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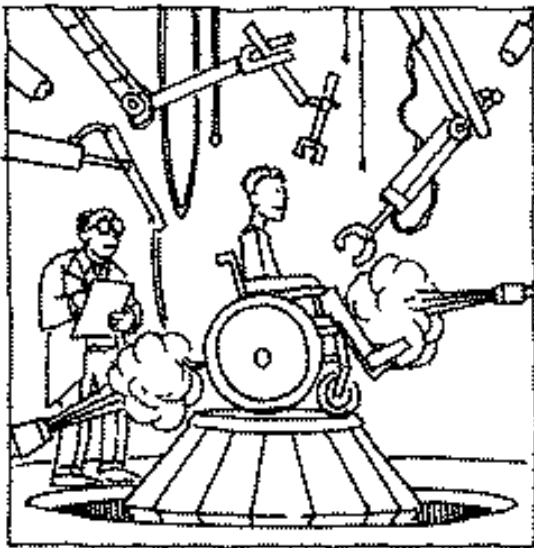
## The Manual Wheelchair Training Guide

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## The Manual Wheelchair Training Guide

### Section 1.2

#### Set Up and Adjustment

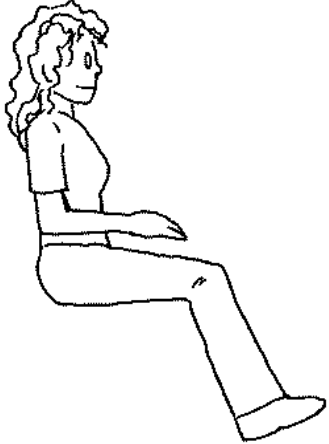


The many hours you will spend in your wheelchair dictate that you should customize it to fit your body. A properly adjusted wheelchair will be more comfortable to sit in, make maneuvering more efficient, and reduce the skeletal and muscular stresses caused by the unnatural motions of propulsion. Your wheelchair setup drastically affects your comfort, posture, stability, and ability to use the wheelchair.

In a properly adjusted wheelchair, you should have enough room for your knees to fit underneath most table tops. Your footrests should be high enough off the ground to avoid hitting obstacles in your path. Make sure your wheelchair cushion, back support, and other positioning aids are in place when you make the adjustments. One change to your wheelchair will affect the fit of all the other components, so be prepared to spend a fair amount of time on this crucial operation. Ideally, you should enlist the help of an

assistive technology provider or supplier certified by the Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) when adjusting your wheelchair. After each adjustment test drive the wheelchair on ramps, different surfaces, and side slopes to make sure your mobility needs have been met.

Whenever you alter the setup of your wheelchair, check your forward, side-to-side, and rear stability with a spotter to make sure your wheelchair performs the way you want it to. (Section 1.4 Learning Your Limits describes how to experience your limits of stability.)



*Optimal sitting position for most wheelchair users is a seat-to-back angle of 90° -100° and a knee angle of 90° -120°. Shown: 90° seat-to-back angle and 120° knee angle.*

## **Wheelchair Types**

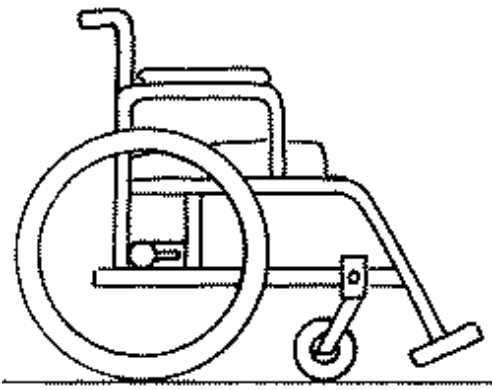
As with the automobile, enterprising inventors have developed many different styles and models of wheelchairs. Each is designed for a different purpose, and permits different types of adjustments to be made.

### **Standard wheelchair**

Standard wheelchairs, also known as depot or institutional, are the no-frills, chromed, aluminum workhorses usually found in hospitals, nursing homes, and airports. Standard wheelchairs are designed to be simple to use and durable enough to survive an institutional setting. The armrests and footrests of standard wheelchairs are usually welded to the frame and cannot be moved or removed. The same chair is frequently used by more than one person. Standard wheelchairs are usually sufficient for short-term or infrequent use but offer the least amount of flexibility in adjustment. Most changes and adjustments are made by replacing equipment.

Changes easily made on standard wheelchairs include:

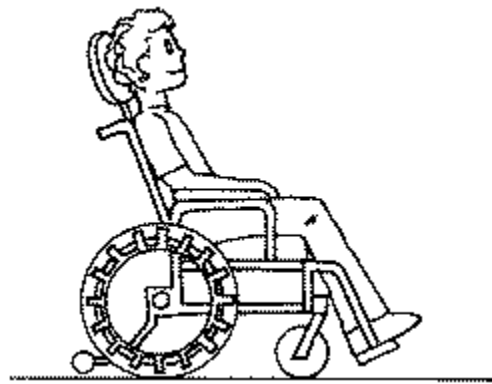
- rear wheel type and size
- caster type and size
- footrest positioning (typically only a length adjustment)
- upholstery replacement



*Standard wheelchair*

### **Recliner wheelchair**

Often recliner wheelchairs are used by people who use gravity to help balance their trunks, who cannot maintain an upright sitting posture, or who need to recline in order to relieve pressure from their buttocks. Recliner wheelchair's rear wheels are further back and may have anti-tippers installed to prevent the chair from tipping over backward. Anti-tippers are small-diameter wheels that attach at the back of the chair to provide additional rear stability.



*Recliner wheelchair*

### **Wheelchairs that permit vertical axle adjustments**

In addition to the changes available in standard and recliner models, some wheelchairs also offer several vertical adjustment positions for the front and rear wheel axles.

Moving the rear wheel axle up or down will change:

- the seat angle
- the angle of the casters
- the orientation of the frame
- your ability to reach the pushrims

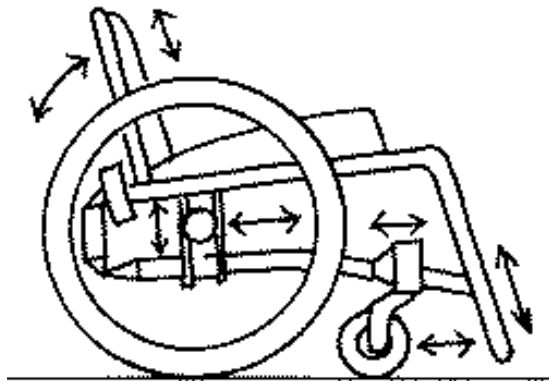
### **Multi-adjustable wheelchairs**

Like luxury automobile seats, multi-adjustable wheelchairs come with a variety of adjustable options and are easier to customize than standard or recliner wheelchairs. This type of wheelchair is available in rigid and folding frame styles.

The options available on multi-adjustable wheelchairs include:

- multiple vertical and horizontal rear wheel positions
- seat angle
- front caster position and angle
- footrest length and position
- backrest height
- back angle
- wheel-lock position and type
- seat width
- seat depth
- seat-surface height
- rear wheel camber
- armrest height
- type and size of wheels and casters

This training guide describes the proper fitting parameters for each adjustment. Changing or adjusting one part of your wheelchair often changes the position of another part. You will probably have to perform a series of adjustments to achieve the correct fit.



*Multi-adjustable wheelchair*

## **Wheelchair Components**

Most manual wheelchairs feature these basic components:

- rear wheels front casters
- tires armrests
- pushrims footrests
- wheel locks back support

The materials, design, and adjustment of these components will affect your wheelchairs performance and fit.

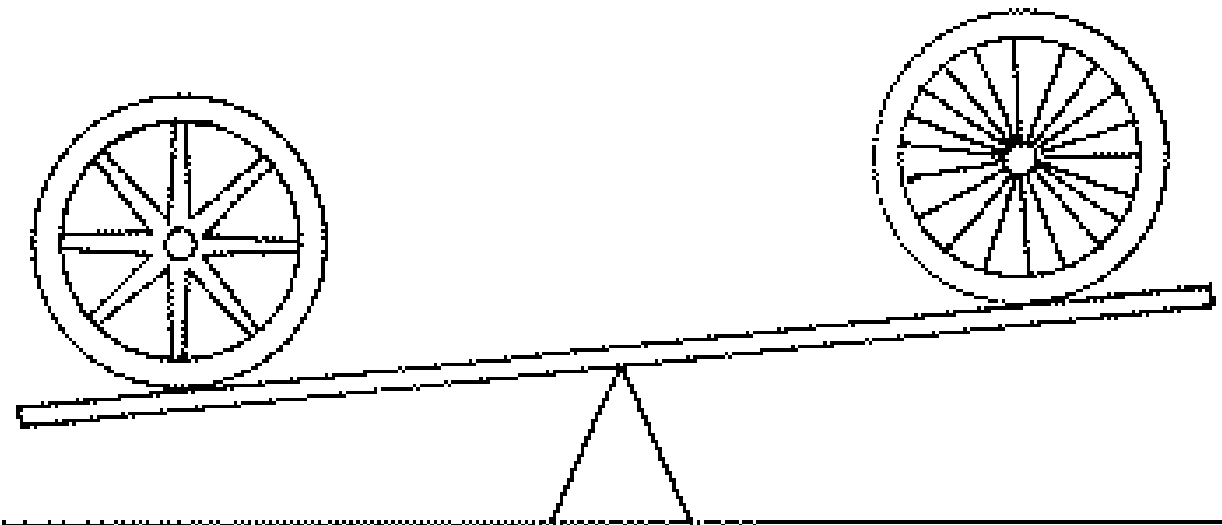
## **Rear wheels**

Many types of rear wheels are available for manual wheelchairs. Most are either spoked or mag. Mag wheels are usually made from hard plastic and typically have only five or six molded ribs between the hub and wheel rim. Mag wheels are virtually maintenance-free and more durable than spoked wheels, but are usually heavier.

On spoked wheels, thin metal rods, or spokes, connect the hub to the wheel rim. Most have 38 spokes. Spoked wheels require more care than mag wheels because the spokes can loosen, break, or fall out. All the spokes must be present and maintained at the same tension, or the wheel may go "out of round." The same wrench used to tighten bike wheel spokes can be used on wheelchair wheels.

The size of the rear wheels also affect how the wheelchair will perform. Most are 24 inches in diameter. The wheel's size determines the pushrim position in relation to your hands, affecting your ability to propel the chair. Larger wheels are usually easier to reach and more energy efficient to propel, especially over obstacles and rough terrain.

Rear wheels that can be removed make transporting and stowing your wheelchair easier. Quick-release axles allow you to detach your rear wheels in a few seconds without tools.



*Spoked wheel / Mag wheel*

## **Tires**

Rear tires for wheelchairs are either air-filled (pneumatic) or solid (flat-free or airless). Pneumatic tires require a certain air pressure to provide optimal performance. If you have pneumatic tires, you may want to carry a patch kit, pump, and/or spare tire tube at all times to avoid being stranded by a flat. Pneumatic tires usually give a more cushioned, smoother ride and are easier to propel than solid tires. However, the tread on pneumatic tires tends to wear out more quickly than the tread on solid ones. Pneumatic tire rims can be filled with solid inserts instead of tubes.

Solid tires are filled with a foam core, called a flat-free insert. Solid tires only need to be replaced for tread wear. Because solid tires are stiffer than pneumatic tires and have no shock absorption capabilities, they give a bumpier ride. Solid tires are generally only recommended for indoor use.

Tire tread also affects the wheelchair's performance. Knobbier tires perform better on rough terrain because they provide more traction. The same knobby tread that grips so well also tracks more mud, snow, and dirt inside than smooth ones. Knobby tires also require more effort to propel over smooth surfaces

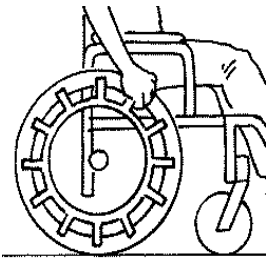
than smooth tires. Smooth tires are more maneuverable over hard, flat surfaces, but make rolling over rough terrain more difficult. Wider tires are better on rough terrain, while narrow ones perform better on hard, flat surfaces.

## **Pushrims**

The pushrim is usually attached to the wheel near the rim. A spacer on the bolt attaching the pushrim to the wheel gives you room to grip the pushrim with your fingers. You can use a shorter spacer to bring the pushrim closer to the wheel. This narrows the overall wheelchair width but may make it more difficult to get a good grip on the pushrim. A longer spacer makes it easier to grip the pushrim, but you may catch your thumb in the gap if this space is too wide.

Metal pushrims are sometimes difficult to use because they are slippery and can get very cold, especially in winter. Rubber coated or textured pushrims might improve your grip and allow you to push more strongly, but the extra friction might cause your hands to burn when going downhill. The coating can also wear off with repeated scraping against corners and narrow doorways.

Pushrims with projections can make it easier to push with less hand function. Pushrim projections can be angled vertically or horizontally to accommodate different pushing styles.



*Pushrim projections*

## **Wheel locks**

Wheel locks are sometimes called brakes. Wheel locks are generally available in low- and high-mount versions and are selected when you order your chair. Low-mount wheel locks interfere less with your movements. Swing-away wheel locks are desirable since you can avoid hitting your thumbs on them when pushing directly on the tires. Some manufacturers have designed wheel locks that mount under the seat so they don't get in the way of pushing. Wheel locks are not dynamic brakes that can be applied while you are moving and will only lock the wheels when properly adjusted. They will not keep the wheelchair from sliding. You will have to reset your wheel locks after you change the rear wheel position or type of tire so they will work effectively. Check your owner's manual and follow the manufacturer's instructions to determine how far the wheel locks should penetrate into the tire.

## **Front casters**

The two small wheels at the front of the wheelchair are called the casters. Casters can swivel in all directions and improve the wheelchair's maneuverability. Caster housings connect the casters to the wheelchair frame.

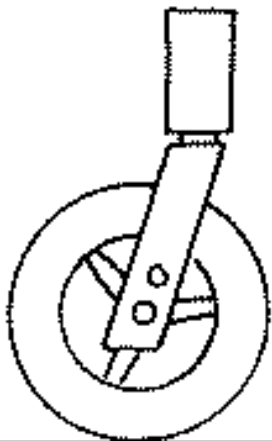
Many different types of casters with a range of performance features are available. Small, hard wheels will improve maneuverability on hard, flat surfaces but tend to catch in the cracks and crevices of rough surfaces. Larger pneumatic casters are less likely to catch and handle better over rough terrain but are more

sluggish on hard surfaces.

- Solid casters usually give a rougher ride than pneumatic casters because they have little shock-absorbing ability.
- Semi-pneumatic or pneumatic casters give a smoother ride than solid casters and provide better traction outdoors; however, pneumatic casters can go flat.



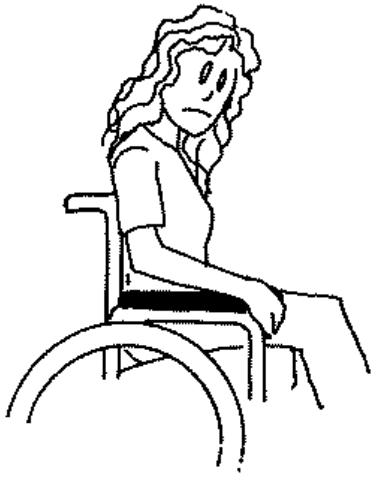
*Hard plastic caster*



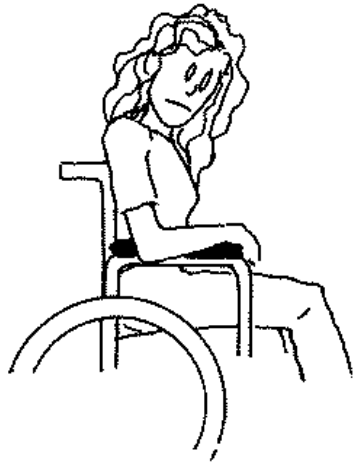
*Pneumatic caster*

## **Armrests**

To armrest or not to armrest? This question is best answered by your personal preference and level of function and balance. Armrests provide additional support if you have limited trunk balance and act as side-to-side stability anchors if you reach sideways. However, many manual wheelchair riders do not use armrests because they prefer more freedom of movement and less additional weight. Seat transfers and weight shifts may require more strength and balance without armrests. If you choose to use armrests, make sure the height does not interfere with propelling. Your elbows should be slightly forward of your shoulders when your arms are resting on the armrests.



*This armrest is too low and does not provide enough arm support.*

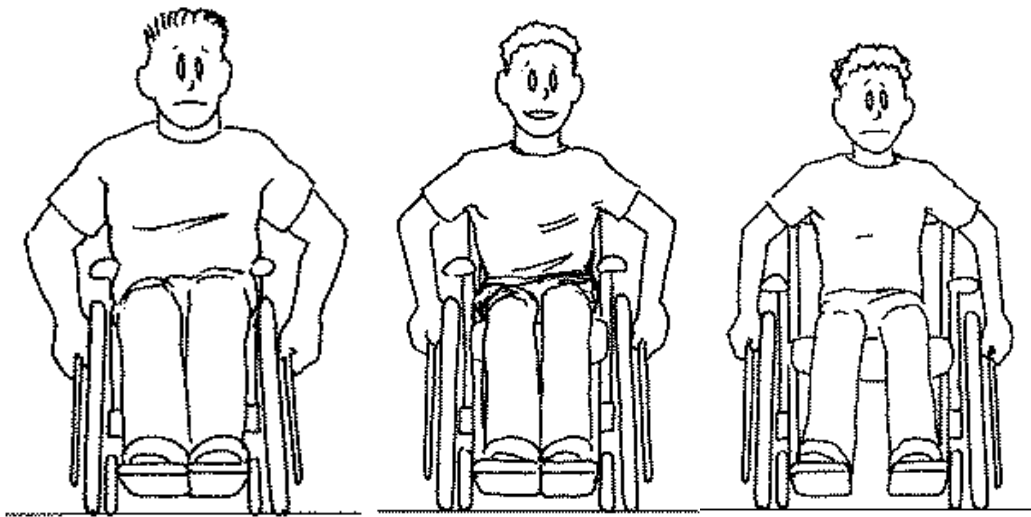


*This armrest is too high and pushes the rider's arms up into her shoulders.*

## **Seat Dimensions**

### **Seat width**

Your wheelchair seat should be as narrow as possible without touching your hip bones. If the seat is too narrow, the pressure on bony hip prominences could cause a pressure ulcer. If the seat is too wide, you might have difficulty propelling your chair and getting through doorways. It might also cause you to lean over when you propel, which could lead to the development of spinal deformity. There should be about half an inch of space on either side of your thighs. The space gives you a little room to move and tuck in your clothing. Seat width affects the overall width of the wheelchair.



*This seat is too narrow.*

*This seat is just right.*

*This seat is too wide.*

## **Seat depth**

The right seat depth is essential for providing the right amount of support under your thighs. If the seat is too shallow, you will experience more pressure on your sitting area, and you could develop pressure ulcers. If the seat is too deep, you will be unable to move all the way against the back of the chair and will end up slouching backward. A seat that is too deep can cause pressure on the backs of your knees and calves. This could interfere with circulation to your legs and cause pressure ulcers behind your knees.

The correct seat depth typically permits one inch of space between the front edge of the cushion to the back of the knee. The distance needed may be larger if you regularly use your hands to lift your leg, or propel the wheelchair with your legs.

If the seat upholstery or seat is too long:

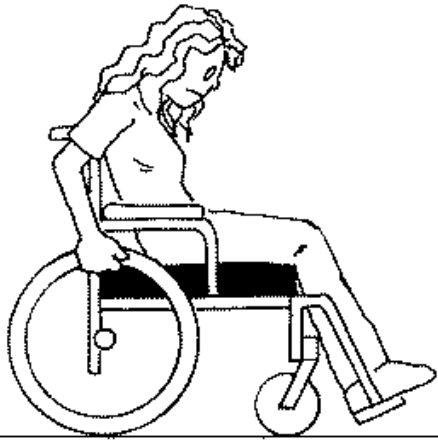
Talk to a seating specialist about shortening the upholstery or solid seat beneath your cushion.

If the seat cushion is too long:

Get a shorter cushion or modify the rear corners of the cushion so it fits farther back on the seat.

Get a thicker back rest, which will push you forward in your seat and shorten the overall seat depth.

Slide the cushion back. Sometimes the cushion will even slide under the backrest. Make sure your buttocks are still positioned correctly on the cushion.



*This seat is too long. Pressure may develop behind your knees and thighs, and you may have difficulty sitting all the way back in the chair.*

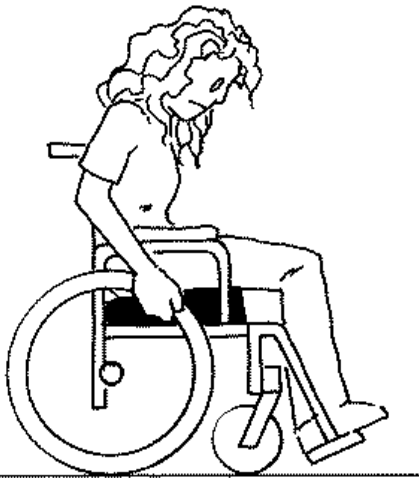
If the seat is too short:

Move the backrest back. This will allow you to slide farther back in your wheelchair, lengthening the seat depth and making room for a longer cushion.

Use a longer seat cushion supported over the front edge of the seat by a firm board or sheet of stiff plastic.

If the seat cushion is too short:

Get a longer cushion.



*This seat is too short. Pressures will be higher on your sitting area.*

### **Seat surface height**

Your wheelchair seat must be high enough to accommodate the length of your legs with your feet on the footrests. The seat should be high enough for your footrests to clear obstacles and low enough for your knees to fit under tables. According to the Americans with Disabilities Act Accessibility Guidelines, standard tables or counters should have knee clearance spaces at least 27 inches high.

Sit on your seat cushion with the footrests adjusted.

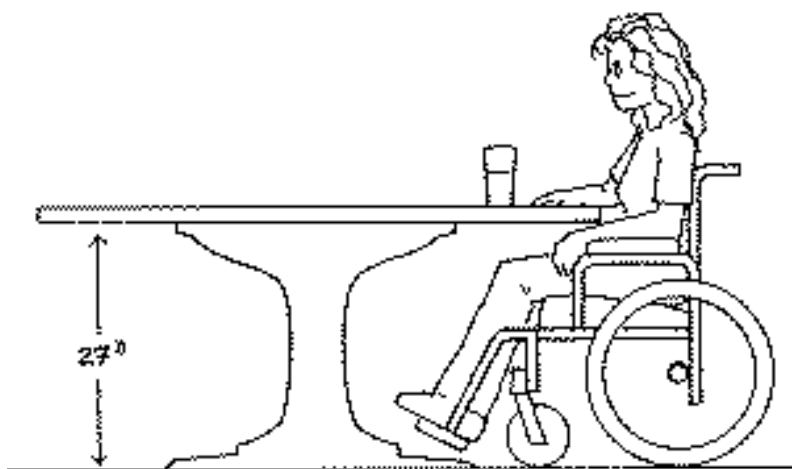
Make sure you have two inches of clearance under your footrests to maneuver safely outdoors.

The leg support angle may have to be changed to accommodate a very tall person. A larger angle from the bottom of the seat to the back of the calves will allow greater footrest clearance and/or a lower seat height.

If your legs are long, you might have to compromise between sitting comfort and leg clearance. It is more important for your wheelchair to fit properly and comfortably than to be able to roll under tables. If your knees will not fit, slip a brick or wood block under table legs to improve clearance. Make sure the table is secure and will not slide off the leg props.

To increase ground clearance (raise yourself higher off the ground), you can adjust the seat up. Alternatively, you can increase the seat cushion thickness by adding padding or a solid wood insert under the cover. Lowering the rear wheel axle position raises the rear of the wheelchair higher off the ground. Larger rear wheels and front casters will also lift you up higher.

To decrease ground clearance (lower yourself closer to the ground), you can decrease the thickness of the seat cushion or move the seat down. Raising the rear wheel axle position lowers the rear of the wheelchair closer to the ground. Smaller rear wheels and front casters will also lower you closer to the ground.



*This person has enough clearance above the knees to roll under tables and enough clearance below the footrests to clear obstacles.*

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