



DISCOVER ACCESSIBLE FITNESS

A Wheelchair User's Guide for Using Fitness Equipment



Copyright © 2014

All rights reserved. No part of this guide may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, without permission in writing from the publisher.

This guide is a collaborative project of the National Center on Health, Physical Activity and Disability (NCHPAD) and Beneficial Designs, Inc. The information provided in this guide was supported in part by Grant/Cooperative Agreement Number U59DD000906 from the Centers for Disease Control and Prevention (CDC). The contents are solely the responsibility of the authors and do not necessarily represent the official views of CDC.

Printing for this publication was supported by The Disability and Health Program of the Alabama Department of Public Health Cooperative Agreement Number 5U59DD000947-02 from The Centers for Disease Control and Prevention.

National Center on Health, Physical Activity and Disability
4000 Ridgeway Drive
Birmingham, AL 35209
www.nchpad.org
800-900-8086
email@nchpad.org

Table of Contents

1.0	Introduction	4
2.0	Special Considerations for Wheelchair Users	6
3.0	Adaptive Equipment	19
4.0	Getting Started	21
5.0	Flexibility/Cool-Down – Upper Body Stretches	26
6.0	Strength Training for the Upper Body	32
7.0	Pulley Exercises	45
8.0	Cardiovascular Exercises	48
9.0	The Muscles of The Body	51

1.0 Introduction

Welcome to the exercise program for persons using wheelchairs. This booklet is not to be used in place of physical therapy or exercises prescribed by your doctor. It is intended to incorporate physical activity into your daily life.

Exercise increases your ability to perform activities of daily living. It can also increase physical independence and self-confidence. In addition, exercise can also aid in a healthy body image and allow for social interaction. As a result, you can become more independent in your daily activities, more efficient in your locomotion, and decrease the risk of secondary conditions associated with wheelchair use.

With any exercise program, proper precautions must be taken before you begin. An understanding of potential problems is necessary for you to exercise safely. Please contact your physician if you have any concerns. It is also advised that individuals with disabilities desiring to engage in exercise contact an ACSM/NCHPAD Certified Inclusive Fitness Trainer for more assistance.

For more information regarding a trainer, visit www.nchpad.org.



1.1. Importance of Exercise for Wheelchair Users

- Increases ability to perform activities of daily living
- Increases physical independence and self-confidence
- Aids in healthy body image
- Allows for social interaction
- Reduces stress
- Improves stability and balance while body is in an upright position
- Increases efficiency of the heart and increases blood flow to the lower extremities
- Reduces levels of harmful low-density lipoprotein (LDL) cholesterol and can increase levels of “good” high-density lipoprotein (HDL) cholesterol
- Maintains/increases muscle strength
- Helps reduce complications associated with vascular disease and diabetes by improving blood/glucose control
(specifically Type 2 Diabetes)
- Improves insulin sensitivity
- Reduces body fat
- Decreases probability of a stroke
- Decreases the risk of heart disease
(one of the leading causes of death in persons with spinal cord injury)
- Decreases complications of spinal cord injury and further hospitalizations

2.0 Special Considerations for Wheelchair User

2.1. Types of Wheelchair Users

Absence or loss of lower extremity – Typically due to trauma or surgery; prosthetics are usually worn but do not result in full return of function.

Arthritis – Pain in joints, usually reducing range of motion and causing weakness.

Cerebral Palsy – Damage to the motor areas of the brain prior to brain maturity.

Diabetes – A group of metabolic diseases in which a person has high blood sugar, either because the body does not produce enough insulin, or because cells do not respond to the insulin that is produced; often results in cardiovascular disease, stroke, peripheral vascular disease, neuropathy, and/or limb loss.

Heart Disease – Umbrella term for a variety of diseases affecting the heart including: coronary heart disease, cardiomyopathy, cardiovascular disease, ischaemic heart disease, heart failure, hypertensive heart disease, inflammatory heart disease, and valvular heart disease.

Multiple Sclerosis – A group of hereditary diseases causing progressive muscular weakness, loss of muscular control, contractions and difficulty in walking, breathing, reaching, and use of hands involving strength.

Paraplegia – An impairment in motor or sensory function of the lower extremities.

Rheumatoid Arthritis – Chronic arthritis.

Stroke (Cerebral Vascular Accident; CVA) – Thrombosis (blood clot in a blood vessel which obstructs blood flow), hemorrhage (resulting in bleeding into the brain tissue; associated with high blood pressure or rupture of an aneurism), or embolism (a large clot breaks off and blocks an artery) which causes the affected area of the brain to either stop functioning altogether or to be impaired.

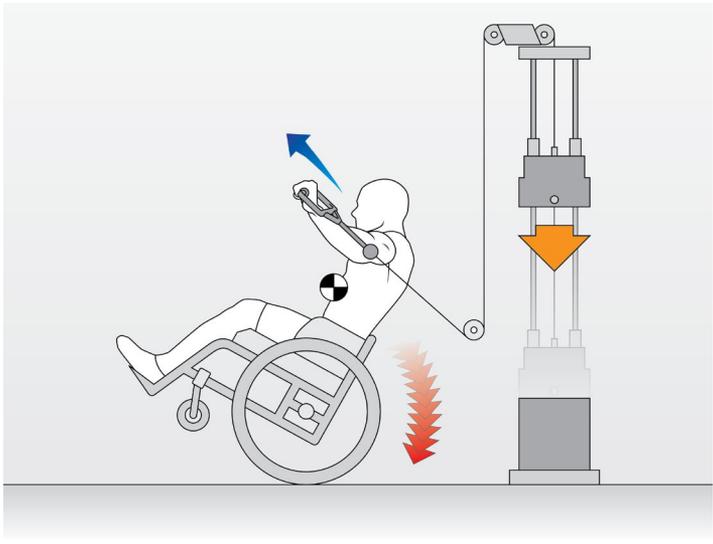
Tetraplegia (Quadriplegia) – An impairment in motor or sensory function of the upper and lower extremities including the torso.

2.2. Follow Fitness Equipment Instructions

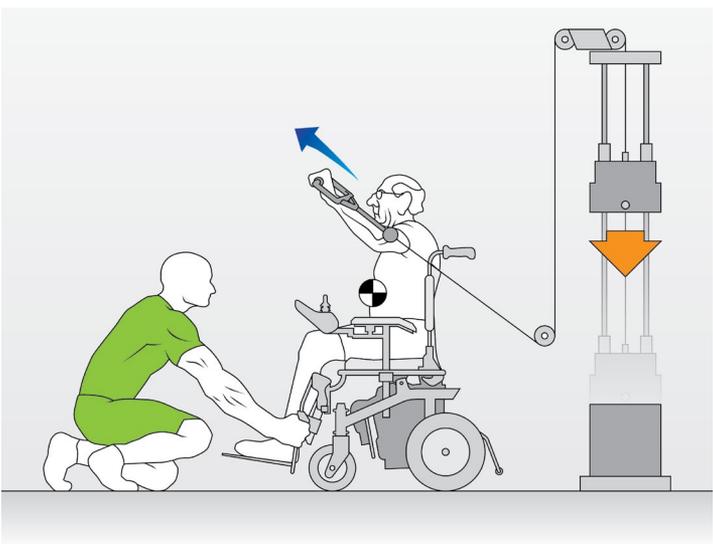
In addition to these considerations, please read and follow all instructions located on fitness equipment prior to use. Fully understanding how to properly exercise before beginning will lead to a safe and beneficial fitness experience and will maximize your results.

2.3. Warnings

WARNING: Failure to take stability issues into consideration could cause you to tip over while exercising in your manual or powered mobility device and could result in severe injury or death. Always attempt exercises for the first time with the assistance of a spotter and be aware of the potential for your mobility device to tip over in any direction. Always lock your mobility device in position prior to exercising. The use of wheel-locks is recommended during exercise. Powered mobility devices should be turned off prior to exercise.

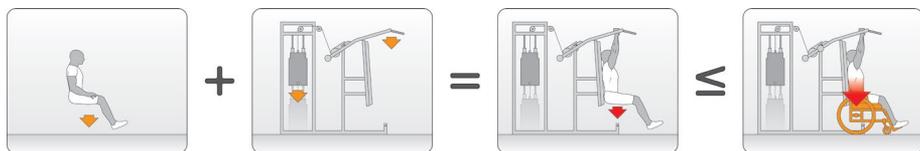


Incorrect exercise position



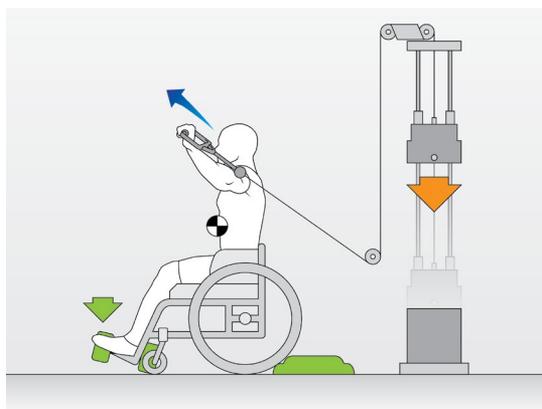
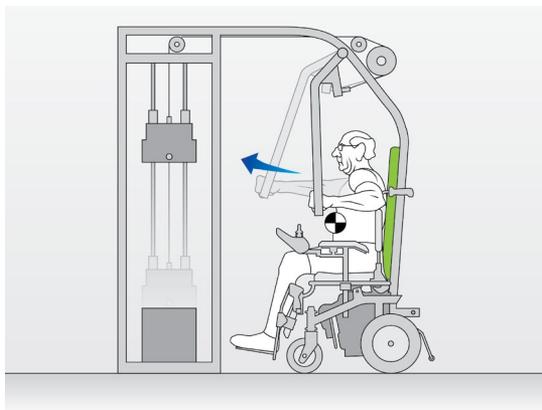
Correct exercise position

OVERLOADING WHEELCHAIR WARNING: The combination of your body weight and the exercise weight that you are lifting while seated in your mobility device effectively increases the total payload weight in your mobility device. Determine the maximum recommended weight capacity of your mobility device and stay within this limit to ensure that you will not cause overstressing to the structure of your mobility device. Exceeding the maximum payload of your mobility device could result in failure of one or more components of your mobility device and could result in severe injury or death.



2.4. Positioning and Securement of the Wheelchair

Exercising in your wheelchair – Some fitness equipment allows you to exercise while seated in your wheelchair. It is generally best to move your wheelchair as close to the exercise equipment as possible, putting your rear wheels or the frame of your wheelchair into contact with the support structure or padding provided for exercise. Fasten your wheel-locks. Step risers can be used to block the wheels of your wheelchair to further assist in preventing movement of your wheelchair during exercise. Use of weight or the assistance of a spotter will be required to maintain stability during certain exercises.



Correct exercise positions

Postural positioning strap –

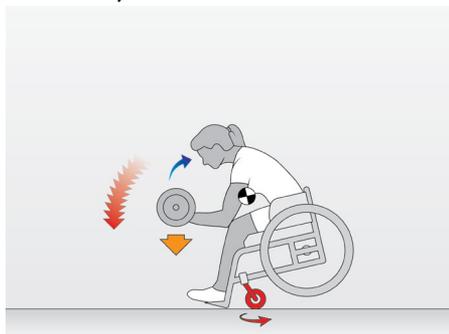
You can use a long strap with an adjustable buckle to strap yourself into your wheelchair seat while exercising. The strap can be passed underneath the seat frame portion of the wheelchair and over your thighs to hold you securely into the seat of your wheelchair during exercise.



2.5. Ways to Increase Stability of the Wheelchair

2.5.1 Forward Stability

Front wheel caster orientation – You can increase the stability of your wheelchair in the forward direction by moving your wheelchair backwards to rotate your front casters forward before locking your wheel-locks.



Incorrect front caster position



Correct front caster position

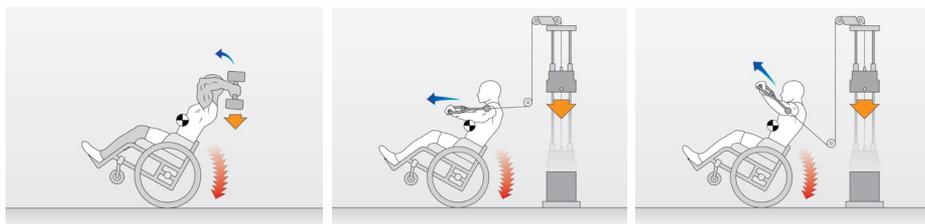
2.5.2 Rearward Stability

Rear axle position – Many manual wheelchairs have adjustable axle positioning to move the rear wheels forward and backward. Be aware that if your wheelchair has the rear wheels positioned forward, making the wheelchair tippy, you may need to be very careful about tipping to the rear when exercising while seated in your wheelchair.

Use of a spotter – Multiple exercises may cause rearward tipping, such as pushing weights forward or upward, or lifting weights above and behind the head. Having a trainer hold down the front of your wheelchair near the front casters or leg supports will prevent your wheelchair from tipping over to the rear while exercising.

Use of weight on the foot support – A dumbbell can be placed on the foot support of the wheelchair to add extra weight to the front of the chair. This will help to reduce the tendency to tip to the rear while exercising in your wheelchair.

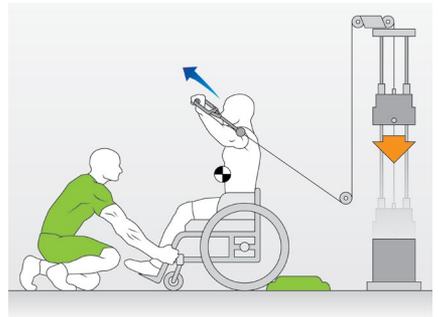
Use of a restraint – A large plate that sits underneath all wheels of the wheelchair with two ratchet straps at the front can be used to hold down the front of the wheelchair during exercise. The wheelchair user can back onto the plate and the two straps are then hooked onto the frame of the wheelchair near the front casters to hold down the front of the wheelchair during exercise.



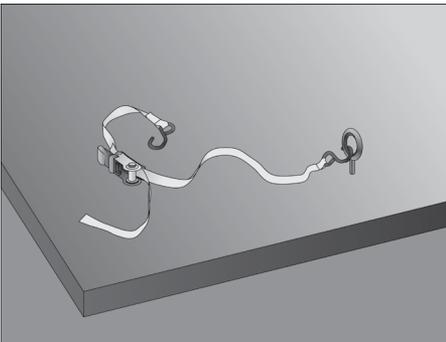
Incorrect rearward stability method



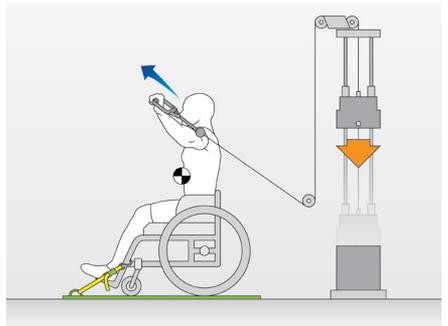
Correct stability techniques using spotter and/or weight on foot support



Correct stability techniques using spotter and/or weight on foot support



Securement strap



Correct rearward stability method using a restraint

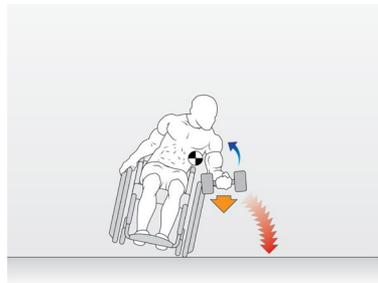
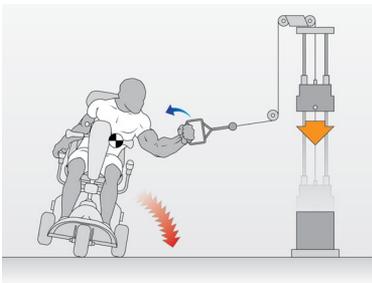
2.5.3 Lateral Stability

Leaning – Stability may be increased by leaning toward the side of the wheelchair opposite the tipping direction.

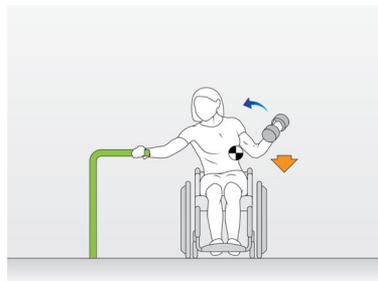
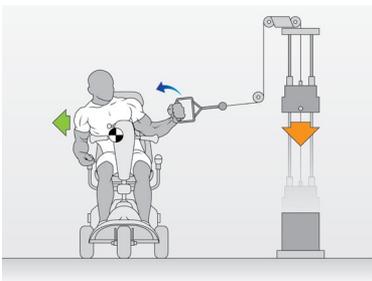
Holding - If possible, you can hold onto the wheelchair frame or wheel on the opposite side for stability. It may also be possible to hold onto a handrail or another piece of stationary fitness equipment.

Use of a spotter – While lying back on a bench or raised mat area, the assistance of a spotter will help to prevent lateral tipping.

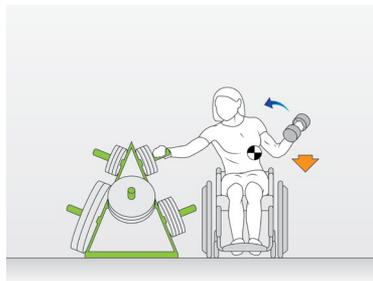
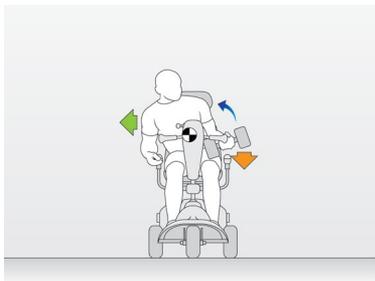
Use of a strap – While lying back on a bench or raised mat area, a strap around the legs above the knees may be used to keep the legs positioned correctly.



Incorrect lateral stability method



Correct lateral stability method



Correct lateral stability method

2.6. Removing and/or Moving Seating on Fitness Equipment

Adjustment of seat height – Most fitness equipment has an adjustable seat height to move the seat up and down. You may need to ask for the assistance of a trainer to make the adjustment since the seats can be heavy and typically require the use of two hands to adjust.

Seat size – If the width or depth of the seat on the fitness equipment is too small it will be difficult to transfer on and off of the fitness equipment. Keep in mind that it may not be realistic to exercise on certain pieces of equipment.



Removal of seat – Some fitness equipment allows the removal of the seat altogether. If the frame structure of the remaining equipment is low enough, it may be possible to back or drive into the equipment to exercise while seated in your wheelchair.



2.7. Transfers from Wheelchair Into and Out of Fitness Equipment

Wheelchair positioning prior to transfer – Figure out the best angle to approach the fitness equipment from your wheelchair. A side-to-side parallel approach or a 90-degree approach is usually the easiest for most wheelchair users. Lock the wheel-locks on your wheelchair prior to transferring.



Grip locations for transfer versus exercise – Make sure you know which grip locations on the exercise equipment are designed to move and which ones are fixed. Use the fixed ones as gripping locations when transferring into and out of the fitness equipment. If the fitness equipment has no fixed transfer points to use for the transfer, you can sometimes adjust the weight of the exercise machine to the maximum and then use the grip location that is designed to move as a transfer point as long as your body weight is less than the weight on the exercise machine. Always test the grip that you are using to assist in transfers the first time by proceeding cautiously, as the grip point may move unintentionally or not hold under body weight.

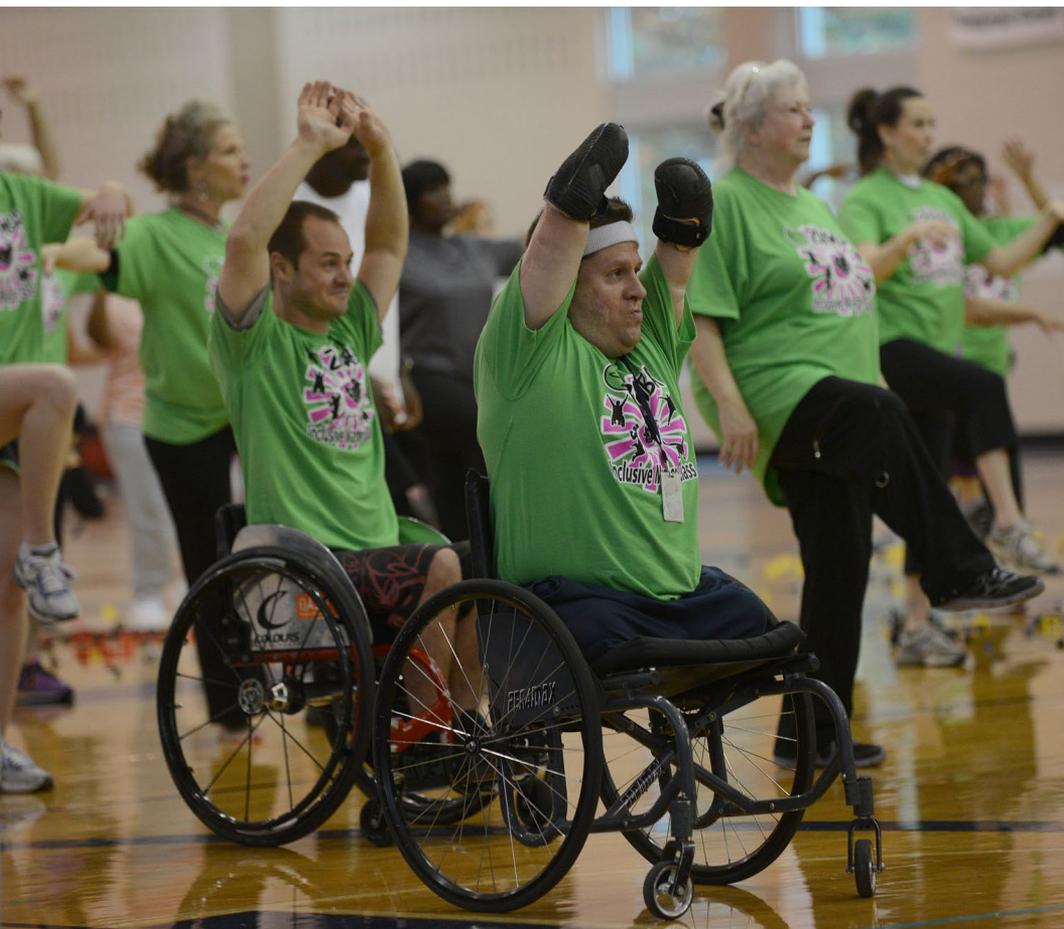


Adjust lift pin to maximum exercise weight to support body weight



Warning: Failure to adjust exercise weight to maximum weight may result in falling

Pressure relief seat cushion – To prevent skin breakdown during exercise, a Sunrise Jay Protector™ or another wheelchair cushion should be placed on the seat of the fitness equipment if you are used to sitting on a pressure relief cushion in your wheelchair.



3.0 Adaptive Equipment

There are several pieces of adaptive equipment that can help you perform your exercise program with greater ease. For more information on how to order adaptive equipment, visit: www.nchpad.org.

3.1 Grasping Cuff or Activity Mitts

Grasping cuffs can be used when grip strength or hand function is limited. Grasping cuffs are very helpful and effective for hands to grip weight machines or dumbbells.



3.2 Wrist Cuff

The use of nylon cuffs with a metal ring is a great way to perform resistance exercises by wearing the cuff on the residual limb. The metal ring should be strong enough to attach weighted resistance to. Depending on the length of the residual limb, you may be able to perform many strength exercises by attaching the nylon cuff with a metal ring to either resistance bands or cable resistance. Wrist cuffs can also be used for individuals with limited hand function.



3.3 Stabilizing Straps

For those who have difficulty with balance and stability, stabilizing straps and gait belts aid in proper seating and positioning in a wheelchair.

3.4. Ankle and Wrist Weights

Ankle weights and wrist weights are weighted cuffs that can be used for various strength training activities. These can be highly effective for persons using wheelchairs in terms of both upper extremity and lower extremity movements. These weighted cuffs can be secured to the body by using an adjustable Velcro strap.

3.5. Medicine Ball

A medicine ball is a weighted ball used during strength training. For individuals with limited hand function, a ball with a textured surface, handles, or straps should be used.



3.6. Elastic Bands or Tubing

Elastic bands or tubing are effective, low-cost, and portable pieces of equipment that allow exercise comparable to activities done with free weights. They provide varying degrees of resistance according to their color and can be performed virtually anywhere, whether seated or standing. To increase the resistance, you may allow less slack in the band or move it away from your anchor. Anchoring is the process of tying one end of the resistive band to a secure, fixed object.



4.0 Getting Started

Before beginning your exercises, it is important that you first perform a warm-up to prepare the muscles of the body. The warm-up can be any activity that gets you moving, such as light rolling or an aerobic activity such as cycling (see 8.3).

After you complete your cardiovascular exercise and strength training routine, you should also perform a 5-10 minute cool-down, including stretching to maintain range of motion and flexibility.

It is beneficial to exercise most days of the week. Start slowly if you are a beginner or if you have not exercised in a long time. If you have any special health concerns, you should consult your physician prior to beginning an exercise program. If any of the exercises you perform result in pain or discomfort, stop immediately and let your physician know. Once you have determined that the exercises are safe and enjoyable for you, you can choose to perform the aerobic and weight training sessions on alternate days in accordance with the Physical Activity Guidelines for Americans (PAG).

4.1. Rating of Perceived Exertion (RPE) Scale

RPE Scale	
0	<i>Nothing at all</i>
1	<i>Very Light</i>
2	<i>Light</i>
3	<i>Moderate</i>
4	<i>Somewhat Hard</i>
5	<i>Hard</i>
6	<i>Very Hard</i>
7	<i>Very Hard</i>
8	<i>Very Hard</i>
9	<i>Very, Very Hard</i>
10	<i>Maximal</i>

When exercising, you want to stay between levels 3 and 4 of the RPE. It may take you a few exercise sessions to get a feeling for how hard you are working in order to properly adjust your exercise routine.

Another way to measure exercise intensity that is less “scientific” yet very helpful is the “Talk Test.” You should be able to keep a normal conversation while exercising. You may breathe a little heavier, but gasping for air and feeling as though you cannot breathe indicates that the exercise is too intense and you ought to slow down.

4.2. Exercise Precautions

Individuals should take note of the following special considerations during exercise and physical activity:

Individuals with limb loss due to vascular disorders, such as diabetes or atherosclerosis, should be aware of any activity restrictions instructed by their physician. Due to the fact that exercise can reduce the need for insulin, individuals with diabetes should monitor their glucose frequently and always have a quick-acting carbohydrate fuel to treat hypoglycemia during exercise. Appropriate carbohydrate sources include, but are not limited to, sports drinks, gels, and glucose tablets. Consuming around 30 grams of carbohydrates is considered the typical treatment for hypoglycemia.

4.2.1.

Wear any special medical identification that may prove helpful in the event of a problem occurring during exercise.

4.2.2.

Wear comfortable athletic shoes with cotton socks that will not rub or cause sores during exercises. A thorough foot inspection should be done before and after exercise.

4.2.3.

Be aware of any medications you are taking that may have an effect on your ability to exercise.

4.2.4.

Consume adequate amounts of fluids (preferably water) prior to, during, and after exercise. According to the National Strength and Conditioning Association (NSCA), ideal fluid replacement calls for 16 ounces of liquid before exercise, 6 to 8 ounces every 15 minutes during exercise, and a half-liter for every pound lost during exercise.

4.2.5.

Check any tender points, skin breakdowns, or infections in the area of a residual limb, especially if adaptive devices are used during resistance exercises. In the long-term, these can further aggravate the residual limb and may keep you from participating in exercise, recreational activities, work-related activities, and other daily life activities.

4.2.6.

Avoid overuse injuries to the uninvolved limbs.

4.2.7.

You may have a tendency to fatigue easily, especially in the area of the residual limb.

4.2.8.

Lack of adequate balance may interfere with the ability to perform exercises safely.

4.2.9.

Weakness and/or limited range of motion of the arms or legs may interfere with a person's ability to maintain a constant rate of exercise.

4.2.10.

Receptive aphasia, mental confusion, and/or apraxia may interfere with the ability to understand and follow directions during exercise testing and training sessions.

4.2.11.

Individual physical capacity and endurance may be severely limited due to secondary orthopedic, arthritic, cardiovascular, and/or other injuries incurred at the time of an accident that may have been the cause of a primary disability or impairment.

4.2.12.

If at all possible, check your blood pressure before, during, and after exercise. You can purchase a blood pressure monitor at your local pharmacy. It is important to monitor your blood pressure during exercise; if your blood pressure is too high it can put abnormal stress on your heart.

4.2.13.

Individuals with spinal cord injuries at or above the level of T6 may have an impairment of the sympathetic nervous system, which is responsible for the increase in heart rate during exercise. Therefore, an alternative method for monitoring exercise intensity that does not depend on the heart rate is recommended. Exercise intensity may be monitored using a Rating of Perceived Exertion (RPE) scale (see previous section on RPE).

4.2.14.

The maximal heart rate for individuals with tetraplegia (T1 and above) is typically limited to 120 to 130 beats per minute.

4.2.15.

It is important to check for pressure sores before and after every workout. Specifically, check bony areas of the body, such as the elbow, shoulder blade, tailbone, hip, knee, ankle, heel, and the side of the leg pressing against the inside of your wheelchair. Examine these areas for any redness, blisters, openings in skin, or rashes.

4.2.16.

Individuals with surgically placed rods or a spinal fusion should be aware of restrictions to movement and exercises. Consult with your physician to make sure that the exercises in this guide are safe if you have one of these conditions.

4.2.17.

Thermoregulation or body temperature regulation is affected below the level of injury. The external environment in which exercise is performed will be a major determinant of body temperature during exercise. Anticipate these exercise conditions. Keep a cold, damp cloth, fan, or spray bottle handy when the temperature is too hot or when you feel you are getting overheated.

4.2.18.

Individuals with sensory impairments may not be able to obtain an accurate pulse.

4.2.19.

Some medications will inhibit (prevent) heart rate from going above a certain level (ask your doctor to explain this to you).

4.2.20.

An individual with a C1-C4 lesion may have decreased respiratory function that leads to problems such as increased risk for respiratory infections, congestion, rapid breathing, and/or increased shortness of breath. Breathing exercises may be beneficial in sustaining healthy lung capacity, lung expansion, and lowering risk for respiratory complications, such as pneumonia.

5.0 Flexibility/Cool Down – Upper Body Stretches

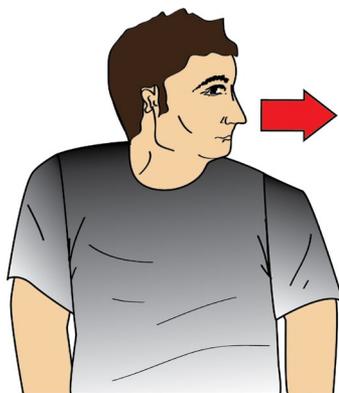
Just as the warm-up is important to get your body started, the cool-down is very important to return your body to its resting state. The cool-down is a great time to perform flexibility (stretching) exercises.

While stretching, find the point where you feel a slight pull and hold. Do not bounce or try to stretch to a point at which pain is felt. You should breathe regularly. Hold each stretch for 10-30 seconds and repeat.

Upper Body Stretches

5.1. Neck Rotation

Take a deep breath in, and exhale while turning the head to one side, looking over that shoulder. Hold. Repeat on the opposite side.



5.2. Neck Lateral Flexion

Take a deep breath in. Exhale as the neck bends to one side and the ear goes down towards the shoulder. Hold. Repeat on the opposite side.



5.3. Neck Forward Flexion

Take a deep breath in. Exhale as you slowly lower the chin to the chest. Hold.



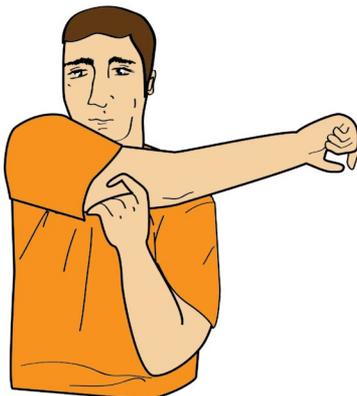
5.4. Shoulder Rolls with Depression

Take a deep breath in, and roll the shoulders up towards the ears. Exhale and roll the shoulders back while depressing. Hold.



5.5. Posterior Deltoid Stretch

Take a deep breath in, and extend one arm out in front of you. Exhale as you hook the arm slightly above the elbow with the opposite hand, bringing it across and in towards the chest.



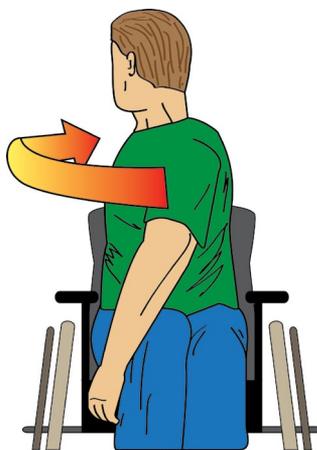
5.6. Tricep Stretch

Take a deep breath in, and extend both arms above the head. Reach down the center of the back with one arm, and exhale, pressing down slightly with the opposite hand on the elbow. Repeat on the opposite side.



5.7. Trunk Rotation

Place the hand on the opposite thigh. Take a deep breath in and exhale while twisting the torso, looking over the shoulder. Hold, and repeat on the opposite side.



5.8. Lateral Trunk Flexion

With the arms at your side, take a deep breath in, and exhale as the trunk bends to the left and the right arm extends overhead. Hold, and repeat on the opposite side.



5.9. Rhomboid Stretch

Extend the arms out in front, crossing them over so the palms are touching. Inhale and raise the arms up to shoulder height. Exhale and push the shoulders forward. Hold.



5.10. Biceps Stretch in Doorway

Extend the left arm out to the side. Place the left fist in the doorway with the palm down. Take a deep breath in, and exhale while turning the head to the right, looking over the right shoulder. Switch sides and repeat.



5.11. Seated Chest Stretch in Doorway

Place an arm bent at 90 degrees in doorway. Take a deep breath in, exhale while turning the head to the opposite side, looking over that shoulder. Repeat with other arm, looking over the opposite shoulder.

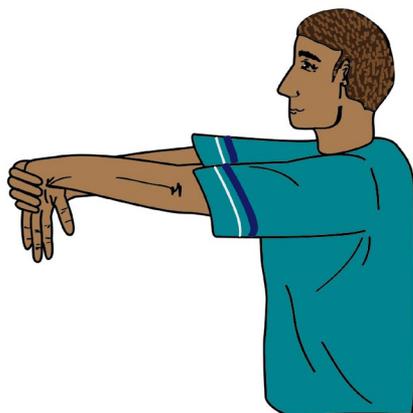
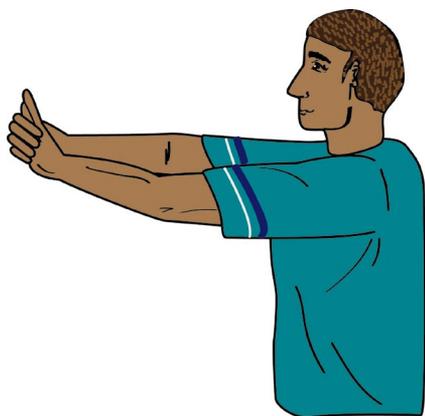


5.12. Chest Stretch (hands clasped behind back)

Clasp hands behind your back. Take a deep breath in. Exhale and roll your shoulders back as you stick out your chest and hold (10 seconds). Unclasp hands and relax.



5.13. Wrist Flexion and Extension Stretch

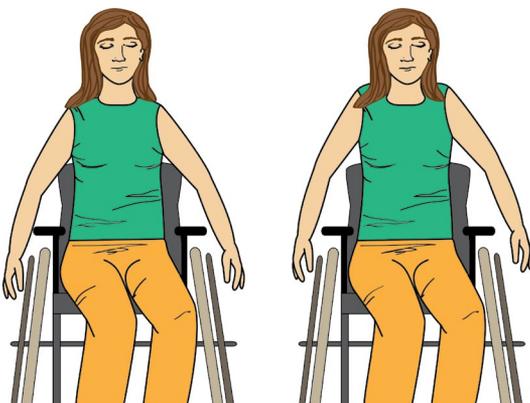


Extension – Extend an arm out in front; take a deep breath in, point fingers up, grasp upper palm and lower portion of finger with opposite hand, exhale, pulling palm and fingers towards you. Repeat with other arm.

Flexion – Extend an arm out in front; take a deep breath in, point fingers down, grasp upper palm and lower portion of finger with opposite hand. Exhale, pulling palm and fingers towards you. Repeat with other arm.

5.14. Shoulder Shrug

Take a deep breath in, lift and hold your shoulders up to your ears and hold (10 seconds). Exhale and allow your shoulders and arms to drop down by your side reaching toward the floor and hold that stretch (10 seconds).



5.15. Hamstring Stretch

Lift one leg up and place it out in front of you on a chair, mat, or bench. Take a deep breath in. Exhale as you reach your arms forward as far as possible toward your foot. Hold your foot and gently pull the ball of your foot toward you, flexing your ankle toward you and hold (20 seconds). Repeat with the other leg.



5.16. Shoulder Retraction

Take a deep breath in. Exhale and bring shoulders back as far as you can, squeezing your shoulder blades inward (see Chest Stretch 5.12).

6.0 Strength Training Exercises for the Upper Body

WARNING: If there is a crepitation or any popping inside the shoulder on any exercise, you should change the movement pattern so that this does not occur. If you do not have good shoulder stability, do not perform any exercises that cause your elbow to move above the height of your shoulder.

There are five basic factors in strength training:

- 1) Exercise Repetition:** One movement or exercise completed through a full range of motion.
- 2) Exercise Set:** A group of multiple repetitions performed in a row, e.g., a set of 10 repetitions.
- 3) Exercise Frequency:** The number of training times per week.
- 4) Exercise Weight:** The amount you are lifting, usually expressed in pounds.
- 5) Stability:** The positioning of the wheelchair user in the wheelchair or during the exercise in order to maintain proper balance.

6.1. How Hard Should I Exercise?

Use lighter loads when beginning a weight-training program in order to master the technique. You should feel comfortable with body positioning, moving through a comfortable range of motion, lifting the weight in a slow and controlled manner, lowering the weight in a slow and controlled manner, and breathing – exhale with exertion, do not hold your breath. Start with a weight that you can lift for 12-15 repetitions. If you are able to perform more than 20 repetitions, the weight or resistance can be increased. If you are unable to reach 12 repetitions comfortably, the weight or resistance may be too heavy.

You should not work the same muscle group every day. Alternate days of rest with days of activity. Make small increases in the amount of weight as the exercise becomes easier.

If you have problems with balance or trunk instability, do not lift free weights over your head without a spotter or trainer.

For all exercises, take a deep breath and exhale during the lifting portion of the exercise and inhale as you return the weight to the starting position. Exercise in front of a mirror and use your own muscles to balance and sit as upright as possible.



6.2. Wrist Strengthening

Muscles: Flexor Carpi Radialis, Flexor Carpi Ulnaris, Extensor Carpi Radialis, Extensor Carpi Ulnaris

Grip the ends of the Flex Bar with both hands. Take a deep breath in, exhale and twist the right hand forward and the left hand backwards. Inhale as you slowly allow the Flex Bar to return to the starting position. Repeat the exercise, twisting the opposite direction with right hand backwards and left hand forwards.

6.3. Power Web

Muscles: Flexor Carpi Radialis, Flexor Carpi Ulnaris

Sit up with good body alignment and feet flat. Position the power web in front of you. Place a hand in the web spreading the fingers out and squeeze the web in flexion. Then place the hand in the web with the fingers close together and spread the fingers out in extension. Exercising the opposing muscle groups is important for all exercises. Inhale as you return to the starting position. Repeat with the opposite arm.



6.4. Shoulder Abduction

Caution: Lateral Instability (See 2.5.3)

Muscles: Medial Deltoid, Supraspinatus

Note: Wrist weights can be used for individuals with limited grip strength.

Grasp a dumbbell. Place the hand you are not lifting with on the chair, wheel, or another stationary object for stability. Sit up nice and tall with the arm extended down at your side, palm facing in. Keeping the upper body stationary, take a deep breath in and exhale as you extend the arm out to the side, slightly in front of the body, and raise to shoulder level. Keep a slight bend in the elbow, the hand in line with the arm. Do not use jerking or swinging motions. Inhale as you reverse the direction and allow the arm to slowly go back down to the starting position. Repeat with the opposite arm. This exercise can also be performed with the elbows bent 90 degrees. Performing this exercise with the thumb pointed down will engage the supraspinatus muscle which is part of the rotator cuff that provides the shoulder with stability.



The medial deltoid shoulder abduction can be performed with two dumbbells at the same time. Hold the dumbbells at your side with your elbows bent 90 degrees. Raise your elbows slowly until they are even with your shoulders. Then lower your elbows back down to your side slowly.

External rotation shoulder abduction: Start with your arm hanging down by your side. Lift your arm up to shoulder level keeping in line with the side of your leg with your thumb pointing up.





Supraspinatus shoulder abduction: Start with your arm hanging down by your side. Starting with a much lighter weight, lift up your arm to shoulder level keeping in line with the side of your leg with your thumb pointing down. This strengthens an important rotator cuff muscle that will help stabilize your shoulder.

6.5. Shoulder Adduction

Muscles: Pectoralis Major

Grip the ends of the Flex Bar with both hands. Hold the Flex Bar chest high, elbows out to the sides. Take a deep breath in, exhale and bend the Flex Bar down moving the elbows toward the body. Inhale as you raise elbows back up to the starting position.



6.6. Upright Row

Muscles: Deltoids, Trapezius, Biceps Brachii

Start with your arms down at either side in front of you, palms facing back. Use a strap to support your upper body if needed. Exhale and bend your elbows to bring your hands up to your armpits. Keep your hands close to the body through the motion. Inhale and slowly lower to the starting position.

Note: Individuals with a complete injury at or above the C6 level may not be able to perform this movement.

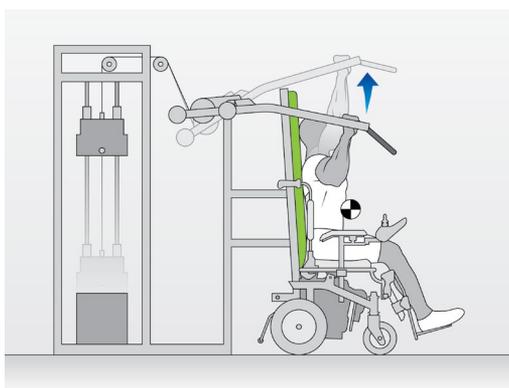


6.7. Overhead Shoulder Press

Caution: Rearward Instability (See 2.5.2)

Muscles: Anterior and Medial Deltoids, Upper and Middle Trapezius

Sitting up with good body alignment grasp the hand grips, and if needed secure with gloves. Bring hands to shoulder level with palms facing forward and take a deep breath in. Exhale and push the arms above the head and toward the middle of the body in an arc motion. Do not arch the lower back or forcefully lock out the elbow. Allow the elbow to slowly flex, inhale and lower the hand grips back down to the beginning position. If you do not have good shoulder stability, this should only be done until the elbow is even with the shoulder and no higher.



6.8. Lateral Pull Down

Caution: Rearward Instability (See 2.5.2)

Muscles: Latissimus Dorsi, Teres Major, Middle Trapezius, Rhomboids

Grasp the hand grips with palms facing forward. Grip should be wider than shoulder width apart. Position the feet flat and lean the torso slightly backward and extend elbows fully. Take a deep breath in, exhale and pull the hand grips toward the upper chest, maintaining a slight torso backward lean. Do not jerk the torso for assistance. Bring the hand grips down until they are almost touching the shoulders. Inhale as you allow the arms to slowly extend back to the beginning position.

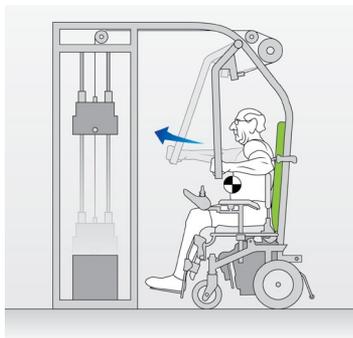


6.9. Forward Chest Press

Caution: Rearward Instability (See 2.5.2)

Muscles: Pectoralis Major, Pectoralis Minor, Anterior Deltoid, Subscapularis, Serratus Anterior

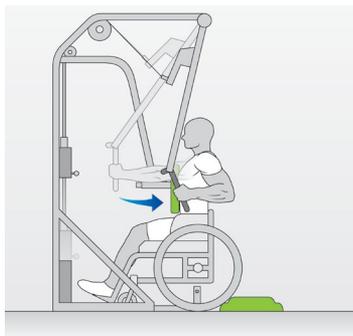
Position your chair to face away from the fitness equipment. Grasp the hand grips and align hands with the center of the chest. Take a deep breath in, exhale and push hands away from the chest to an almost fully extended elbow position. Do not bend wrists, but keep them straight. Do not arch the back. Inhale as you allow the hand grips to slowly return to the starting position, staying level with the chest.



6.10. Seated Row

Muscles: Rhomboids, Posterior Deltoids, Latissimus Dorsi, Teres Major and Minor, Infraspinatus, Middle Trapezius

Position your chair to face toward the fitness equipment. Adjust chest pad so that your back remains straight and upright while being able to grasp the hand grips with arms fully extended in front of you. Grasp the hand grips with a closed or vertical grip. The grip should be wider than shoulder width apart. Position your feet flat, if you are able to. Take a deep breath in, exhale and pull the hand grips back towards the chest, squeezing the shoulder blades together. Pull the hand grips back as far as you can without jerking the torso. Inhale as you allow the hand grips to return to the starting position, keeping the elbows inwards towards the ribs.

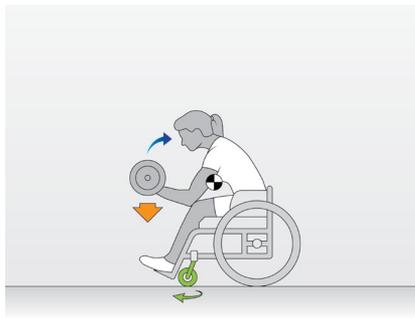
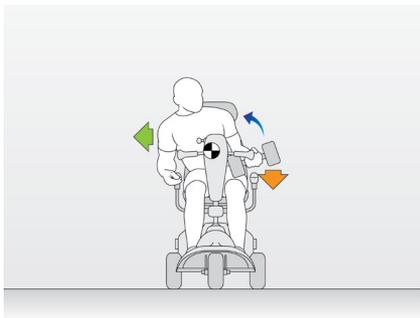


6.11. Bicep Curl

Caution: Lateral or Forward Instability (See 2.5.3 and 2.5.1)

Muscles: Biceps Brachii, Brachioradialis, Brachialis

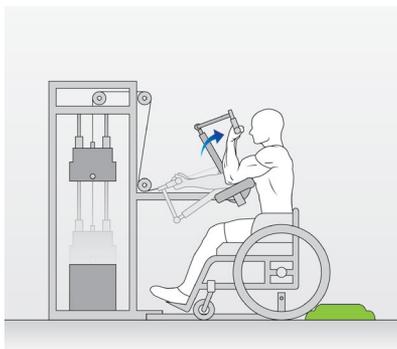
Start with one arm extended at your side, palm facing up, grasping the dumbbell. If needed, remove the side guard or arm support of your wheelchair or transfer onto a bench in order to perform the movement with a full range of motion. Keeping the upper arm and upper body stationary, take a deep breath in. Exhale and flex the elbow, raising the forearm towards the shoulder. Do not jerk or swing the dumbbell upward. Inhale as you reverse the direction, slowly extending the weight back to the starting position. Lean toward the opposite side of your wheelchair to increase your lateral stability as well. If possible, you can hold onto the wheelchair frame or wheel on the opposite side for stability. It may also be possible to hold onto a handrail or another piece of fitness equipment to assist with your lateral stability. Repeat with the opposite arm.



6.12. Arm Curl Machine

Muscles: Biceps Brachii, Brachialis, Forearm Flexors

Grasp the hand grips with palms facing upwards and keep wrists straight throughout the exercise. Rest upper arms on the pad, keeping elbows in line with the pivot point of the machine. Sit up straight and take a deep breath in. Exhale and raise the forearm towards the shoulder. Inhale as the arms slowly return to the starting position, almost fully extended.



6.13. Triceps Kickbacks

Muscles: Triceps Brachii

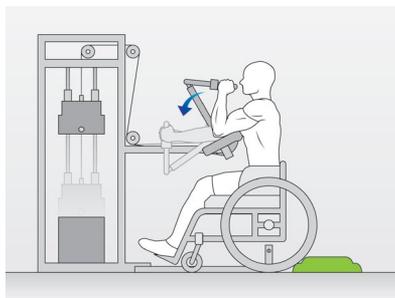
Place the hand you are not lifting with on the chair, wheel, or another stationary object for stability and to allow you to slightly lean forward. With one hand grasping the hand grip of the free weight or cable resistance, move the elbow behind the midline of the body, keeping the arm at 90 degrees. Take a deep breath in. Exhale and flex the elbow and inhale as you return the forearm to the starting position. Repeat with the opposite arm.



6.14. Arm Extension Machine

Muscles: Triceps Brachii

Lift up handles, grasp the hand grips with palms facing inwards and keep wrists straight throughout the entire exercise. Rest upper arms on the pad, keeping elbows in line with the pivot point of the machine and with the shoulders. Sit up straight and take a deep breath in. Exhale, pushing forearms downward as the upper arms remain on the pad. Inhale as the forearms return to the starting position.



6.15. Bent Over Shoulder Fly

Caution: Forward Instability (See 2.5.1)

Muscles: Posterior Deltoid, Trapezius

Position yourself face down on an incline bench and start with your arms fully extended out in front of you. Grasp the dumbbells in your hands, having the dumbbells touch out in front of you. Extend your arms out to the side contracting your shoulder blades and then lower your



arms back in front until the dumbbells touch again at the starting position. Keep your elbows straight without locking during the entire movement.

6.16. External Rotation Row and Bent Over Row

Caution: Lateral or Forward Instability (See 2.5.3 and 2.5.1)

Muscles: Trapezius, Posterior Deltoid

For wheelchair users, the most effective row can be performed on a weight bench or by leaning forward on your thighs if you have the core strength.

External Rotation Row

With the elbow raised even with the shoulder as shown on the right, raise the hand forward until the hand is level with the shoulder.



Bent Over Row

Starting with the arms extended fully down toward the floor, pull your elbows up and back pinching your shoulder blades together as shown on the right. If you have the core strength, you can also lean forward with your chest on your lower legs to perform this exercise.



6.17. Reclined Pectoral Fly

Caution: Lateral Instability (See 2.5.3)

Muscles: Pectoralis Major

Transfer to a bench or raised mat area. Lie on your back, keeping the spine neutral and your head remaining on the surface. A strap around the legs above the knees may be used to keep the legs positioned correctly when lying back on the surface. You may need an assistant to hand you the dumbbells after you are positioned correctly. With weights in your hands and arms extended out to the sides, exhale and bring both arms together over your chest. Keep a consistent slight bend in the elbow throughout the motion and do not jerk or swing the weight up. If you cannot maintain your arms in the same extended, slightly bent position throughout the

movement, a lower weight should be used. Inhale as you slowly allow your arms to return to the starting position. A strap around the legs, below or above the knees, may be used.



6.18. Lying Abdominal Crunches

Caution: Lateral Instability (See 2.5.3)

Muscles: Rectus Abdominus, Transverse Abdominus

Position yourself facing up, on a flat or declined bench, or a flat mat. If possible, bend knees while keeping feet flat on the floor. A strap around the legs above the knees may be used to keep the legs positioned correctly when lying back on the bench. An additional strap can be used to secure the feet to the surface or have a spotter assist by holding the feet down. While lying down with shoulder blades and neck in alignment with the body, exhale and curl up. Allow shoulder blades to come up off the surface and keep your eyes focused on the ceiling directly overhead. Inhale as you slowly return to the starting position, allowing shoulder blades to return to the surface.



Inhale as you slowly return to the starting position, allowing shoulder blades to return to the surface.

Note: For individuals with a spinal cord injury, this exercise can be performed using a counter weight such as a medicine ball thrown over head or resistance band positioned around a secure object.

6.19. Seated Abdominal Machine

Muscles: Rectus Abdominus, Transverse Abdominus

Fold arms, resting hands on shoulders and resting arms on top of the pad. Keep chin resting on pad or arms throughout the entire exercise. Sit up straight, slightly arching back to extend abdominal muscles. Take a deep breath in. Exhale as you move the pad down, allowing elbows to touch knees if possible. Keep chin resting in same position. Inhale as you slowly return to the starting position. Make sure to engage your abdominal muscles while pushing the pad down and not utilizing arm or back strength.

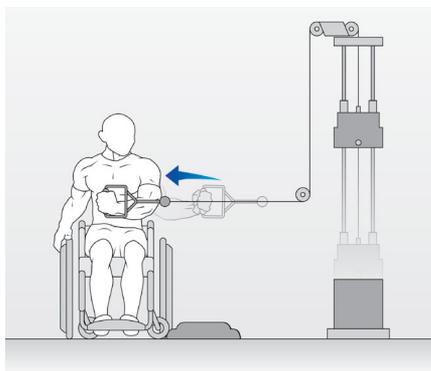


6.20. Internal Rotation

Caution: Lateral Instability (See 2.5.3)

Muscles: Anterior Deltoid

Position the side of your chair toward the fitness equipment and grasp the hand grip with the hand closest to the equipment. Place the other hand on your lap or wheel for stability. Bend the arm at a 90 degree angle. Keep elbow firmly against your side. Take a deep breath in. Exhale as you bring your hand across your body. Inhale as you slowly return to the starting position.

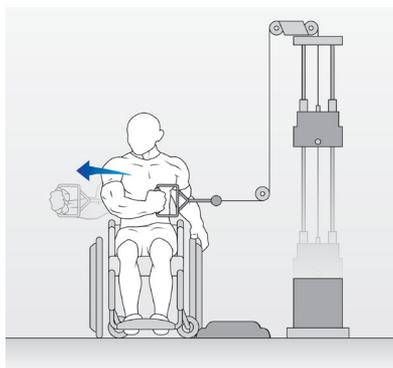


6.21. External Rotation

Caution: Lateral Instability (See 2.5.3)

Muscles: Rotator Cuff

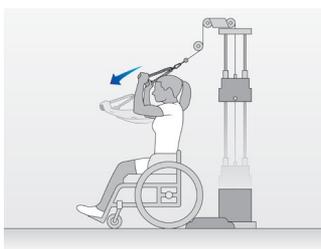
Position the side of your chair toward the fitness equipment and grasp the hand grip with the hand farthest from the equipment. Place the other hand on your lap or wheel for stability. Bend the arm at a 90 degree angle, elbow firmly against your side and forearm across your body. Take a deep breath in. Exhale as you bring your hand out to the opposite side of your body. Inhale as you slowly return to the starting position.



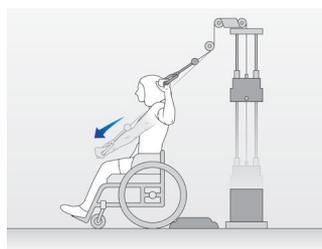
7.0 Pulley Exercises

The following pulley exercises are all designed to strengthen the muscles in the rotator cuff group of muscles. Performing these exercises on a regular basis will strengthen all of the muscles that functionally hold your shoulder together to perform most of the activities that you need to be able to perform using a wheelchair. This includes propelling your wheelchair and performing transfers.

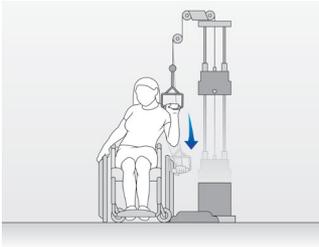
While performing any pulley exercise, in order to exercise and strengthen your balance and torso, avoid grasping tightly onto the frame, wheel, or arm support of the wheelchair. This will generally require leaning away from the pulley machine during the initial portion of the pull. As the hand holding the pulley crosses the centerline of the body, you will likely have to lean in the other direction to stay balanced. Keeping a hand on a solid part of the wheelchair will allow you to maintain your balance if you start to lose your balance. For more information on stability issues, see section 2.5. Select a weight that seems easy at first. You should be able to perform the exercise for up to 15 to 20 repetitions in one set of exercises before you increase the weight. It is suggested that you perform three sets of repetitions of each pulley exercise that you are doing on any particular day. If you cannot perform at least 12 repetitions during each set of exercises, you should decrease the amount of weight that you are using to exercise. In most of these shoulder stability exercises, the number of repetitions is more important than the amount of weight.



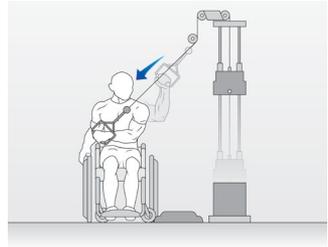
Overhead Triceps Extension



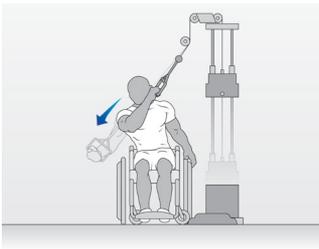
Decline Press



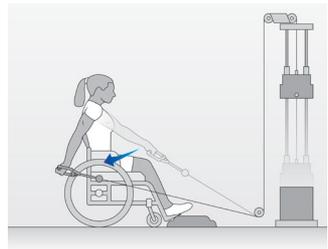
One-Arm Triceps Extension



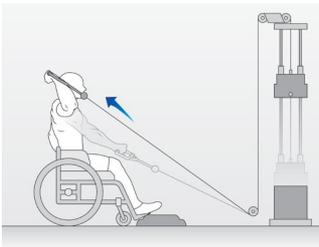
Pull-Down Diagonal (1)



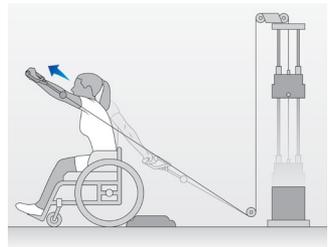
Pull-Down Diagonal (2)



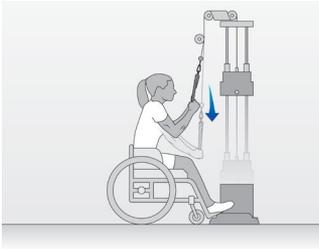
Pull-Back Straight Arm



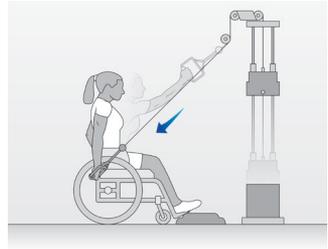
Pull-Back Rotation



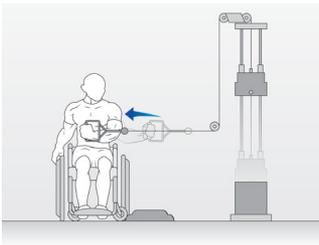
Pull-Push Incline Press



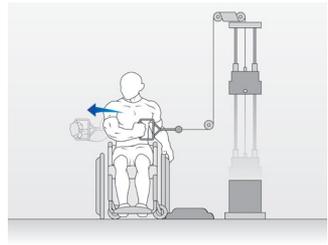
Triceps Extension with Rope



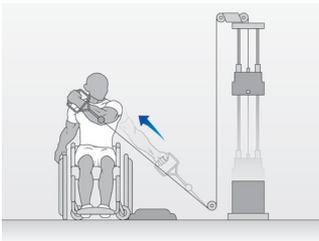
Pull-Back Straight Arm



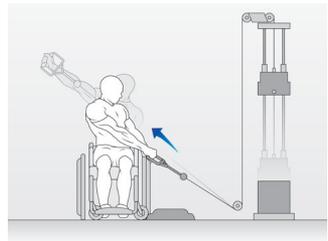
**Shoulder Internal Rotation
(See 6.20)**



**Shoulder External Rotation
(See 6.21)**



Pull-Across Diagonal (1)



Pull-Across Diagonal (2)

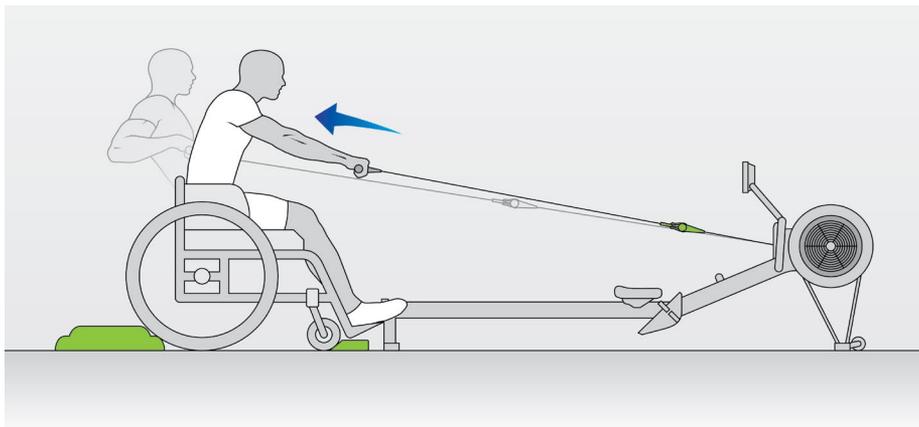
8.0 Cardiovascular Exercise

How Hard Should I Exercise?

Target Heart Rate

Age-predicted maximum heart rate can be used to find a target heart rate range for aerobic training. The equation (220 minus age) is used to find a maximum heart rate. It is recommended by the American College of Sports Medicine (ACSM) that individuals with spinal cord injuries exercise at 50-80% of their age-predicted maximum heart rate. However, individuals with a spinal cord injury may need to use an alternative method to determine exercise intensity since the use of smaller muscles in exercise will generally result in lower heart rates (See 4.1 for alternative methods).

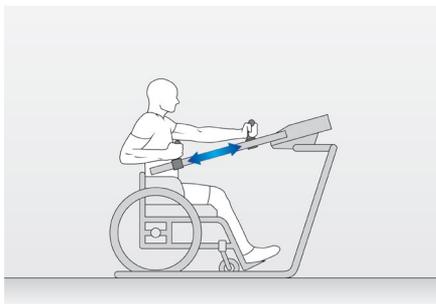
8.1. Rowing Machine



Both locking the wheelchair and the use of wheel chocks may help to secure a stationary position. Hold onto a single or double handle and reach forward as far as possible without losing your balance in the forward direction. Pull back, leading with your shoulders to the rear while pulling your arms back as far as possible.

8.2. Alternating Flexion Extension of the Arm in the Forward Direction

Hold onto the hand grips vertically and alternate pushing the left hand forward while pulling the right hand backward and vice-versa. Keep an upright balanced posture with your back slightly arched.



8.3. Ergometer

Align wheelchair directly in front of the ergometer. Adjust pedals to the proper alignment with shoulders. Adjust the resistance so that a higher RPM may be maintained without using up muscle strength.



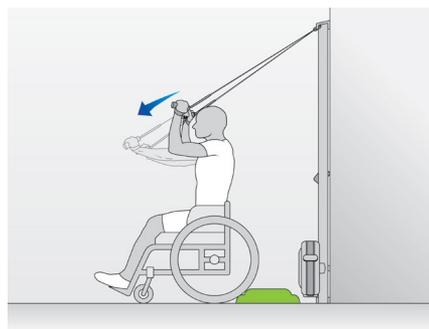
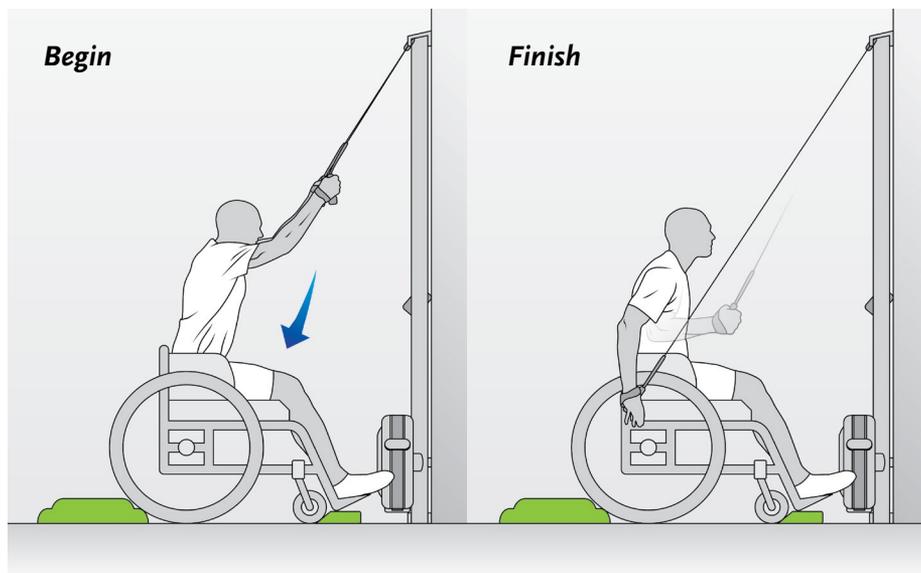
8.4. VLT Rope Trainer



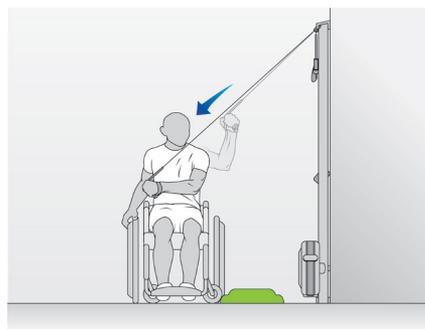
Transfer from wheelchair onto the seat or remove the seat and align wheelchair directly in front of the rope trainer. Position yourself closer to the edge of the seat to engage the core. For individuals with higher level spinal cord injuries, position yourself to the back of the seat and if necessary place a stabilizing strap around your waist and/or thighs. For general cardiovascular training, work at a low to medium resistance setting.

8.5. SkiErg

Using a cable driven ergometer, a variety of exercises can be performed in a repetitive way to obtain good cardiovascular exercise using movements that are not overused during wheelchair propulsion.

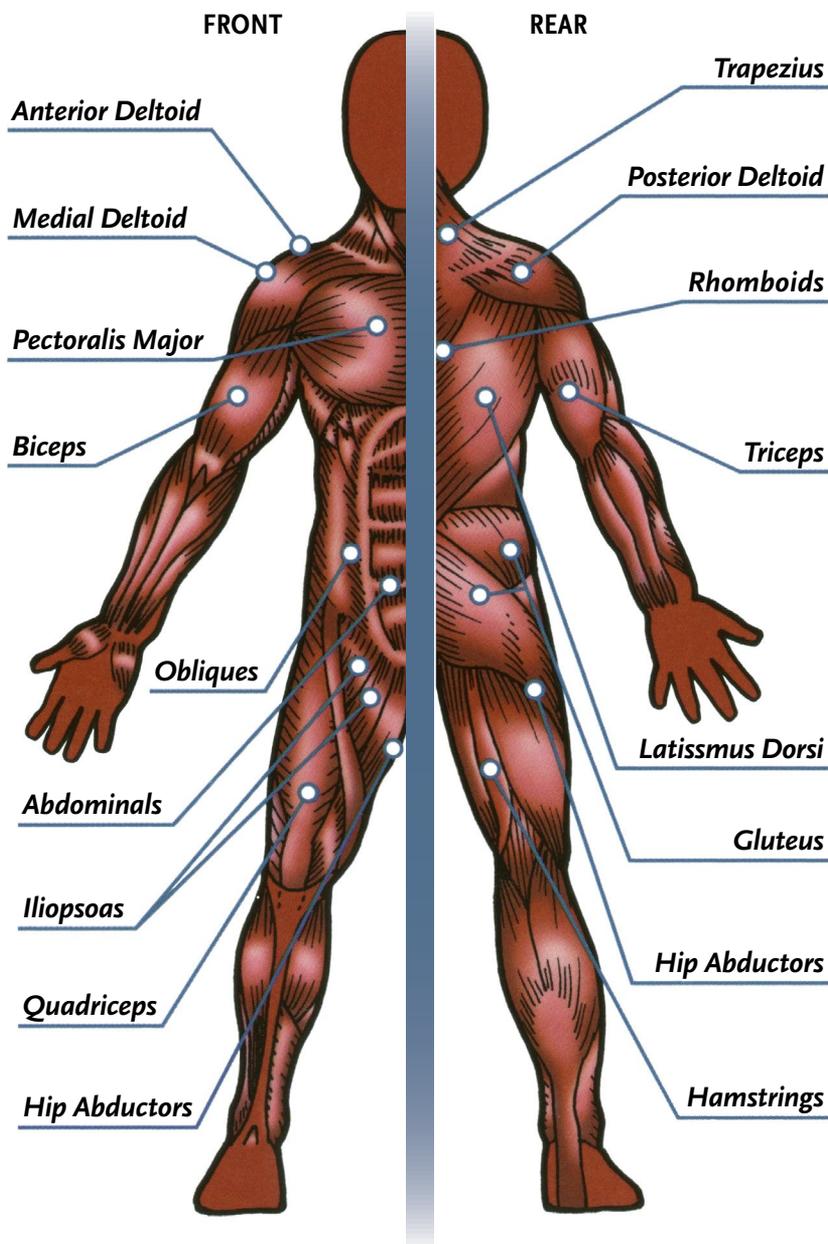


Overhead Triceps Extension



Pull-Down Across Anterior

9.0 The Muscles of The Body





www.nchpad.org



www.beneficialdesigns.com