

On the Road ... to Health & Fitness



A starter's guide for people with paraplegia.



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BENEFITS OF EXERCISE

Exercise increases strength and endurance which:

- are needed for wheeling, and in particular for negotiating inclines and curbs,
- are important for independence in daily activities,
- may limit the incidence of injuries related to higher stress activities like transferring to and from uneven heights,
- are beneficial for many leisure and sport activities.

Exercise improves aerobic or cardiovascular fitness which:

- improves the efficiency of the heart at rest and during exercise,
- improves blood flow to muscles and skin during exercise,
- decreases the risk of heart disease by improving cardiovascular function, improving blood lipid profile, and assisting in weight control,
- provides more energy and minimizes fatigue.

Exercise improves general health by:

- helping to control body weight,
- providing a sense of well being.

Ask yourself:

Do I have energy for all the things I like to do, or want to do?

Am I happy with my current fitness level?

Am I happy with my current weight?



If the answer is no to any of these questions, engage in regular exercise and pay closer attention to diet. You will begin to lead a healthier lifestyle with more energy for all activities.

Start exercising at a reasonable intensity based on your fitness level, and progress slowly. High intensity exercise increases the likelihood of injury as it places more strain on the body than moderate intensity exercise. Also, high intensity exercise is not necessary to achieve the fitness levels associated with optimum health and wellness.



For a long term active lifestyle

Choose exercise activities you enjoy, as you are more likely to maintain them.

Make regular exercise a part of your daily routine.

EXERCISE PROGRAMS

A balanced fitness program should include exercises for both muscle strength and aerobic conditioning.

Optimally you should be exercising 4-5 days/week, with a minimum of 3 days devoted to aerobic types of activities.

Exercise workouts more than 5 days/week have few advantages and may lead to over-training and greater susceptibility to injury. A healthy body needs both exercise and rest. When engaged in a very active lifestyle, rest days should be interspersed with exercise days to provide a rest day mid week as well as one at week's end.

If you are over 40 years of age and male, or over 50 years of age and female, and intend engaging in very strenuous activity you should obtain medical clearance first. If your doctor has indicated that you have cardiovascular disease, or high blood pressure at any age, seek medical advice before engaging in an exercise program.

Endurance Training

Endurance exercise is required for aerobic conditioning to improve cardiovascular fitness. To obtain cardiovascular benefits, exercise must be of a sufficient intensity, duration and frequency each week to induce changes. (See general guidelines on page 4).

Free wheeling is an effective form of endurance training, if an individual can wheel fast enough, or the terrain is such that heart rate can be increased to the target range and maintained there. For example, an unobstructed outdoor pathway, long stretches of wheelchair accessible sidewalks, or a track are suitable. However, wheeling in a crowded mall is unlikely to provide the increased and sustained work effort required to provide cardiovascular training effects. Free wheeling is often associated with periods of coasting where heart rate may drop considerably and the effects of training may be less than anticipated. During free wheeling, develop a hand strike pattern which keeps your arms moving and limits coasting. Sustain an effort which feels moderate to moderately hard. If the wheeling feels easy then it is unlikely to be producing any cardiovascular training benefits.

Resistance wheeling on wheelchair rollers or wheelchair ergometers is an effective means of training. These devices allow both speed and resistance to be used to increase intensity of the workout. They provide a means of exercising in all weather conditions, and the use of resistance provides a strength training stimulus as well.

Wheelchair sports such as basketball, track and field, tennis, and swimming have all been shown to improve aerobic fitness, whereas weight lifting, archery, target shooting or table tennis have been shown to be ineffective. These latter sports should not be chosen for their ability to improve aerobic capacity. However, individuals engaged in any sports activities generally have higher fitness levels.

Arm crank training is a less specific exercise than wheeling training, but is an effective means of improving aerobic fitness and strength. In general, for the same workload, the heart and lungs work harder during wheeling than during arm cranking exercise. As the muscle activity is quite different between arm cranking and wheeling, where possible, choose a wheeling activity over arm cranking. Wheeling improves aerobic capacity and works the muscles in the activity they have to perform most.



General Guidelines for Aerobic Exercise

Frequency: 3 - 5 days/week

Intensity: increase heart rate to within training zone (use chart below), and sustain this effort for the duration of the workout.

Duration: 20 - 60 minutes (at target exercise heart rate or target effort).

Time: It takes approximately 8 weeks of regular training 4-5 days/week before benefits are observed in most people.

Cardiovascular training benefits are quickly lost if a minimal endurance activity level is not sustained, that is, if you do not continue to exercise within the guidelines outlined above for 2 - 3 days/week.

Exercise without adequate warm-up and stretching will predispose individuals to greater risk of muscle or tendon injury (see page 8).

To Determine Exercise Intensity For People With Injuries Below T4

During exercise, heart rate increases proportionately with work output, so that heart rate is a good measure of exercise intensity.

Refer to the chart below to determine a recommended training heart rate range. Notice that there are three recommended training zones which refer to a lower training intensity, a mid, and a high intensity region. Heart rates below these training zones are unlikely to produce cardiovascular training benefits. Heart rates above these zones indicate very intense effort, and are NOT

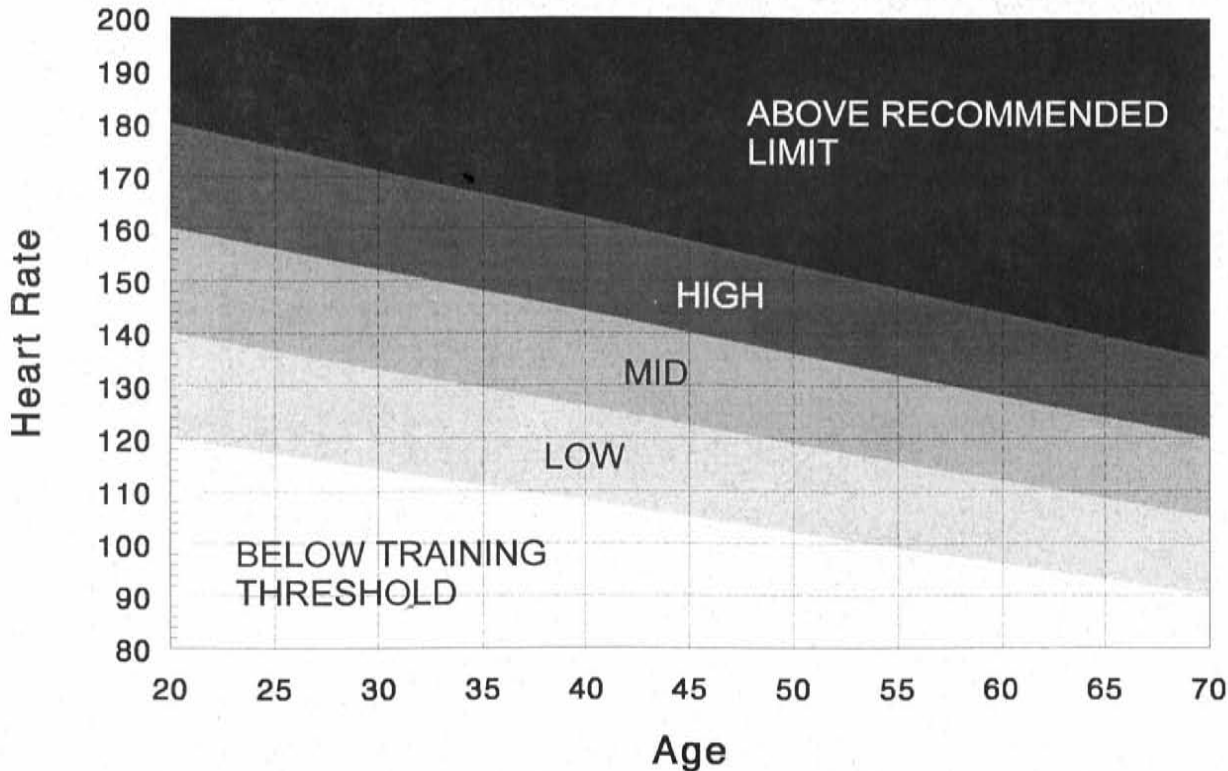
recommended for regular training. Always start a training program at the low to mid intensity ranges and progress gradually.

As you age, your maximum heart rate decreases. Therefore, the training heart rate zones are lower for older people than for younger people.

An exercise program should be:

- 4-5 days/week to *improve cardiovascular fitness*, and
- 2-3 days/week to *maintain a fitness level*.

HEART RATE TRAINING ZONES



To Measure Heart Rate

Use a watch with a second hand. Find your pulse on the thumb side (palm facing up) of your wrist, just above the fold of your wrist joint (see picture). The pulse is easy to find if you relax your wrist and hand on your lap. Do not flex your wrist. Count the number of beats felt in 10 seconds and multiply by 6 to get your heart rate in beats per minute.

You can also find your pulse using your middle and index fingers and lightly placing them on your neck (as shown in picture) just to the side of your wind pipe. You will feel the pulse over a major artery called the carotid artery. Again use your watch or a clock to count your pulse for 10 seconds.

Example: 22 beats felt in 10 seconds ($22 \times 6 = 132$). Heart rate is 132 beats/minute.

If you have trouble taking your pulse, ask a health professional or fitness trainer to show you.



To Determine Workout Intensity by How Hard the Effort Feels

When exercising within the training heart rate zone, note how this effort "feels". Does the work feel easy, moderate, moderately hard, hard, very hard, or very very hard? Generally, when you increase your heart rate to within the training zone, you will be working at levels which feel moderate (low zone), moderately hard (mid zone), or hard (upper zone). If the work feels easy, then heart rate is usually too low, and if the work feels very hard, you are near or at the upper limits. If the work feels very very hard, then your heart rate probably exceeds the upper recommended training zone limits. Teach yourself how exercising at your training heart rate feels, as it will allow you to exercise without having to stop and take your pulse. As improvement occurs, the work will feel easier, and heart rate will be lower. Increased effort will then be required to keep heart rate in the training zone.

Your sense of EFFORT can be used to gauge the intensity of exercise.

How Work "Feels"	Training Zone
easy	below training threshold
moderate	lower training zone
moderately hard	mid training zone
hard	mid-upper training zone
very hard	upper limits of training zone
very very hard	above recommended training zone

To Determine Exercise Intensity For People With Injuries Above T4

With injuries above T4, the nerves which increase heart rate during exercise may be damaged, and heart rate response during exercise may be impaired. Heart rate alone is usually not a good indicator of exercise intensity. Individuals may have to rely more on the guidelines for "feeling" effort as outlined above. Work within the moderate zone to start. After a couple of months work up to an intensity that feels moderately hard to hard. If the work feels very hard, then the intensity is likely near or above the recommended upper limits, and exercise intensity should be lowered. Similarly, if the workout feels easy then the intensity is likely below the training threshold.

Learn to read your body to determine how hard a workout feels.

DO NOT engage in vigorous exercise when you have a fever, a bad cold or flu. Also, when you are recovering from any illness, begin to exercise slowly, and avoid regular exercise until you are well.

Sample Endurance Program

This sample endurance program is for a person who does not exercise regularly. If injury is above T4, start with exercise which feels moderate. If injury is below T4, determine your training heart rate within the lower range of the training zone from the chart.

Start with 20 minutes, 3 days/week, with at least one rest day between each workout day. On rest days, include muscle warm-up and stretching in your daily routine (see page 8). If you cannot exercise for 20 minutes all at once, start with whatever length of sessions you can manage. Place a 2 minute rest period between each session, but complete a total of 20 minutes of **exercise** at the target intensity each exercise day.

Once you can work out for 20 minutes/day, 3 days/week comfortably, add another exercise day per week, but include a rest day between days 2 and 3 of exercise. Over the next month, gradually lengthen each exercise session until you are working for 30 - 40 minutes, 4 days/week.

If an even higher fitness level is desired, sessions can be gradually lengthened to 40 - 60 minutes, and/or increased to 5 days/week, and/or increase training intensity from low to mid training zone. **DO NOT** increase all parameters at the same time. Progress slowly over 6 months to 1 year.

Both interval (short rest periods during exercise session) and continuous training (no rests during exercise session) have been shown to produce cardiovascular training benefits. With an interval program what is most important is that rest periods are sufficiently short (1-2 minutes) as compared to exercise periods (5-10 minutes), and that the total exercise time is greater than 20-30 minutes.

For active individuals: start training in the mid heart rate zone or at intensities that feel moderately hard, 4 days per week, for 30 minutes/session, and gradually progress to achieve even greater benefits; or continue with current activity level to maintain benefits.

Regular endurance exercise is needed to gain and to maintain cardiovascular training benefits.

Strength Training

Muscle weakness may exist in some muscles of the upper limbs even in people leading fairly active lifestyles. For example, wheeling places more emphasis on some muscles, less on others. The muscles used in wheeling become stronger through repeated use, while those used less remain weaker. Wheeling is very good exercise to improve strength of certain muscle groups and enhance aerobic conditioning, but when performed without a complementary strength training program may create muscular imbalances.

These muscle imbalances make one more susceptible to injury, particularly during activities such as transfers when body weight may be borne by both strong and weaker muscle groups. Adequate strength and endurance training will not only benefit you for normal transfers and wheeling, but will help to minimize injuries.

Strength is important:

- *for functional activities such as transfers*
- *to obtain maximum aerobic exercise benefits*
- *to protect against upper limb injury*

A number of the muscles surrounding the shoulder joint are susceptible to injury especially without a balanced strength training program. Specific strength training for all upper limb muscles is recommended.

During endurance (aerobic) exercise, benefits are derived both from improved heart and circulatory function and improvements in the exercising muscles themselves. Therefore, a sufficiently large exercising muscle mass is needed to gain aerobic training benefits. As the shoulder girdle and arm muscles are a smaller muscle mass than the legs, a lower maximum aerobic power (approximately 75%) can be achieved with arm training as compared to leg training. The larger the arm muscle mass involved in the exercise, the greater the aerobic training effects will be.

Strength training alone should not replace endurance training. Most strength training regimens do not increase heart rate enough nor sustain the necessary increased heart rate long enough to produce cardiovascular training benefits.

Your body will reveal the benefits of regular strength training quite quickly, in as little as 3-4 weeks.

Types of Strength Training

Both the *muscles* and the *nervous system* benefit from regular exercise. The most common form of weight or strength training involves the use of free weights (barbells, dumbbells). Other strength training equipment includes stack weight machines (plate weights routed through pulleys via cables), elastics (surgical tubing and bands), and other specialized devices such as accommodating resistance machines (like Nautilus™) and dynamometers.

Access to strength training equipment can be as easy as finding suitable household items, purchasing a set of dumbbells, or buying a membership to a reputable facility.

Successful Strength Training

- a commitment to **regular** training (as little as 2 days/week)
- starting with easily managed loads and **progressing slowly** over a few weeks
- having a **well-rounded exercise routine** which targets all major muscle groups
- performing the exercises with **controlled motion** (not jerky)
- performing the exercises in a **safe manner**

Select the **EXERCISES** for your workout.

- Perform a balanced workout which includes exercises for all major muscle groups.
- Do not avoid weaker muscle groups as they will only get relatively weaker.



Only use weights which allow you to perform exercises in a controlled manner without struggling or jerking

Select a suitable **LOAD** for each muscle group.

- The load should permit you to complete all repetitions of the first set without struggling and without interfering with normal breathing.
- Start at low loads and work up gradually.

Determine how many **REPETITIONS** you will perform per set.

- Typically 8-12 repetitions (10-20 for endurance exercise benefits) constitute a set.

Determine how many **SETS** you will perform for each exercise.

- Typically 2-3 sets (each with 8 - 12 repetitions) are completed for each muscle group.
- The number of repetitions may be decreased between sets due to fatigue.

Allow for **REST** between repetitions, between sets, and between muscle groups exercised.

- Allow a momentary pause between each repetition.
- Allow a minute or two of rest between each set and after each muscle group is exercised.

PROGRESSION is accomplished over a few weeks by:

- Using a greater load (weight).
- Increasing the repetitions (for example, from 8 to 12).
- Decreasing the rest between sets (for example, from 2 to 1 minute).
- Performing more exercises (a variety) for the muscle group.

Progress slowly. Change your workout periodically by varying the above points, but do not change more than one at any given time.

Warm-up

A warm-up is a period of low intensity exercise which gradually prepares the muscles for the main exercise session. It helps to prevent muscle or tendon injury and allows for a gradual increase in the workload for the heart.

Warm-up before endurance exercise by wheeling at an easy pace and gradually increasing the difficulty until you are at your training intensity after approximately 5 minutes.

Stretches

To improve flexibility and to prevent or treat muscle pain and stiffness, *daily stretching is recommended.*

If starting an exercise session from no activity at all, then wheel for approximately 3 minutes at an easy pace, or perform 3-5 minutes of low resistance arm exercises. Once the muscles have warmed up, stop and complete some neck, shoulder and shoulder girdle, and trunk stretches to improve flexibility.

If you are unsure of how to effectively stretch all muscle groups, consult a qualified health professional, or qualified fitness instructor. *Effective* stretching is an important part of both injury prevention and treatment of chronic muscle pain and/or muscle spasm.

Each stretch should be held for 10 -20 seconds and repeated 3 - 5 times. Stretch smoothly and do not bounce or jerk. Stretch into the mild discomfort (not painful) range.



Cool Down

At the end of the exercise period, a free wheeling or low resistance cool down of approximately 5 minutes should be included to assist in recovery from exercise. Like the warm-up, this period helps to minimize muscle fatigue after exercise, and allows the body to gradually return to a resting state.

A minimum of 20 additional minutes should be added to an exercise training program to provide for adequate warm-up, stretches, and cool down after exercise.

Adequate warm-up should be a part of every exercise session.

Sample Total Program

Complete a muscle warm-up and stretches daily, even on rest days.

Start with 4 days/week of exercise. For example, use Monday and Thursday for endurance (aerobic) exercise, and Tuesday and Friday for strength training. Leave Wednesday, Saturday and Sunday as rest days.

For the aerobic workout, start with 20 minutes/day at a moderate effort or within the low training heart rate zone.

For the strength workout, start with 5 or 6 different upper limb exercises, trying to cover all major muscle groups. Choose a load which allows you to complete 8 repetitions without struggling. Complete 2 sets of 8 repetitions for each exercise.

Increase activity level during your regular daily routine such as increasing the effort during wheeling activities, and increase the frequency of wheeling as much as possible. The general increase in daily activity will assist with weight control as well as improve fitness.

After one month, increase aerobic conditioning to 3 days/week and keep strength training at 2 days/week. Keep a mid week rest day (for example, Wednesday), and continue stretches as least 5 days/week.

To achieve a higher fitness level, progress slowly as indicated in the endurance and strength training sections.

Injury Prevention

- *Warm-up*
- *Stretch*
- *Maintain good upper limb strength and endurance*
- *Progress exercise program slowly*
- *Heed signs of overload and overuse such as pain and/or tenderness.*

People with spinal cord injuries are more prone to repetitive strain injuries to the upper limb. If undue discomfort is felt during or after exercise, or during any activity, adjust your program and activities to prevent further injury. Most minor muscle or tendon injuries resolve in a few days with rest.

If an injury is more severe, does not resolve within a few days of rest, or is recurrent, seek advice from a qualified health professional. Early intervention and education on how to avoid re-injury will assist in recovery and minimize recurrence.

Temperature Regulation

Damage to the nervous system following a spinal cord injury alters the effectiveness of the body to maintain core body temperature. With complete spinal cord injuries, no sweating or shivering occurs below the injury level. Body temperature then rises and falls with environmental temperature, which makes a person more susceptible to overheating (hyperthermia) and over-cooling (hypothermia).

In Hot Humid Weather

- *Drink plenty of liquids*
- *Cool the skin through the use of a fan and/or a water mist which promotes evaporative cooling.*
- *Avoid heavy exercise*

During exercise, heat is produced by exercising muscles. If the exercise is hard enough, long enough, or is performed in a hot and/or humid environment, core body temperature will rise rapidly.

The body tries to control overheating by:

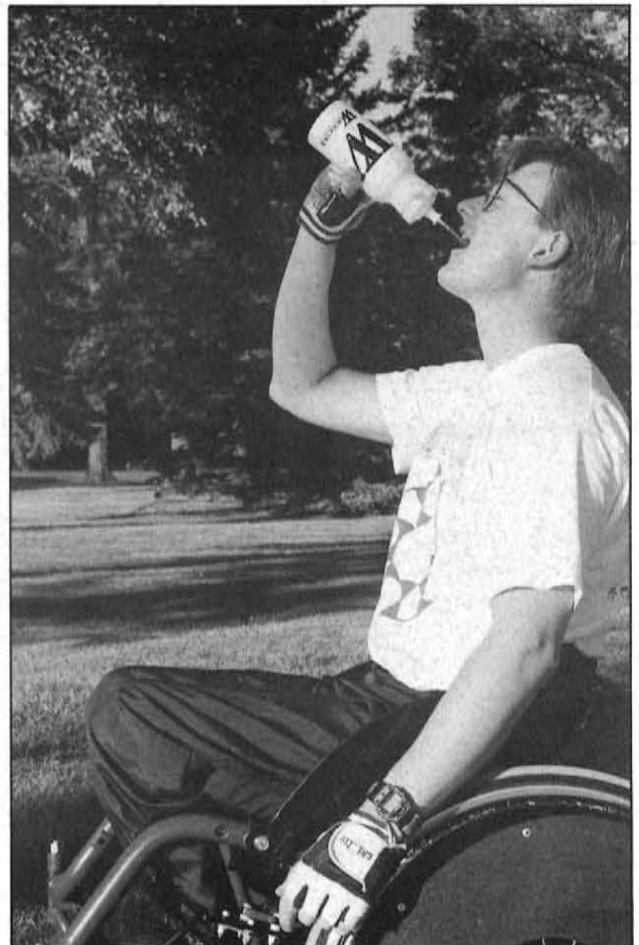
- sweating, and
- diverting blood to the skin for cooling.

Both these mechanisms are less effective after a spinal cord injury.

Exercise in hot and/or humid conditions will tend to increase 'core' body temperature placing a greater strain on the heart. The heart will try to pump enough blood to the muscles for exercise and to the skin for cooling. After spinal cord injury, some blood pools in the leg vessels, leaving less volume to be redirected to meet the needs for both exercise and body cooling.

Care should be taken when exercising in such conditions.

Similarly, care should be taken to avoid over-cooling when exercising in a cold environment.



Nutrition

"You are what you eat!"

Diet affects the general health of all body tissues. A poorly balanced diet means that exercise ability and recovery from exercise will be impaired.

- *Carbohydrates are needed for energy.*
- *Fibre promotes regular bowel function.*
- *Adequate fluids minimize urinary tract infections and prevent dehydration.*

Adhere to the basic principles advocated for everyone, that is, a diet high in complex carbohydrates, low in fats, and containing adequate protein and fiber.

Minimum caloric intake requirements vary widely amongst individuals with paraplegia, and depend to a large extent on activity level. However, loss of voluntary muscle activity in the large leg muscles generally means less calories will be required. Following caloric requirement standards set for able bodied will often result in increased weight gain, except for those engaged in very active lifestyles.

A diet equal to approximately 75% of the intake prior to injury is a good guideline to follow.

People with paraplegia should consume 5 - 10 servings of fruit and vegetables every day and 5 - 12 servings of whole grains. This will meet the carbohydrate requirements and ensure adequate fiber intake. Increasing fiber intake is important for regular bowel function. (Examples of 1 serving are: 1/2 cup of juice, a medium sized apple or banana, 1/2 cup of vegetables, or a single slice of bread. One cup of rice or pasta equals 2 servings). For more information consult a registered dietitian.

Adequate fluid intake is important to minimize urinary tract infections and to prevent dehydration. Frequent urination or catheterization and dilute urine are the best indicators of adequate fluid intake. During exercise, drink 1/4 - 1/2 cup of fluid every 20 minutes. Water, dilute fruit juice or sports drinks are appropriate.

Optimal body composition means less fat and more muscle!

Diet alone is NOT enough!

Many individuals with paraplegia have deficient diets. To be able to exercise, muscles must have fuel (carbohydrates and fats). There is evidence that a diet deficient in carbohydrates may impede exercise ability, and deplete muscles of glycogen (carbohydrate) stores. This results in earlier fatigue during exercise than would occur if diet was high enough in carbohydrates. Sufficient available carbohydrates also "prime" the use of fats as a fuel for exercising muscles. Fats are an important fuel for longer duration exercise.

Weight Control

Weight control is best achieved by both an active lifestyle and a well balanced diet, where caloric intake equals caloric output through activity.

Lower fat weight is important for general health, for decreased risk of heart attack and stroke, and for improved exercise performance.

Seek advice from a qualified health professional if diet and weight control are of concern.

Obesity

- *increases the risk of pressure sores*
- *is a risk factor for many chronic illnesses*
- *increases the work of breathing*
- *increases the work for the heart*
- *increases the load on the upper limbs during all activities requiring weight shifts. This increases the risk of both acute and chronic muscle, tendon, ligament or joint injury.*

Lifestyle and Lifespan

It is not necessary to "take time out" of one's regular schedule **IF** sufficient exercise can be included into normal activities. Individuals should consider their current lifestyle and see how increased activity could be included into their daily routine. For example, a person can wheel to work morning and/or night, or take time on lunch break to exercise, or do warm-up exercises and stretch every morning. Include exercise in leisure activities.

People with paraplegia are living longer more active lifestyles. With aging comes the normal increased prevalence of muscle, tendon, and ligament injury and many other diseases. In particular, heart attacks and strokes from narrowing of the arteries are more common with increased age.

Heart attacks are becoming the major cause of death and disability for people with spinal cord injury as they age. Further, there is some evidence that heart disease may appear at a younger age in spinal cord injured people as compared to the able bodied population.

There are "good fats" in the blood called high density lipoproteins (HDL's) which protect against narrowing of the arteries; and there are "bad fats" called low density lipoproteins (LDL's) which are thought to increase narrowing of arteries. Exercise increases the ratio of "good fat" (HDL) to "bad fat" (LDL) in the blood, and thereby decreases the risk of heart and blood vessel disease. Blood lipids (fats) are abnormal in people with paraplegia early post injury, but improved values have been found in people who undergo endurance training, and normal values have been observed in wheelchair athletes.

Higher fitness levels are associated with less risk of heart disease, better weight control and improved blood lipid profile.

Exercise needs to be integrated into an individual's regular lifestyle for optimum health and wellness.



Regular exercise, and a balanced diet are the keys to a healthier lifestyle.

People who maintain the highest fitness levels have the least medical complications from all causes, the least physician visits and the least hospitalizations.

Wheelchair mobility places high demands on the upper limb muscles, joints, tendons and ligaments. There is growing concern over musculo-skeletal injury with aging for wheelchair bound individuals. Upper limb injury can be very debilitating and can severely limit lifestyle. Maintaining an active lifestyle with strong, endurance trained muscles is the best protection.

Avoiding or minimizing chronic repetitive high stress maneuvers throughout life, (such as transfers in and out of a car or truck with very unequal heights), and seeking early treatment for injuries will minimize problems with aging.

Tendons and ligaments lose their elasticity with age. Adequate warm-up, stretching, and a realistic progression of activity will avoid unnecessary injury.

Aging is often associated with muscle weakness more from a lack of regular activity, than from the aging process itself.

Community Resources

Canadian Paraplegic Association
1101 Prince of Wales Drive, Suite 320
Ottawa, Ontario, K2C 3W7
(613) 723 - 1033

Consult your nearest CPA office for assistance in identifying local health professionals, and local wheelchair accessible exercise facilities.

Canadian Wheelchair Sport Association
1600 James Naismith Drive
Gloucester, Ontario.
(613) 748-5685

Canadian Wheelchair Basketball Association
1600 James Naismith Drive
Gloucester, Ontario.
(613) 748-5888

All of the provinces and territories have a wheelchair sport association. Your local association may be consulted to access sports, recreation and fitness facilities which have wheelchair accessible exercise equipment or programs.

Local Office:

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