

Motorized Scooters *and* User Safety

(Electric Scooters for Disabled People)

The National Institute for Rehabilitation Engineering (NIRE) is a non-profit organization which operated clinics to design, dispense and fit customized assistive equipment from 1967 through 1996. Working with disabled people and their own doctors and therapists, these NIRE clinics assisted *hundreds* of people having severe and permanent motor impairments. *The N.I.R.E. pioneered the development and use of power wheelchairs and MOTORIZED SCOOTERS.* During these years, a great deal was learned concerning USER SAFETY. This paper explains many safety issues and is intended to assist Motorized Scooter users, new and old. ***PERMISSION is herewith granted for the free copying and distribution of this © paper, provided all copies are complete and unaltered and that The NIRE is fully credited as the source.***

THIS PAPER is for disabled people using, or considering the use of a **Motorized Scooter** as an alternative to a power wheelchair. It is said that “knowledge is power” and this is especially true for electric scooter users ... because of the safety issues. The user who knows about and understands the various safety issues will enjoy more varied uses of his scooter, and more peace of mind, than the person who must limit his uses out of fear of being injured. Motorized scooters are seen by some people as offering advantages over power wheelchairs. This may be true for some people - but not for others. Serious safety questions must be considered in choosing one or the other.

MOTORIZED SCOOTERS vs POWER WHEELCHAIRS

Comparisons are between “light, foldable power wheelchairs” and “motorized scooters.” Both have small wheels in front – the typical wheelchair has two small casters in front, on opposite sides – the typical scooter has one small, steerable wheel centered in front. Both have similar outdoor-use limitations *Heavy duty outdoor, stand-up, and stair-climbing wheelchairs cannot be compared with any type of motorized scooter.*

Comparative Costs: Motorized Scooters typically cost less than light-weight, foldable, Power Wheelchairs. The scooter may cost up to twenty percent less to buy. Ongoing maintenance costs, however, are about the same for both.

Transportability & Storability: Both types of vehicles can be partially disassembled and folded for compact storage, or transportation in the trunk of a car. Scooter and wheelchair weights may be comparable or the wheelchair may be slightly heavier depending on its construction. Both vehicles carry a storage battery. Only the wheelchair can be transported in a van with the user seated in it. This is not feasible for a scooter.

Appearances: Motorized Scooters appear quite different than Power Wheelchairs. The scooters are usually smaller and lighter-weight. Scooters may be favored by some people because they look, to others, more like recreational vehicles than medical equipment. *Some people - mostly those with mild disabilities - have the option of choosing either a motorized wheelchair or a motorized scooter. (Those with more severe disabilities must pass on the scooter and take the wheelchair.)*

Comparative Features: Most *power wheelchairs* have at least four wheels; some have more. Some have small wheels in front and large wheels in back ... and are better suited for indoor use. Others have large wheels in front and smaller ones in back ... and are better suited for outdoor use. The wheels are widely spaced, opposites usually being on

opposite sides of the wheelchair. This gives the wheelchair increased stability and safety, lessening the likelihood of rollover accidents. *Motorized scooters often lack this stability.*

Most power wheelchairs are propelled by two motors, one on each side. One motor drives one wheel and the other motor drives the other wheel. Power wheelchairs are steered by the user, using his fingers to move a small control stick forward, backward, left, or right to control speed and direction of travel. People so severely disabled that they cannot reliably operate the small joystick control can be fitted with high-technology (quadriplegic) controls that sense changes in breath ... or eye movements ... to steer and control the power wheelchair. *Special quadriplegic controls require intensive mobility and safety training for each user. They are available for power wheelchairs, only – not for motorized scooters.* In addition to the special controls available for severely disabled people, power wheelchairs can be dispensed with electric user-controlled elevating legrests, back and head supports, etc. – *not available to scooter users.* Wheelchairs often feature removable sides to facilitate sideways transfer in and out, via a sliding transfer board – *not available to scooter users.* The use of four wheels stabilizes the wheelchair to make such transfers safe for the severely disabled wheelchair user. *Scooters often have only 3 wheels and lack such stability.*

Most *motorized scooters* have three wheels and use mechanical steering. The typical design has two widely spaced wheels in the rear, across from each other. A single or double-width wheel is in front, attached to a tiller, handlebar or steering wheel. The entire scooter looks a little like a child's tricycle – a major difference being that the scooter has smaller wheels. A child's tricycle has a saddle seat which is unsuitable for most disabled people. The scooter has a larger seat which gives much more support than a saddle seat on a tricycle. The scooter seat may or may not have armrests and/or a back support. *Often, the seat has to be customized for a particular user. If possible, order a scooter offering 4-wheel stability. Some are available!*

The scooter's handlebar, tiller or steering wheel is used for manually steering the scooter. Because the scooter has only 3 functional wheels, it can turn over if the user leans heavily forward and/or to one side. This can happen while riding, especially if a tilted or uneven incline is encountered. Or, the scooter can fall over when stopped, when the user transfers in or out. *These characteristics of the motorized scooter limit its safe use to people with full use of at least one arm and hand, who have strong trunk muscles and can sit upright with little body support, and who can efficiently and safely transfer in and out of the scooter's seat.* Scooter users can include people with conditions such as arthritis, cerebral palsy, Parkinson disease, multiple sclerosis, etc. in early stages with mild impairment.

Necessary HAND & ARM MOBILITY for Safe Scooter Use - Many motorized scooters are mechanically steered using a handlebar (two hands required) similar to a bicycle. Braking while driving is mechanical, usually requiring the user to squeeze one or two braking handles, using one hand or both hands. The parking brake, a necessity for safety, is also mechanical and requires at least one normal arm and hand. Safe operation of some models may require normal mobility of BOTH arms and hands. Other models use a steering "tiller" or "wheel" which can be operated with one good arm and hand. *Note: If the free arm and hand are disabled, then braking and other controls must be on the tiller or steering wheel so all are operable hand and arm used to steer the scooter.*

Necessary BODY STRENGTH and MOBILITY for Safe Scooter Use – The first need is for a user to be able to safely transfer in or out of the scooter seat – *alone and unaided*. To do this, the person must be able to walk unaided, or to walk with a walker, cane or crutches. Wheelchair users have a problem in that transferring between a wheelchair and a scooter, alone and unaided, is very risky and often leads to serious falls. A second need is stability while sitting on the scooter seat for long periods of time and while bouncing and tilting as one drives. A third need is for sufficient body mobility and flexibility to maintain balance as the scooter tilts and bounces along, especially on outdoor sidewalks and pavements. *Scooters are not safe to use on soil or grass.*

Where Can Motorized Scooters be used safely? INDOOR TRAVEL is safest, with flat and level floors. *Notes: Deep-pile carpets can present immediate mobility and safety problems and can, sometimes, cause equipment problems due to carpet fibers entering the wheel bearings, gears or pulleys. Low-cut carpets and rugs usually cause no problem except that they can be stained by oil or dirt falling from the scooter.* Scooters usually travel well in malls, public buildings, food stores, etc. – and in any and all indoor areas having flat, level and hard floors. OUTDOOR TRAVEL requires more caution. Generally, travel is safe on outdoor sidewalks and pavements ... PROVIDED the small front wheel of the scooter does not encounter raised slabs, potholes or debris. Also ... PROVIDED the sidewalk or pavement does not tilt to the left or right (which could cause the scooter to roll over). *NOTES: Know how steep a grade your particular scooter can safely traverse, up and down, with the particular user's height and weight. Then, safely ride up or down inclines within these limits ... but always directly UP or DOWN an incline – NEVER across an incline!* GRASS and SOIL are not good places to be on a motorized scooter because (a) you are more likely to fall and be hurt ... and (b) grass and soil can damage the equipment and can damage rugs and floors when brought home. *WET grass and soil are especially dangerous – and it is a good idea to NOT use a motorized scooter outdoors when it is raining or when the ground is wet or icy.*

CAUTIONS: Choosing and buying a motorized scooter must be taken as seriously as choosing and buying a power wheelchair. To ensure **USER SAFETY**, it is essential that the user choose and procure a motorized scooter in ways comparable to procuring a power wheelchair. **Note:** *In the USA, most scooter manufacturers and vendors are honest, caring and reputable. They know their products and are needed for ongoing maintenance and technical support. However, they do not have the training and experience of physicians and occupational therapists. Hence, help should always be sought from these professional resources before a disabled person buys a motorized scooter or power wheelchair.*

RECOMMENDED SCOOTER PROCUREMENT PROCEDURES

- 1. Have medical screenings for eyesight and seizures.** Be sure your corrected vision is 20/40 or better, in one or both eyes. If not, then obtain glasses or other correction before using any motorized vehicle. If subject to unexpected fainting or seizures, do not drive any powered vehicle.

2. **Know your medical diagnosis and prognosis.** You need this information for your ongoing safety. Your functional condition, today, may be compatible with safe use of a motorized scooter. But, how long will this last? When will the scooter become unsafe for your use? If the prognosis is for rapid disability progression, it may be better to obtain a power wheelchair – not a motorized scooter. Or, if the scooter is safe for you to use, now, then, how often do you need to be re-evaluated by a physician or therapist to ensure it continues to be safe for you to use the scooter? *Are you willing to stop using the scooter when your worsening condition makes it unsafe for you?*
3. **Do research and obtain product literature** on the various make and model scooters available in your area. It is better to consider only those products sold and serviced by medical equipment dealers or manufacturers' representatives in your area. **DO NOT BUY FROM THEM, YET.** Only get literature at this time. Rule out products lacking local support. **DO NOT** buy by mail!
4. **Contact a Local Registered OCCUPATIONAL THERAPIST (OTR)** in your area, preferably in the Rehabilitation Department at a hospital or rehabilitation center near you. Plan on and discuss your need for two or three appointments: (a) for a preliminary wheelchair clinic evaluation for a Motorized Scooter, if appropriate, or for a Power Wheelchair. Ask that they have both appliances on hand for you to try. Most of the testing will be by an OTR, under medical supervision by a physician who specializes in rehabilitation medicine. (b) the same OTR should be asked to schedule a visit to your home to inspect the premises for equipment suitability and user safety. This can be without any equipment – or, it may be with a scooter brought by the OTR – or, the OTR may request a local scooter vendor to bring a particular model scooter to your residence for on-site testing and user training. If this on-site equipment testing is not done on the second appointment, then a third appointment (c) should be made with the OTR and the vendor for these purposes. *It is strongly recommended that the final scooter trials, before ordering, be done in the user's home with both the OTR and the sales person present. If done at and in the residence, outside test driving should also be done by the user in the actual scooter to be ordered to assure safety and compatibility with the nearby pavements and sidewalks.*
5. **When a motorized scooter is being ordered,** be certain that one person is designated in writing, to be responsible for the overall fit of the equipment, including all prescribed modifications, adjustments and accessories (such as special grips, handles or reaching tools, etc.) Usually, the responsible person is the local vendor or dispenser. Sometimes, however, it is the clinic or therapist rather than the vendor. This must be defined and detailed in writing. For user safety and comfort, we recommend several **VISION AIDS:** (a) One or two rear-view mirrors are recommended. For scooters having a handlebar, it is simple and effective to buy and attach two inexpensive clamp-on rear-view mirrors ... such as those sold for bicycles. One or two mirrors can usually be attached in some way to a scooter having a tiller or steering wheel. (b) In bright sunny climates where a lot of outdoor daytime use is planned, we recommend that scooter users wear gradient-tinted sunglasses, prescription or plain, as the eye doctor recommends. The graduated tint (darker at top and lighter going down the lens) is best colored gray or brown. *Greens, blues and reds are best avoided.*

- 6. When the motorized scooter has finally been ordered and is to be delivered,** the user may be asked to visit the dispenser's shop for final adjustments. This is fine. However, it is recommended that final delivery be at the user's residence with both the OTR and the vendor present. This facilitates final adjustments, any additionally needed user training – especially outdoors, and also needed technical training. The user and a family member, neighbor or friend, should be shown – with the user - how to disassemble and store the scooter and its detachable parts. How to re-assemble and adjust everything; how and how often to recharge the battery; how and when to perform equipment inspections and maintenance.
- SCHEDULES:** A schedule should be agreed upon for professional inspections and services by the vendor. AND ... If the user has a progressive disability, a schedule of periodic re-evaluations by the OTR should be agreed upon. These might be once every 6 months or 3 months, for example, or once a year – as the OTR feels best.
- 7. Personalized equipment adjustments** should have been made by the vendor, with the knowledge and approval of the OTR. Actual settings should be recorded in writing in a log, with dates, for future reference. These settings would include these items, plus others: (a) height of seat to place user's legs at correct height for the foot rests; (b) height of manual steering control; (c) location of hand braking control for driving; (d) locations of hand parking brake levers; (e) location of seat rotation locking mechanism; (e) location of controls for parking brakes, if any; (f) locations of rear-view mirrors; etc. It is important to keep written records of all user-settings so that any that become altered can easily be restored.

Sharing Motorized Scooters is risky, at best, for all parties unless use of the shared scooter is limited to strictly indoor use - and with other people present. If used by just one person, always adjusted optimally for that person, the scooter can be used with the least possible risk, indoors or outdoors – as discussed in this paper. Unfortunately, when two or more people share use of the same scooter, then the many settings are no longer optimized for each user. This can lead to fatigue while riding, or even to falls or injuries. *For this reason, we recommend against sharing unless there are only two people and both are the same size and weight, and both use all the same adjustment settings.*

For a copy of our paper: “Power Wheelchairs and User Safety” contact us.

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