task. The exercise session was completed twice in the morning and again twice in the afternoon, daily. Significant improvements were demonstrated ($p < 0.05$) for step width, assist for rising, urinary calcium and body weight. Urinary calcium was 42 and 49 mg per day, respectively, upon pre-testing and below 10 mg per day for both subjects upon post testing. Weight loss of 4 kg and 3 kg, respectively, was observed upon post testing. Bone mineral density remained unchanged. The authors provide evidence that even with low independence and limited staff supervision, a lower intensity longer duration exercise program can improve health status but must be scheduled as part of the daily routine.

### *Arthritis*

Approximately 5.0 million people in the United States are significantly limited in their activities by osteoarthritis. Moderate levels of exercise may reduce symptoms associated with osteoarthritis, improve balance and increase program compliance (Sennott-Miller and Miller, 1987, Ettinger, 1998, Messier, 2000, Miller, et al., 2000). A dance-based exercise program may improve cardiorespiratory fitness and decrease depression, anxiety, fatigue and tension in women with rheumatoid arthritis (Noreau, 1997). Quadriceps strengthening may further reduce pain and improve ability to perform functional tasks (Prentice, 1991; Ettinger et al., 1997, Heath and Fentem, 1997, Sevick et al., 2000). Of primary importance is protection of involved joints. An exercise program combined with diet modifications for weight loss may improve pain, disability and gait more than exercise alone (Messier et al., 2000). Select low impact activities. Avoid jogging, stair climbing and running in people with hip and knee involvement. Include flexibility and joint ROM in exercise sessions but avoid over stretching and hypermobility. Proper shoes for shock absorption and orthotics for biomechanical correction should be considered. Vigorous exercise is contraindicated in the presence of acute joint inflammation (Durstine, 1997).

Although there has been no definitive research on the relationship between weight bearing and osteoporosis in women with physical disabilities, the National Osteoporosis Foundation routinely recommends standing and weight bearing exercises to decrease osteoporosis and promote cardiovascular benefits (NOF, 2002). Though much of the literature on weight bearing exercise and osteoporosis speaks to the use of exercise prior to age 30 as a preventive, some research suggests that weight bearing exercise after the onset of osteoporosis to maintain and even increase bone strength (Katz, 1998.)

### *Asthma and Pulmonary Disease*

Breathlessness can be uncomfortable and frightening. Lung disease can be either obstructive or restrictive and other conditions can limit exercise, such as peripheral muscle deconditioning and impaired left ventricular function (Durstine, 1997). Be sure exercisers avoid activity during times of high pollution. Warm up gradually. Exercising in humid environments, such as swimming, may decrease broncospasms (DeLisa, 1998). Cardiovascular endurance training improves respiratory muscle strength, body composition and body image, while resistance training markedly improves muscle strength and balance (Heath and Femtem, 1997, Durstine, 1997). Other benefits of exercise for this population include desensitization to dyspnea and improved ventilatory efficiency. Careful attention to medications is necessary to accomplish these changes. Some exercisers may require the use of oxygen therapy to maintain adequate oxygenation during exercise (Durstine, 1997).

### *Diabetes*

Glucose is the predominant fuel early in an exercise bout. Regular physical activity may: decrease the need for insulin by 1 to 2 units, increase the need for carbohydrate intake, improve insulin sensitivity, reduce body fat and reduce added risk of cardiovascular disease (Durstine, 1997). Prolonged physical activity may require carbohydrate intake every 20 minutes depending on exercise intensity. Most importantly, blood sugar should be monitored before, during and after exercise, adjusting diet or medications accordingly. Intense exercise can increase glucose demand up to 48 hours post-exercise. Monitor serum glucose diligently.

Contraindications for exercise include: active illness or infection, blood glucose > 250-300 mg/dl and the presence of ketones or if blood glucose is 80-100 mg/dl. Be sure to keep a source of rapidly acting glucose available during exercise, consume adequate fluids, practice good foot care by wearing socks and appropriate shoes and carry medical identification (Durstine, 1997).

### *Amputees*

Poorly fitting prosthesis can cause skin irritation and breakdown during physical activity. Have prosthesis refitted, use appropriate padding to reduce friction and inspect skin regularly.

### *Multiple Sclerosis*

Fatigability, lack of coordination and muscle weakness are common complaints among exercising women with multiple sclerosis. Passive range of motion and active strengthening activities are appropriate according to functional levels. Health promotion programs such as t'ai chi may be helpful (Husted et al,. 1999) Performing ADLs, incorporating inefficiency into daily living and active recreation are appropriate methods for increasing activity in women with multiple sclerosis (Petajan and White, 1999). Limit physical activity that causes increases in core body temperature. Cold pool swimming may decrease the concomitant rise in body temperature.

### *Cerebral Palsy*

The average individual with cerebral palsy (CP) will benefit most from a balanced program of muscular strength, flexibility and aerobic endurance while combating a sedentary lifestyle and reducing the risk of cardiovascular disease (Durstine, 1997). For competitive athletes with CP, the Cerebral Palsy-International Sports and Recreations Association has developed classifications based on an individual's functional level. Sports such as swimming, track and field and bocci are working toward a functional classification that categorizes athletes based on sport-specific abilities to promote better matched competition.

### *Spinal Cord Injuries*

Muscle and nervous system paralysis frequently result in two major exercise related problems. First, there is reduced ability to voluntarily recruit large muscle groups for aerobic exercise, and second, an inability to stimulate the cardiovascular system to support higher rates of aerobic metabolism (Durstine, 1997) Women with incomplete spinal cord injuries above T6, may experience autonomic dysreflexia causing extreme hypertension and possibly resulting in a stroke. Proper bowel and bladder management should be attended to (Schmid et al., 2001). Conversely, venous pooling in the lower extremities may lead to hypotension. Use of support hose and/or an abdominal binder may minimize pooling and orthostatic effects if blood pressure is < 80/50 mmHg (Bradley-Popovich, Abshire, Crookston and Frounfelter, 2000, Durstine, 1997). Attention must also be paid to temperature regulation and skin integrity due to a compromised autonomic nervous system, impaired circulation and impaired sensation. Upper extremity activities may only induce a training effect in the arm muscles but upper and lower extremity activity may induce both muscular and cardiopulmonary training effects (Durstine, 1997)

### *Women Who Use Manual Wheelchairs*

Overuse injuries, sprains and strains to the muscles of the upper extremities are very common in this population (Curtis and Black, 1999). Some women find wrist guards valuable for preventing overuse injuries to the wrist. Special attention should be given to the balancing of strength in the muscles of the shoulder girdle (Wu, 1997). Typically, the anterior shoulder muscles need to be stretched and the posterior muscles of the shoulder and upper back need to be strengthened, especially the external rotators and scapular adductors (Bradley-Popovich et al., 2000; DeLisa, 1998, Curtis et al., 1999). Aerobic exercises that involve the posterior muscles, such as rowing, should be encouraged (DeLisa, 1998).

At the other extreme, disuse and immobilization may promote atrophy and contractures in unused joints such as ankles, knees and hips (Cummins, 1992). Connective tissue dysfunctions, including abnormal collagen cross links and shortened inter-fiber distances are associated with the lack of motion (Amiel, 1982). It is sometimes difficult to regain lost motion associated with joint contractures.. Low-load, long duration stretching is the most effective means of restoring normal tissue length. Sapega (1981) describes a program designed to lengthen functional connective tissue structures in an atraumatic fashion, advocating a moderate but tolerable force to stretch contractures for 20-60 minutes, depending on tolerance. The joint is placed at end range. Several 30-second breaks can be used. Superficial heat is also used to elevate tissue temperature. Finally,

ice is applied for 15 minutes at the end of the session while maintaining the stretch. It has been suggested that a 3° increase of joint motion per week is an acceptable standard (Cummins, 1992).

### *Stroke*

Since the majority of strokes occur in older people, participation in aerobic exercise by this population may be complicated by cardiovascular, orthopedic or arthritic problems. Stroke survivors are at a greater risk for having another stroke. Improving fitness and reducing risk factors through aerobic exercise should decrease the likelihood of a second stroke. An aerobic exercise program for stroke survivors can potentially help reduce hypertension, improve glucose regulation, improve lipid profile and reduce body fat, in addition to improving physical fitness and strength (Potempa et al., 1996, Teixeira-Salmela et al., 2001, Teixeira-Salmela et al., 1999). Exercise intensities of 40% to 70% VO2peak can help reduce hypertension (Durstine, 1997).

### *Polio*

The primary goal of exercise for women with postpolio syndrome is to maintain adequate muscle strength for occupational and leisure pursuits (Durstine, 1997). Involve as much musculature as possible (Ernstoff et al., 1996). Initially, a twenty-minute exercise session may be divided into ten two-minute intervals (Durstine, 1997). Attention must be paid to designing a program that will not prematurely accelerate the loss of remaining motor units (Agre et al,. 1997). Avoid overstressing especially during times of unstable postpolio and high stress. Morning sessions may be more beneficial than afternoon sessions (Agre et al., 1998, Durstine, 1997).

## HEALTHCARE TEAM'S RESPONSIBILITY

***"Health practitioners need information on exercise options for women with disabilities, like accessible pools and sports." -- Woman with a disability***

All too often the self-perception of women with physical impairments, and society at large, is that they are unable to exercise. Disabled women themselves, may not perceive themselves as having the potential to be physically active. It is the responsibility of the healthcare team to: provide information, discuss the importance of, promote participation in and provide specific recommendations for participation in physical activities. This may include problem solving for: location, equipment, transportation, cost and supervision. Or it may require learning about community resources and referring the patient to a specialist, a physiatrist, exercise physiologist or physical therapist. Have the discussion even if it appears obvious and overstated. Consider showing educational videos about health, nutrition and exercise in the waiting room to introduce the discussion. There are plenty of barriers to participating in physical activity, real and imagined (Durstine, 1997, Heath and Fentem, 1997, DeLisa, 1998, Cooper et al., 1999, Rimmer et al., 2000). Do not let the statement "my health care provider never told me to" be one of them.

## RESOURCES

Sports and Spokes, Paralyzed Veterans of America, 5201 North 19th Avenue, Suite 111, Phoenix, AZ, 85015-9986.

Paraplegia News, Paralyzed Veterans of America, 5201 North 19th Avenue, Suite 111, Phoenix, AZ, 85015-9986.

Access to National Parks: A Guide for Handicapped Visitors. Superintendent of Documents, U. S. Government Printing Office, Washington, DC, 20402. Stock #024-0005-00691-5.

Berkeley Outreach Recreation Program (BORP), 830 Bancroft Way, Berkeley, CA 94704. (510) 849-4663.

City of Berkeley Disabled Recreation, 2180 Milvia Street, Berkeley, CA 94704. (510) 644-6530.

Access America, Northern Cartography, 4050 Williston Road, #131, South Burlington, VT 05403. (802) 860-2886.

National Association of Disabled Athletes, 33 Leonard Avenue, Tenafly, NJ 07670.

National Association of Sports for Cerebral Palsy, 66 East 34th Street, New York, NY 10016.

National Handicapped Sports and Recreation Association, Capitol Hill Station, P. O. Box 18644, Denver, CO 80218.

National Sports Center for the Disabled (NSCD), 2107 Templerton Gap Road, Sure C, Colorado Springs, CO 80907. (303) 632-0698.

National Wheelchair Athletic Association, 40-24 62nd Street, Woodside, NY 11377.

Wheelchair Bowling Association, Inc., North 54 W 15858 Larkspur Lane, Menomonee Falls, WI 53051. (414) 781-6876.

Wheelchair Sports, USA, 3595 East Fountain Boulevard, Suite L1, Colorado Springs, CO 80910.

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