

SECTION B: MEDICAL

1. INTRODUCTION TO THERAPEUTIC RIDING

PREAMBLE

Before participating in a **Therapeutic Riding Program**, all rider candidates must have a medical doctor complete a physician referral form. People with disabilities should not participate in therapeutic riding until a medical advisor and another appropriate professional such as a physiotherapist or an occupational therapist, have evaluated them and determined that riding is a safe and suitable activity for them. The program reserves the right to determine the candidate's suitability for inclusion in the program. If riders experience any changes in the nature or extent of their disability, they must obtain a physician's update.

CONSIDERATIONS FOR THERAPEUTIC RIDING INSTRUCTORS

Therapeutic riding instructors should be aware of the specific benefits of riding for people with disabilities. They should also understand the interests and needs of people with disabilities and the challenges and inequities they experience in today's society.

Therapeutic riding instructors must respect the right to privacy and the dignity of people with disabilities. They should also recognize that their students are people first, people with disabilities second, and that the nature and extent of their students' disabilities is privileged and confidential information.

As in any activity involving diverse groups of people, instructors, volunteers and staff should be familiar with universal precautions concerning communicable diseases.

Riding instructors who coach and teach riders with disabilities must be familiar with and knowledgeable about a wide range of disabilities and how specific disabilities affect the people who have them.

2. BENEFITS OF THERAPEUTIC RIDING

- Development of mobility, balance and co-ordination
- Improvement of muscle tone and strength
- Increased concentration and improved learning skills
- A challenging recreational activity
- Independence, integration and a sense of achievement
- Development of self confidence and motivation

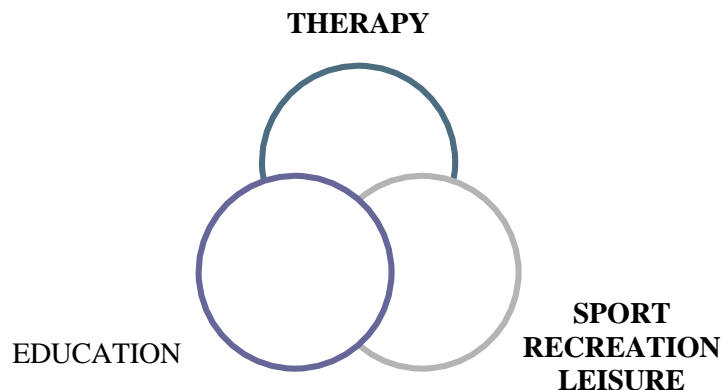
THERAPEUTIC RIDING CLASSIFICATIONS

Therapeutic Riding is a collective term which encompasses all horse-related activities for people with disabilities, emphasizing the learning of functional riding skills for therapeutic purposes. An appropriate professional, such as a physiotherapist or occupational therapist, psychologist or special education teacher, works with the rider and his or her riding instructor. Together they set physical, psychological, educational and equestrian goals, designing a safe and logical program to achieve those objectives. In effect, the horse is a helper, assisting both the rider and the riding instructor to achieve their aims.

Therapeutic riding can help to improve the physical, mental, emotional and/or social well-being of most people with disabilities. An invigorating form of exercise and recreation, riding is challenging, giving the rider a sense of accomplishment and increased self-esteem. For individuals who have disabilities that affect mobility, the horse provides freedom of movement and independence of assistive devices, such as wheelchairs, crutches and canes. Riding is also a positive sensory experience for the rider who has a disability. Perhaps most important, riding is enjoyable, worthwhile for its recreational value alone.

The following are three primary classifications of therapeutic riding, representing different approaches to this activity:

THERAPEUTIC RIDING – DIAGRAM OF CLASSIFICATIONS



1. Therapy

Activities involving the horse can be used as forms of therapy to assist people with disabilities in achieving physical and mental health, and cognitive, behavioural, social and communication goals. In this context, a team approach involving health professionals, therapeutic riding instructors and riders who have disabilities, is used in designing and implementing the riding sessions. Within the therapy classification there are three approaches: riding therapy, developmental riding therapy and hippotherapy.

Riding therapy makes use of functional riding skills to assist the rider in achieving specific therapeutic goals such as improved sitting balance, self-confidence or social skills. In riding therapy, these goals take precedence over the basic goal of learning to ride.

Developmental riding therapy overlaps with the field of education. Health and educational professionals find that developmental riding therapy is particularly useful for riders whose motor control, mobility, perception, cognition, behaviour, mental health and language/communication skills are impaired. Vaulting is particularly valuable in this approach to therapeutic riding.

Developmental riding therapy involves the use of developmental sequences, for example, the sequence of movements an individual makes in moving from the prone position to kneeling. It also involves the control an individual must exert to maintain a particular position. Developmental riding therapy also improves an individual's sensory integration, which is the ability to receive, understand, organize and respond to external information and stimuli, such as in balance and touch.

2. Education

Activities involving the horse assist people who have physical, intellectual, developmental, psychological, and/or sensory impairments to achieve educational goals. In this context, emphasis is placed on incorporating cognitive, behavioural, mental health, social and physical goals into a program of riding, driving and/or vaulting. In addition, through these activities, riders may improve their skills in the particular equestrian discipline in which they participate.

Therapeutic riding instructors and educational professionals work together in designing and implementing therapeutic riding programs which have an educational focus. Health professionals may be involved as consultants.

3. Sport, Recreation and Leisure

In sport, the therapeutic riding program helps the rider to develop new skills or to improve existing skills. Sport activities involving the horse can be adapted so that they are accessible to people who have physical, intellectual, developmental, learning, sensory and/or psychological impairments. People with disabilities can derive therapeutic, psychological, educational and social benefits from their involvement in equestrian sport activities. These activities include riding, driving and vaulting as forms of recreation and competition.

Therapeutic riding instructors are the key individuals responsible for the design and implementation of equestrian sport programs for people with disabilities.

Equestrian activities can be adapted and used as recreation/leisure by people with physical, mental and psychological impairments. The emphasis is on enjoyable and relaxing experience that provides additional benefits in the areas of socialization and physical well-being. Individuals may participate in horse-related activities to their maximum abilities in an atmosphere of support and structure for the primary purpose of the intrinsic enjoyment of these activities.

Therapeutic riding instructors and recreation therapists are primarily responsible for program development. Health professionals and education specialists are generally involved on a consultative basis.

- The term health professionals is used to refer to physiotherapists, occupational therapists, speech/language pathologists, audiologists, psychiatrists, psychologists, nurses, social workers and physicians.
- The term educational specialists is used to refer to special education teachers, teacher, adapted physical education teachers and recreational therapists.

HIPPOTHERAPY

The word 'hippotherapy' comes from the greek 'hippos' meaning horse and 'therapy' meaning care. Thus, hippotherapy is the utilization of the horse for therapeutic purposes rather than equestrian goals. This field targets acquisition of motor pre-requisites rather than equestrian abilities. Hippotherapy is a rehabilitation strategy using a mobile and live instrument called 'horse.' The horse possesses motor and emotional, neuro-sensitive stimulation qualities never equaled by a machine. The horse offers 110 multidimensional movements by impulsion every minute. No therapist, no matter how motivated or talented, can compete with this quality stimulation. Hippotherapy is a specialization reserved to rehabilitation specialists: physiotherapists, occupational therapists and speech language pathologist trained in this field. In hippotherapy, the rider does not influence the horse but rather the movement of the horse stimulates postural and muscular reactions on the rider. The rider will take different positions on the horse to stimulate affected muscle groups. Objectives are not essentially motor; they can be of all types (cognitive, behavioural, etc.) depending on the initial evaluation prepared by the therapist (OT, PT, Speech-Language Pathologist) with the help of the rider's medical team.

EQUINE FACILITATED WELLNESS

Equine-Facilitated Wellness incorporates a range of counselling, education and personal development approaches, strategies and techniques which bring humans and equines together in healing and learning environments.

Terms which are currently used in this area of practice include, amongst others: Equine-Facilitated Counselling, Equine Experiential Learning, Equine-Assisted/Facilitated Psychotherapy, Equine-Assisted Activities, Equine-Assisted Professional Development, Equine-Guided Education and Equine-Assisted Personal Development. The term Equine-Facilitated Wellness (EFW) is intended to encompass all of the above terms.

3. ORTHOPAEDIC CONDITIONS

AMPUTATIONS

People who are missing one or more limbs have what is known as an amputation. They sometimes refer to themselves as “amputees”. Such people may have experienced limb loss for medical reasons such as cancer or diabetes, as the result of an accident, or limb loss may be congenital, i.e. the individual was born without one or more limbs.

Depending on the level of amputation, the rider may have a residual limb. While this is sometimes referred to as a “stump” amputees prefer the phrase “residual limb,” which has a more positive connotation. Amputees may use a variety of mobility aids, such as prostheses (artificial limbs) and/or crutches, canes and wheelchairs. Note all amputees use a prosthesis, and those who do may not use their prosthesis all the time. If the rider wears a prosthesis while riding, care should be taken to avoid excessive friction or pressure on the residual limb, which can result in skin breakdown and pressure sores. The therapeutic riding instructor should be aware that such problems, which can occur with regular prosthesis use, may be made worse when the amputee riders with a prosthesis.

Therapeutic riding instructors should be aware that the question of riding with a prosthesis can be problematic, for amputees with high-level amputations, such as above-elbow, should-disarticulation, above-knee, hip-disarticulation and hemipelvectomy, the prosthesis may actually hinder the rider’s comfort, safety and independence on horseback. If the rider falls off, the prosthesis can pose a hazard, acting as a foreign object and adding to the potential for injury. In addition, prostheses are expensive and specialized assistive devices. Care should be taken to avoid damage to the prosthesis.

Riders who have had the amputation of a leg also experience a significant weight differential, which can result in one-sidedness, uneven balance and slippage of the saddle. While riders with such amputations may choose to ride with a prosthesis, they may find that their residual limb is uncomfortable during riding. The therapeutic riding instructor and the rider should work together to achieve the most comfortable and safest ride possible. Solutions for the rider may include the application of padding or the removal of the prosthesis during riding. To prevent saddle slippage, weights may be sewn into the saddle flap on the rider’s amputation side. The use of a non-slip girth, such as a string girth, is also advisable.

In some cases, adaptive equipment can assist amputees to progress in riding. For example, a rider who is missing a lower limb and who chooses to ride without a prosthesis may find it helpful to have a rigid handhold attached to the pommel of the saddle. The use of the handhold can assist the rider in adjusting body weight and balance. A rider who is missing an upper limb may find ladder reins, neck-reining or reins knotted to a certain length useful in guiding the horse. People who are missing a lower limb experience an uneven stance and gait, whether or not they use a prosthesis. In the long term, such individuals may experience lower back pain and scoliosis (curvature of the spine). The rhythmic motion of the horse mobilizes the rider’s spine and pelvis, resulting in decreased pain in the lower back. Some amputees find that regular riding helps prevent back pain from occurring.

Riding has many benefits for people with amputations. Riding offers freedom of movement and independence to people who are missing one or more limbs. Amputees can learn a wide range of riding skills, depending on the type and extent of their amputation(s).

ARTHRITIS

Osteoarthritis

People with *osteoarthritis* experience joint degeneration or breakdown, most often in the weight bearing joints such as the spine, hips and knees. They will experience joint pain, stiffness and swelling. Most people with osteoarthritis are over forty years of age.

Therapeutic riding is considered to be an effective way for people with osteoarthritis to exercise affected joints. A balanced riding seat does not stress the spine, hip or knee joints. In riding, these joints are not placed in extreme positions and, therefore, the impact of forces that could damage the joints is reduced. In addition, the rider must use muscular effort and coordination to assume and maintain the riding position. This tends to protect the joints. The rhythmic motion of the horse mobilizes the rider's spine and pelvis, and increases flexibility, resulting in decreased pain in the lower back.

Finally, because of the nature of their disability, people with osteoarthritis may have to curtail their involvement in many sport and recreational activities, riding, however, provides a safe, appropriate and enjoyable activity in which they can participate.

Reactive Arthritis

The term *reactive arthritis* includes: systemic lupus erythematosus (lupus or SLE); rheumatoid arthritis; and juvenile arthritis. People with any of these forms of reactive arthritis experience painfully inflamed joints – that is, joints which are stiff and swollen. They experience variable degrees of pain, from early morning stiffness to pain that is debilitating and affects all joints. People with reactive arthritis often experience muscle weakness and general fatigue. Eye problems can also occur.

Reactive arthritis is characterized by periodic flare-ups, when the individual experiences increased pain and inflammation, at such times, the person should not participate in riding activities.

During remissions, i.e. times when the person experiences less or no pain and inflammation, therapeutic riding is helpful in restoring and/or maintaining the individual's joint mobility and muscle strength, and in providing an enjoyable recreational activity. With such riders, as with all riders, it is important to encourage good posture in the riding position, since this is necessary for an effective riding seat and maximum benefit

Notes for Instructors:

- A horse with smooth gaits may be more comfortable for riders with arthritis
- Include rest periods during the ride, particularly if the rider appears to become tired.
- Ask the riders if and how they need assistance – avoid placing pressure on or pulling on the riders limbs, this will increase the pain in already-painful joints.
- The use of a sheepskin or other pad may increase the rider's comfort, reducing pressure on painful joints.
- Ladder and/or loop reins may assist riders with arthritis, who often experience difficulty holding the reins due to finger deformities or an ineffective grip.

ARTHROGRYPOSIS MULTIPLEX CONGENITA

Arthrogryposis means “curved joints”. There are two main forms of arthrogryposis: neuropathic and myopathic.

Neuropathic arthrogryposis is most commonly seen in association with spina bifida, especially with myelomeningocele or other abnormalities of spinal development. The curvature results from uneven muscle activation or paralysis.

Myopathic arthrogryposis is less common and is a disease of unknown origin in which muscles tissue becomes replaced by fibrous tissue. The individual's joints seem to be affected only secondarily in that the fibrotic and thus contracted muscles restrict the motion of the joints. People with myopathic arthrogryposis experience contracture of joints and muscles weakness. In mild forms of this disease, only the ankles and feet are involved, but it can involve other joints such as the wrists, elbows, hips and knees.

ARTHROPLASTY

Arthroplasty is the surgical replacement of a joint. The most common joint replacements are of hip and knee. Less frequently performed are replacements of upper limb joints. The surgery is performed when damage had limited movement in the joint and pain accompanies what movement there is, thus making mobility very difficult.

Total recovery time for hip or knee arthroplasty is usually 3 to 6 months. Equestrian activities should be avoided until 3 months post-operative. The primary care general practitioner or the orthopaedic surgeon will make the decision as to when riding can begin after all surgeries. Once riding has commenced, there is no need to be overly cautious.

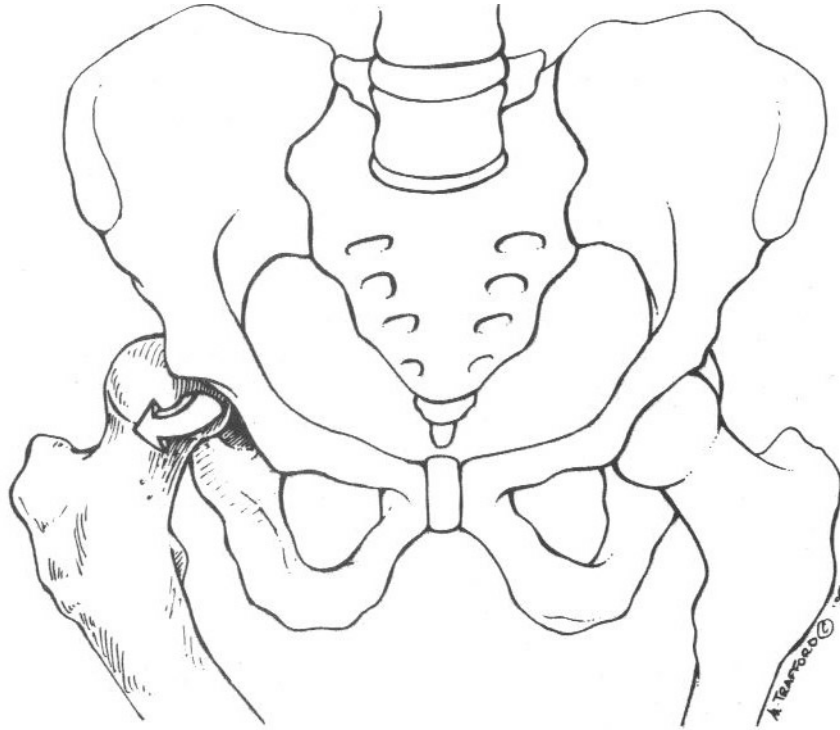
CONGENITAL DISLOCATION OF THE HIP (CDH)

People who have *congenital dislocation* of the hip, which is caused by an inherently shallow socket in the hip joint, experience instability of the hips. The shallow socket tends to allow the femur (thigh bone) to slip out of position.

When congenital dislocation of the hip is detected in infancy, the child can receive treatment. This includes the application of a wide-leg hip brace, which the child must wear for several months.

If not detected in early infancy, congenital dislocation of the hip become apparent by the time the child reaches 18 months of age. At this age, the child will begin to show a characteristic walk, with an unsteady, side-to-side gait. Any treatment initiated at this time is less successful than intervention begun in infancy.

At toddler or early school age, the child may benefit from riding a fat pony because the riding position, with the legs far apart, reproduces the wide-leg position of the brace. While riding, the child experiences gentle rocking movements which tend to increase the pressure of the head of the femur in the hips joint socket. This encourages a deepened and improved shape of the hip joint socket, and strengthens the muscles which help to stabilize the joint. Riding is particularly effective in supplementing other physiotherapy following the surgical repair of congenital dislocation of the hip.



OSTEOCHONDRITIS

This is a condition where damage occurs at the epiphysis (growth plate of bone) in children and adolescents. The epiphyseal plates of certain bones are impaired by faulty circulation, by traction injuries or by cartilage fractures. Degeneration and deformity of the bones may occur at these sites.

The most common site is the femur below the femoral head, and the condition is referred to as *Perthe's Disease*. It occurs in childhood, usually between 3 and 10 years, and sometimes follow a minor injury associated with hip discomfort. In many cases no cause is found. Perthe's Disease is characterized by pain and a limp, and the treatment of the acute phase in prolonged non-weight bearing, either by bed rest or with a pelvic brace to reduce the deforming degeneration.

Riding is appropriate exercise and recreation after the acute phase, as is sedentary and no weight needs to be carried by the affected leg.

Scheuermann's Disease involves the lower thoracic and upper vertebrae in young teenagers and is probably due to traction injuries of the epiphyses of the vertebral bodies. The symptoms are back pain and the treatment is at least 6 weeks of avoidance of contact sport and the stress of lifting.

Osgood-Schlatter's Disease is characterized by pain in front and below the knee and is caused by traction injury to the anterior surface of the tibia below the knee.

In all forms of osteochondritis, riding is contraindicated in the acute phase, but is useful during rehabilitation after pain has subsided.

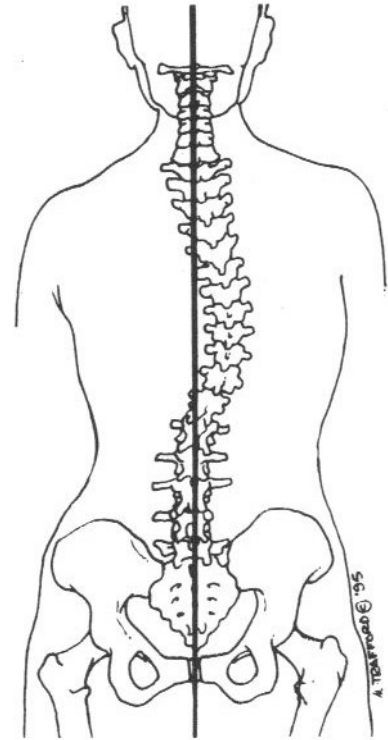
SCOLIOSIS (Curvature of the Spine)

People with *scoliosis* may have acquired the spinal curvature or they may have been born with it, as in congenital curvature of the spine. Most often, the spinal curvature occurs in the thoracic or chest region.

Some people with scoliosis wear a spinal orthosis or brace. If the curvature is particularly severe, the individual may undergo surgical treatment, in which a stabilizing device known as a Harrington rod is inserted along the spinal column. Riding is not a safe activity for a person with a Harrington rod. (see Section B, Chapter 7, Page 32, Contraindications to Therapeutic Riding.)

In general, physiotherapy is the preferred treatment for scoliosis. People who have scoliosis may find that they are bored by the repetitive exercises they perform in physical therapy. Riding can permit them to perform the same exercises in a more enjoyable setting, and to gain the added benefits from the movement of the horse, recreation and overall physical activity. Rider may also be able to monitor their own exercises and posture by using mirrors such as those often installed in indoor arenas.

For individuals who have a scoliosis with a curvature greater than 30 degrees, riding may not be beneficial and may even be harmful. (See Section B, Chapter 7, "Precautions and Possible Contraindications.") Such people may have markedly asymmetrical posture and their spines may lack the mobility required for them to ride safely and comfortably. The physiotherapist and orthopaedic surgeon must evaluate the person's spine to determine if he or she has sufficient spinal mobility to accommodate the movements of riding.



SPINAL IMMOBILITY

People may have *spinal immobility* for various reasons:

- organic (due to disease or injury)
- congenital
- surgical (such as fusion of the vertebrae or insertion of a Harrington rod)
- due to wearing a back brace

In determining the safety and appropriateness of riding for people with spinal immobility, the physiotherapist, in consultation with the orthopaedic surgeon, must consider the location of the immobility and hypermobility or looseness of the spine. Particular caution is required if immobility is present in the lumbar or lower thoracic regions of the back as most back movement occurs in these areas. Some horses do not facilitate much pelvis and spinal movement and should be used with riders with these conditions. In general, riders who have had spinal surgery should wait at least one year after the operation before they resume riding, and they should do so only with the written consent of their orthopaedic surgeon.

4. NEUROLOGICAL CONDITIONS AFFECTING THE BRAIN

CEREBRAL PALSY (CP)

Cerebral palsy is the most common cause of childhood disability. People with cerebral palsy experienced permanent damage to the developing brain, that damage having occurred before, during or up to two years after birth. This damage to the brain is non-progressive. Individuals with cerebral palsy experience various effects but usually movement, posture, balance and mobility are impaired. Brain damage may also cause seizures as well as impairment of vision and intellect, although not all individuals with cerebral palsy experience these effects.

People with cerebral palsy may experience the following:

- monoplegia, in which one limb is affected;
- diplegia, in which two limbs (the lower limbs more often than the upper limbs) are affected;
- hemiplegia, in which one side of the body is affected;
- quadriplegia, in which all limbs are affected.

Spastic cerebral palsy

This is the most common form of cerebral palsy. Individuals with spastic cerebral palsy experience:

- increased (spastic) tone in the muscles of the arms and legs, particularly in the flexor muscles (those which act in flexing or bending joints);
- decreased tone in the muscles of the trunk;
- loss of coordination.

Athetoid cerebral palsy

This is a less common form of cerebral palsy. Individuals with athetoid cerebral palsy experience:

- increased muscles tone, particularly in the extensor muscles (those which act in extending or straightening joints);
- poor posture due to decreased muscles tone of trunk muscles;
- constant involuntary movements;
- speech impairment or lack of speech despite normal intelligence.

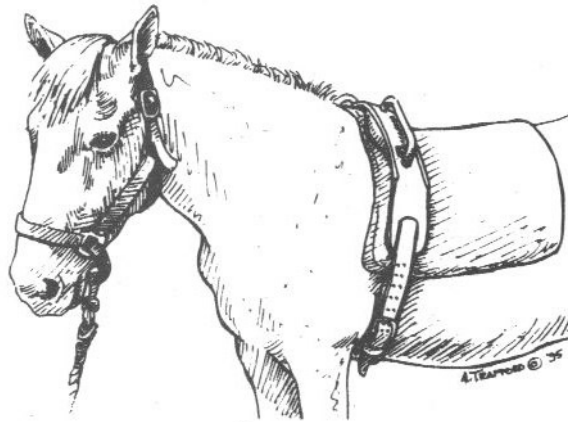
Ataxic cerebral palsy

This is a relatively uncommon form of cerebral palsy. The individual with ataxic cerebral palsy experiences uncoordinated, uneven movement. Such people accommodate decreased balance by walking with a wide-based gait. They may also experience a lack of awareness concerning the position of their limbs.

Riders with cerebral palsy will benefit from riding in many ways. The rhythmic movements of the horse help to improve the rider's balance and muscle tone. The rider's position astride the horse also stabilizes and mobilizes the pelvis, encourages better postural reaction, stretches muscles. Improves trunk control and improves the ability to walk.

Notes for instructors:

The rocking motion of the horse at the walk automatically causes the rider's muscles to relax, which is beneficial to riders who have spasticity. A bareback pad and vaulting surcingle may be more beneficial than a saddle as they afford the rider close contact with the warmth and soothing movements of the horse's back. This can help to ease muscle tightness and spasticity. The rider may benefit from the assistance of a sidewalker in maintaining a good position, and to encourage the rider to develop control of the head, arms and back muscles. With repetition, the rider's coordination and posture will improve.



The position of the rider's foot in the stirrup is important. The use of the stirrup should be guided by the therapist. In riders with cerebral palsy, too much pressure under the ball of the foot may increase muscle tone. To avoid this the rider's foot can be placed a little further forward in the stirrup.



The following will help riders to keep their feet from slipping through the stirrups:

- stirrups threads;
- a one-centimeter (half-inch) wide elastic strip fastened below the stirrup tread and over the foot;
- sheepskin foot guards or Devonshire boots.

Some riders are assisted in keeping the heel down if the sidewalker grasps the back of the heel. Riders may also find that they can better control their head and hands if helpers support their thigh and heel.

< Basic technique used by the sidewalker to provide support to the rider. As shown in the diagram, the sidewalker should grasp the knee roll and provide light pressure across the rider's thigh. This helps to secure and stabilize the rider. The sidewalker's other hand can provide support if necessary, to the lower leg depending on the needs of the rider.

Riders who wear an ankle-foot orthosis (AFO or shoe-horn brace) should keep it on for riding to stabilize the foot and leg position and to encourage a firm seat. Ladder reins or reins knotted to a suitable length may assist the rider in holding the reins. Helpers, with the guidance of the therapist, can assist the rider to improve trunk control, which will encourage head and arm coordination. Some riders with cerebral palsy have tightness of the adductor muscles of the hip, i.e. the muscles of the hip hold the legs tightly together. This is one of the major reasons such individuals have difficulty in walking. Before riding, they should be encouraged to stretch the adductor muscles by sitting astride a wide base, such as a bale of hay or bag of shavings. The stretching period should be about 10 to 20 minutes long. Riders who have tight hip adductors may be more comfortable on a narrow horse. For riders who have difficulty with head control, a lightweight helmet and/or soft foam collar may be helpful (see Section C, Chapter 2, Lightweight Helmet Guidelines)

Selective Functional Posterior Rhizotomy:

The surgical technique *selective functional posterior rhizotomy* aims to reduce spasticity for persons with cerebral palsy. A muscle with normal resting tone is neither floppy nor stiff. The messages from the brain (nerve impulses) that cause muscle contraction (excitatory impulses) and those that cause relaxation (inhibitory impulses) are in balance. If part of the brain is damaged, as in cerebral palsy, there may be reduced inhibitory (relaxing) impulses, i.e. the balance of impulses is disturbed and limbs are stiff (spastic). Traditional treatment for spasticity has tried to lengthen resulting tight tendons. Rhizotomies aim at reducing spasticity itself.

How do selective posterior rhizotomies work? Science has not yet learned how to repair brain damage so that normal impulses can reach the muscles. An alternative is to reduce the excitatory impulses that reach the muscles. A major source of excitation is from nerve impulses coming along the sensory nerves from the limbs to the spinal cord. These impulses enter the spinal cord through sensory or posterior nerve roots. To maintain normal resting tone, these incoming sensory impulses are controlled by inhibitory impulses as they enter the spinal cord. In this way, the brain balances the motor messages which leave the spinal cord through motor nerve roots and travel along motor nerves to the limbs. In spastic CP, there are not enough inhibitory impulses to control the excitation within the spinal cord. By limiting the excitation entering the spinal cord, this balance can hopefully be restored. In a selective posterior rhizotomy, the sensory nerve roots are partly divided. By leaving part of the nerve intact, the child will still have feeling in the limbs. Cutting part of the nerve reduces the amount of excitation going to the spinal cord.

To determine which nerves are cut, the function of each is tested during surgery with electrical stimulation. Each posterior (sensory) root is split into 3 to 5 rootlets, just as one might fray a piece of rope. Each rootlet is tested to determine which causes the most spasticity. These “bad” rootlets are cut and the rest are saved to preserve sensation. Only children with spastic CP will benefit. Since operation is done on nerves coming from the legs, it is appropriate only for children whose spasticity involves mainly their lower body.¹

Children usually wait six months after surgery before being accepted into a therapeutic riding program with the doctor’s consent. Rotation exercises should initially be avoided.

¹ Adapted from an article in *Contact – November 1990* and from *Selective Posterior Rhizotomy: A Guide for Parents*, a booklet developed by P. Steenbok, R. Beauchamp and A. Reimer of B.C. Children’s Hospital.

CEREBRO-VASCULAR ACCIDENT (CVA or Stroke)

In most people, *cerebro-vascular accident*, or stroke, occurs later in life unless there is a congenital abnormality of the blood vessels in the brain. In older people, a stroke is usually due to high blood pressure or hardening of the arteries. In younger people, a stroke is usually due to a high blood pressure or hardening of the arteries. In younger people, stroke is usually due to an aneurysm, which is the bursting of a weak area in an artery in the brain.

Whether the stroke occurs early or late in life, people who have had a cerebro-vascular accident experience some paralysis on one side of the body. In general, if the stroke affects the right side of the person's body (right hemiplegia), the person's speech is affected. People with left hemiplegia may experience difficulties in spatial perception, such as lack of awareness of the left side of the body (known as "left side neglect").

A person who has experienced a stroke will be helped by the retraining of the weak muscles and the redevelopment of coordination and balance. Riding is beneficial for such people because it encourages symmetrical body movement and helps to normalize muscle tone.

EPILEPSY AND SEIZURES

Epilepsy is a disorder involving sudden, transitory changes in brain function. During a seizure, which can vary in degree and duration, the individual loses consciousness, partially or completely, and may experience repetitive, involuntary movements, known as convulsions.

Epilepsy may be caused by damage to the brain, such as blood clot, tumor, head injury or infection, or it may occur as an inherited, primary condition. The most common types of medication prescribed for epilepsy are **Tegretol, Mysolin, Phenobarbital and Dilantin**.

There are three main types of seizures: generalized, known as grand mal seizures; minor seizures, known as petit mal seizures; and psychomotor seizures.

Generalized or Grand Mal Seizure

A person with epilepsy will experience three phases in this type of seizure:

- 1) **Aura:** The time just before the seizure is known as the aura. Some people with epilepsy have up to a one-minute warning, which can take the form of a taste, smell, discomfort in the stomach, numbness or spasms in the limbs.
- 2) **The Seizure:** During the seizure phase of the grand mal seizure, the individual loses consciousness, falls to the ground and his or her limbs begin to move in strong and repetitive contractions, known as convulsions. His or her skin may then appear bluish, he or she may froth at the mouth, pass urine and bite the tongue.
- 3) **Recovery phase:** After the seizure phase, individuals will remain unconscious for a brief period of time and their limbs will be limp. They may experience drowsiness, deep sleep, confusion, headache, vomiting or muscle soreness.

Minor or Petit Mal Seizure

In this type of seizure, the person with epilepsy may experience a brief blank spell during which they appear unaware of their surroundings and cease to move. The individual's muscles tone does not change but mental activity seems to stop for a few seconds. Such seizures may occur frequently – as often as six to ten times an hour – but they may be so minor that they are not noticed. Petit mal seizures do not present a risk to a rider since balance is usually unaffected.

Psychomotor Seizure

Like petit seizures, psychomotor seizures are minor. During such seizures, the person with epilepsy may experience spasms of the facial muscles, slurring of speech and involuntary head and eye movements.

Epilepsy is not only a neurological disability, it is also considered to be a social disability. There are a number of reasons for this designation:

- Epilepsy is not well understood by the general public.
- People with epilepsy may experience seizures at any time. As a result, seizures can be socially inconvenient, and injury can occur during seizures.
- People with epilepsy are often subject to restrictions imposed by others, which excludes them from enjoying many activities such as riding, swimming or bicycling.
- The medication used to control seizures can have unpleasant and inconvenient side effects, such as drowsiness and unsteadiness.
- Some people with epilepsy experience difficulty in hearing and concentration. As a result school, work and social situations can be frustrating.

Notes for Instructors:

- While overstimulation, tiredness and hunger can trigger seizures, seizures occur more frequently at times of drowsiness, boredom and inactivity. A rider is therefore more likely to experience a seizure while waiting to ride or after riding than while riding. The length of the ride for people with epilepsy should be appropriate to the rider's tolerance.
- Before a grand mal seizure occurs, the individual usually experiences a warning sensation. In riding sessions, this sensation may permit them time to let the instructor known that they may soon have a seizure. The instructor should then have the rider dismount and retire from the rider for that day.
- If the rider has a grand mal seizure during a ride, bring the horse to a halt and do everything in your power to dismount the rider. If it is impossible to dismount the rider, given him or her support until the seizure has finished.

The following are guidelines for managing a riding session when a person with epilepsy has a seizure:

- Remain calm. A seizure is neither a medical emergency nor a public curiosity.
- Keep other people from crowding the person who is having a seizure.
- Move any obstacles and horses from the vicinity of the person who is having the seizure. Try your best to remove the rider from the horse.
- Place the person in the recovery position (lying on their side)

- Loosen tight clothing from around the person's neck.
- Do not try to open or to place objects in the person's mouth.
- Apply appropriate first aid procedures if the person is unconscious.
- When the seizure has ended, allow the person to rest. The person may feel drowsy for half an hour or more after having a grand mal seizure.
- After the session, the instructor must complete an incident report and notify the rider's parent(s), guardian(s) or caregiver(s).

HYDROCEPHALUS

Hydrocephalus is the accumulation of cerebro-spinal fluid in the brain and can be caused by a tumour, injury or the abnormal development of the central nervous system. Hydrocephalus frequently accompanies spina bifida.

When hydrocephalus is first detected in an infant, child or adult, medical treatment must be implemented immediately to relieve the pressure on the brain. This treatment involves the insertion of a shunt into the brain. The shunt is located immediately under the skin, usually above the right ear. Its function is to drain the excess fluid from the brain into a tube inserted either into a vein in the neck or under the skin, across the chest wall and into the peritoneal cavity (abdomen). In both methods of shunting, the individual has a valve behind the ear.

People with hydrocephalus may have a larger-than-average head size. Their intelligence may be unaffected or it may be impaired. Some people with hydrocephalus experience a degree of limb spasticity, low muscle tone in the trunk region of the body, an unsteady gait and a slight tremor of the head. Riding is rewarding for them because it often brings about noticeable improvements in their physical condition. For example, they may find that the muscles of the back, abdomen and legs become stronger and their balance improves. This occurs because of the postural reflex changes caused by the movements of the horse.

In working with riders who have hydrocephalus, care should be taken to avoid any head injury that could disturb the shunt. A tight-fitting helmet or harness can place pressure on the valve or tube which may result in the rider becoming dizzy and ataxic (weak, with decreased coordination). Such riders should use large, padded hats or hockey helmets, or their own protective headgear, if applicable. Riders with a shunt should not be placed on their stomachs with their heads lower than their chests.

Notes for instructors:

- If the rider experiences any neurological symptoms such as headache, nausea, decreased coordination and/or loss of balance, note the details in writing and discontinue riding until you have discussed the matter with the rider, if possible, and the physician, therapist and/or caregiver.
- Riders with hydrocephalus may use a lightweight helmet (See section C, Chapter 1, "Lightweight Helmet Guidelines").

TRAUMATIC BRAIN INJURY (TBI)

Most *traumatic brain injuries* are the result of the head striking a stationary object or of the head being struck by a moving object. People who have head injuries may experience residual brain damage. The compression, twisting and distortion of the brain inside the skull associated with the impact may cause localized, as well as widespread damage of the brain. Brain cell damage may also occur in incidents of inadequate blood flow to the brain resulting from near-drowning, heart attacks, chemical and drug reaction and infection. The extent of the functional impairment depends on the extent and location of the brain tissue damage. People who have had traumatic brain injuries may experience the following impairments:

- intellectual impairment, especially skills such as problem-solving ability, memory, judgment and attention span;
- speech impairment and the ability to understand the speech of others;
- changes in personality or mood (increased irritability and frustration, decreased inhibitions);
- decreased coordination;
- decreased balance;
- changes in muscle tone;
- loss of sensation in various parts of the body;
- hemiplegia;
- hydrocephalus;
- visual-perceptual impairments such as changes in the visual field, and inability to process sensory information reliably (spatial awareness, body awareness, form recognition)

In the following analogy, the brain is likened to the workforce of a company which runs most efficiently when everyone is there. At the front of the brain are several vice-presidents (VPs), who make the executive decisions based on feedback from their departments. The VPS make the plans and organize how things get done. Then they judge how things are going and show either appreciation or annoyance. In the middle are the managers who run their own departments. On the left side of the brain is the speech department, the language department and the motor department. On the right side there is a spatial reasoning and perception department and another department. The managers know what the VPs' plans are and they make sure they are carried out. To do this they communicate frequently with each other. At the bottom of the organization are the workers. They don't know what the bigger picture is about but they know their jobs, which they do, day in and day out. They take care of things such as sleep, appetite and basic emotions.

When a brain injury occurs, somebody gets fired. Depending on the severity of the injury, it could be a manager, a worker or a VP. The ultimate result of the injury is reduced efficiency of the company. Messages get sent but not processed. VPs get annoyed, managers fatigued and workers overwrought. Confusion reigns. One purpose of rehabilitation is to find out who is sill on the job so the company can compensate for the losses and become efficient again.

People with head injuries do not necessarily have a visible disability. As a result, they may be labeled as being clumsy or showing bad behaviour. Physically they are able to ride, often on a part with able-bodied riders. As a therapeutic riding instructor, you must be aware of the underlying effects of head injury. Be prepared to encourage the rider and help him or her to build self-confidence. If the rider displays frustration or loses his or her temper, manage the situation with patience and tact. Remember that riders with head injuries may be slow to understand and may find it difficult to efficiently carry out simple instructions.

Notes for Instructors:

- The extent and area of the brain injury will be different in each and every rider you have in your program. An injury can cause anything from a relatively minor disability to a physical, cognitive or perceptual disability. It was thought that three months after an injury, an individual would show very little further recovery, but even several years after an injury, one sees riders improve. The horse and the physical stimulus it provides, plus the social stimulus, may be the key.
- Patience is the password for instructors who have these riders in their programs. Progress is sometimes dramatic but more often very slow – use of a video to document change is invaluable. Families offer information that should be recorded (e.g. “My son is using his walker around the house without supervision now”). If nothing else has changes in the son’s life one can assume riding has helped his balance. Be in touch with the P.T./O.T. if still involved.
- You may encounter the whole gamut of problems associated with neurological disorders, singly or in combinations. This makes a seemingly simple task monumentally difficult. Perceptual problems, visual and spatial, are often an added complication. A supportive family or caregiver can help greatly in your understanding of the problems your rider encounters and will be of great help tailoring your lesson and instructions to maximize ability and build on success.
- Instructor notes for Neuromuscular Conditions Affecting the Brain and/or Intellectual/Developmental Disability may be helpful.

5. NEUROLOGICAL CONDITIONS AFFECTING THE SPINAL CORD

SPINA BIFIDA

People with *spina bifida* have a congenital deformity of the lower spine due to a developmental disruption of the neural tube during the fetal stage (the first three months of pregnancy). The incidence of spina bifida can be greatly reduced if folic acid is taken by the mother a few months prior to conception, and for the first few months of pregnancy. In spina bifida, the vertebral canal does not close normally around the spinal cord. Spina bifida occurs in 0.1 percent of the population, however not all affected have symptoms. It is only when there is damage to the spinal cord (due to lack of protection by the vertebrae) that spina bifida myelomeningocele results. People with spina bifida may also have hydrocephalus.

People with spina bifida may have weakness or paralysis of the body below the level of the spinal defect. Their lower limbs may be weak or paralyzed to varying degrees, and their feet are often deformed. When the individual has paralysis, he or she also experiences a lack of sensation, and because of this, pressure sores can develop on the buttocks or thighs from extended sitting and friction.

Paralysis of the lower extremities may also affect the muscles that control the bowel and the bladder, possibly making the person incontinent. Surgical adaptations, such as colostomy or ileostomy, involving an external bag to collect urine or faeces, can assist in managing the passing of bodily wastes.

Spina bifida is non-progressive. While riding does not affect the extent or nature of the condition, it provides a recreational activity which improves balance and protective reactions, eye/hand coordination, independence and self-esteem.

SPINAL CORD INJURY

Spinal Cord Injuries are often the result of an accident such as motor vehicle collision, Sports or diving mishap. The spinal cord is the large nerve fibre tract which extends from the base of the brain down through the bones of the spinal column (vertebrae). Severe trauma can result in the spinal cord being bruised, crushed or torn.

Spinal cord injury usually affects many systems of the body. Impairments are in the areas of voluntary movement and sensation. Traumatic spinal cord injury results in partial or total loss of function below the level of the injury to the spinal cord. When the injury occurs at the lower level of the spinal cord, and if there is complete loss of muscles control and sensation in the lower extremities, the condition is called paraplegia and the individuals sometimes refer to themselves as paraplegics. If there is only partial loss of muscles control and sensation in the legs, then the condition is called paraparesis (meaning weakness, not total paralysis) or incomplete paraplegia.

An injury to the spinal cord above the fifth thoracic vertebra (T5) will result in either absent or partial strength of abdominal and lower trunk muscles, depending on whether the lesion is complete or partial. Without these muscles, trunk stability is greatly weakened. Arms bridge to help maintain upright position. Suitability of riding should be assessed individually. A complete lesion above the thoracic vertebra causes quadriplegia. Medical professionals generally agree that people with quadriplegia would neither benefit nor be safe during horseback riding due to paralysis of the trunk and leg and arm muscles.

Other systems that may be affected by damage to the spinal cord include:

- bowel and bladder control (inability to control the muscles results in incontinence)
- involuntary muscle jerks or spasms may occur in the involved limbs.

Notes for instructors:

- Consult with the medical advisor to determine whether the rider should wear a spinal jacket and/or leg orthotic (leg brace) during riding. Individuals who usually wear such assistive devices may be more comfortable and effective if they wear them during riding.
- Consult with the individual and/or medical advisor to determine if the rider uses an ostomy or some other device to manage incontinence. If the rider has such a device, care should be taken not to place pressure on the rider's abdomen or thigh. A sheepskin pad or numnah used on the saddle can help prevent pressure sores. A sheepskin secured by a vaulting surcingle will assist the rider in maintaining balance. The two rigid handles help the rider to support the upper body and make balance adjustments.
- Advise the rider, or if the rider is a child, advise the parent/guardian to check for pressure sores after each ride. Pressure points can be caused by the saddle or by wrinkles in the clothing, and the movements of riding can cause sores.
- In most cases, the rider should use stirrups, preferably with Devonshire boots, to support the legs.
- Check the harness of the riding helmet to ensure that it is not too tight, particularly if the rider has a shunt (see Section B, Chapter 3, "Hydrocephalus")
- Driving can be an option for many people with spinal cord injuries when a suitable horse and cart are available.

6. NEUROMUSCULAR CONDITIONS

AMYOTROPHIC LATERAL SCLEROSIS (ALS or Lou Gehrig's Disease)

People with *ALS* experience generalized motor weakness which is often first noticed in the hands as a weakened grip. This disease does not usually have remissions. Initially the arms and legs are involved, and the disease often progresses within a couple of years to the facial and respiratory muscles. Riding is only appropriate in the early stages.

FRIEDREICH'S ATAXIA

Friedreich's ataxia is a genetic disorder of unknown cause which becomes apparent in late childhood or early adulthood. It is a progressive disease that affects the spinal cord and lower section of the brain (the cerebellum). The cerebellum controls muscular coordination. As the cerebellum deteriorates, problems such as clumsiness or incoordination usually develop. The affected person gradually loses the ability to control his/her muscles.

Possible effects of Friedreich's ataxia:

- ambulation may initially be limited due to diminished muscle control and gradually the individual may require a cane, a walker or a wheelchair in order to be mobile;
- the ability to coordinate and effectively use one's arms and hands may become impaired due to severe tremors;
- scoliosis (curvature of the spine) may occur;
- speech may gradually become slurred;
- reduced vision which could progress to blindness may occur;
- mental deterioration may occur;
- degenerative changes and scar formation may occur in the heart muscle.

MULTIPLE SCLEROSIS (MS)

The exact cause of *multiple sclerosis* is unknown. The fatty insulating material (myelin) around the nerve impulses that control various functions of the body. Multiple sclerosis is one of the most common neurological diseases in North America and Europe. The course of the disease is unpredictable and its progression varies greatly among affected individuals.

People with multiple sclerosis may have remissions (i.e. time when they experience fewer or no symptoms of MS) and exacerbation (times when the symptoms occur or worsen). They may experience various impairments including visual impairment (blurred vision or double vision), ataxia (incoordination of limbs), dizziness, loss of balance, decreased protective reactions, muscles weakness, changes in sensation (tingling and numbness), impaired speech (slurring) and some degree of incontinence. Persons with multiple sclerosis are particularly sensitive to heat and stress. Fatigue also has a negative effect on their ability to function. Conceptual thinking, memory, attention span and/or judgment may be affected by the disease. Mood swings may also occur.

Riders with MS may find it difficult to mount the horse. Once mounted, however, these riders are often able to progress quite well in their riding. The benefits of riding for people with MS include an improvement in muscle tone, balance, coordination. Protective reactions and overall physical condition. Riding provides a positive recreational and social activity.

Notes for Instructors:

- It is important to remember that people with multiple sclerosis are extremely sensitive to hot, humid weather and that they fatigue rapidly in these conditions. Physical changes to your rider's condition from one ride to the next can be due to weather or emotional upset and may be quite devastating. Watch constantly for signs of fatigue. It is best to stop when your rider is still feeling energetic.
- Your choice of horse will depend on the condition of your rider's legs muscles. If they are tight and/or spastic, a narrow horse may be more comfortable. You may wish to discuss pre-riding positioning or exercises such as those that are used with riders with cerebral palsy to relax tight adductor muscles. Trunk strength and balance will also affect your horse choice because it is easier to balance on a broad base than on a narrow one.
- Sensation may be decreased and the rider should be alerted to check pressure areas after riding. A sheepskin or gel pad is helpful for a rider who is very thin, especially if he/she has poor sensation.
- Instructors should be aware of the fact that some people with multiple sclerosis may have cognitive and memory problems. This is particularly important around the barn where safety is an issue, since the rider may forget simple safety rules.
- Driving should, if possible, be offered as an alternative if you are having difficulty mounting the rider and safety becomes an issue. If the rider wishes to continue to be involved with horses, driving may well be a viable and pleasurable alternative.

MUSCULAR DYSTROPHY (MD)

Muscular dystrophy encompasses a group of chronic diseases which result in wasting or degeneration of the skeletal or voluntary musculature. The four main types of muscular dystrophy are pseudohypertrophic dystrophy (Duchenne), facio-scapula-humeral (Landouzy-Degerine), limb-girdle dystrophy, and myotonic dystrophy (Steinert's disease). Muscular dystrophy is a progressive disease and as the muscles deteriorate the individual becomes weaker. The age of onset as well as the rate of progression vary according to the type of dystrophy involved. The cause of muscular dystrophy is not well understood; it is known, however, that it is hereditary. In a family in which MD occurs, several children in a single generation may have the disease.

People with MD experience deterioration of muscle fibres, in which muscle tissue is replaced by fat or fibrous tissue. As a result, muscles that appear to look "normal", not thin and wasted-looking, will be extremely weak. The most common form of MD, the Duchenne type, affects almost exclusively boys but is carried by the female's genes. Boys with Duchenne MD have no apparent disability until the age of two, after which they have difficulty walking and they fall down more often than is normal. In the early stages they frequently use their arms to help themselves get up into a standing position. Walking up stairs becomes increasingly difficult. Boys with Duchenne MD become weak in their legs first, and later the muscles of the spine and arms are affected. As a result, they may develop curvatures of the spine such as kyphosis and scoliosis.

By the time they reach age 11, boys with Duchenne MD will often use a wheelchair for mobility, and by their mid teens they will use a wheelchair as their primary mobility aid. These children experience rapid fatigue and their tolerance for activity is limited. As a result they may be overweight. Riding can be beneficial, particularly in the early stages while the individual can still walk. Riding will help maintain

joint mobility and it will gently exercise the muscles. In addition, riding will increase mobility and balance, and provide an enjoyable recreational activity.

Some people experience forms of MD that occur in adulthood, such as limb-girdle muscular dystrophy. As candidates for riding, these people should be assessed on an individual basis.

Notes for Instructors:

- Instructors should try to select horses that have a strong, broad back and smooth gait.
- People with MD may need more back support than a regular English saddle provides. An Australian stock saddle may be helpful for these riders.
- When lifting a child who has MD, avoid lifting under the armpits – the arms will go over the child's head and he/she will slip from your grasp. Instead, visualize lifting an individual who has no arms, so that you lift the child from around the trunk with his/her arms straight down by the sides or crossed over the chest.
- The duration of the riding session should be consistent with the tolerance level of the individual. Maintain good communication with the rider to determine if he or she has ridden long enough. Similarly, good communication will help both of you to determine if he/she can no longer tolerate or benefit from riding at all due to the progression of the disability.
- If a person with MD can no longer ride but wishes to maintain some involvement with horses, encourage him/her to join a riding or horse club as a non-riding member, or to become involved in a driving program. Involvement at shows and meetings as a score keeper or timer may also be a way for them to participate and assist in riding activities.

POST-INFECTIVE NEUROPATHIES

Post-infective neuropathies result from diseases such as Guillain-Barre syndrome, encephalitis, meningitis and poliomyelitis. Meningitis and encephalitis are infections of the tissues covering the brain and of the brain itself, whereas diseases such as Guillain-Barre and polio affect the spinal cord and peripheral nerves.

People who have had these neurological illnesses recover to variable degrees, but they often experience some level of disability, such as decreased muscle strength, tone and coordination. People who have been affected by meningitis and encephalitis may have brain damage with intellectual impairment. Refer to section in Chapter 3 on traumatic brain injury for more information on brain damage.

During rehabilitation, the individual will engage in therapy to strengthen healthy muscles and to learn ways to compensate for the disabilities.

Notes for Instructors when reaching riders with Neuromuscular Conditions:

- Always encourage good, balance posture so that spinal curvatures and contractures will not develop. Encourage equal strengthening of muscles and full range of movement on both sides of the body to prevent asymmetry or uneven posture and muscle development. The therapist can provide input in achieving these goals.

- Provide the rider with support when necessary. Such support should be firm but should not disturb the rider's balance by leaning, pushing or pulling.
- Riders should not become overtired or stressed. Encourage the rider to increase tolerance gradually and include rest session during the ride. Remember that a weak muscle does not strengthen well if it is tired. During rest period, the lesson can continue in another form, with a question and answer period if the rider can tolerate such conversation.
- Before each ride, check with riders to determine how they are feeling that day. People with neuromuscular disorders can experience day-to-day changes in their disability. Remember that people with neuromuscular disorders do not usually have intellectual impairment. Encourage riders to participate in decision making and to contribute toward establishing short and long term goals of their riding program.
- Be careful when assisting the rider to mount the horse, as the hip muscles may be tight and can be quite painful when stretched.
- Encourage the rider to engage in a regular exercise program outside of the riding session. A good exercise program will improve the person's lung capacity and circulation, thereby encouraging overall health.
- Decrease coordination may be due to changes in sensation of to muscle weakness.
- If the rider has decreased sensation, he/she should watch for pressure sores on the legs and buttocks. Adjust the rider's stirrups to provide adequate support for weak legs with decreased sensation. A sheepskin saddle cover can help to protect the skin.
- Remember that if riders with neuromuscular conditions are exposed to excessive exercise, stress or heat, their ability to function will be decreased. If the rider shows signs of feeling weak, such as impaired speech, cramping and/or spasms of muscles and/or decreased sensation, a rest period should be given.
- When the rider is hot during warm-weather riding, a cool, damp cloth can be used to refresh the rider's face and arms. Also, keep plenty of drinking water available to cool and hydrate a hot, thirsty rider.

7. OTHER CONDITIONS

AUTISM SPECTRUM DISORDER

The term "**spectrum**" refers to a continuum of severity or developmental impairment. Children and adults with ASDs usually have particular communication and social characteristics in common, but the **conditions cover a wide spectrum, with individual differences in:**

- Number and particular kinds of symptoms
- Severity - mild to severe
- Age of onset
- Levels of functioning
- Challenges with social interactions

There are in fact five Autism Spectrum Disorders described under this diagnostic category of Pervasive Developmental Disorders (PDD) that appear in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) of the American Psychiatric Association. While the DSM-IV still categorizes autism as a mental health disorder, there is debate about whether this classification is appropriate.

When speaking of ASDs, most people are referring to **three of the PDDs that are most common:**

- **Autistic Disorder** (also called autism, classic autism and AD)
- **PDD-NOS** (Pervasive Developmental Disorder - Not Otherwise Specified)
- **Asperger's Disorder** (also called AS, Asperger's Syndrome and Asperger Syndrome)

Autism Spectrum Disorder is a neurological disorder resulting in developmental disability. This affects

Communication

Social understanding

Behaviour, activities & interests

Individuals with ASDs have varying degrees of difficulty in social interaction and communication and may show repetitive behaviours and have unusual attachments to objects or routines.

Autism is the most common neurological disorder affecting children and one of the most common developmental disabilities affecting Canadians in general. ASDs change the way the brain processes information and can affect all aspects of a person's development. Classic autism usually appears during the first three years of life. Autism is four times more common in boys than girls.

Each individual is unique - no one person with an ASD responds or behaves exactly like another with the same diagnosis.

There are Five Pervasive Developmental Disorders (PDDs)

- Childhood Disintegrative Disorder (CDD)
- Rett's Disorder (RD)
- Autistic Disorder (AD)
- Pervasive Developmental Disorder - Not Otherwise Specified (PDD-NOS)
- **Asperger's Syndrome (AS)**

Childhood Disintegrative Disorder (CDD)

-
- Significant losses in social behaviour, language, play and adaptive behaviour after period of normal development of 3 or more years
- Severe deficits in cognitive ability

Rett Syndrome (RTT)

-
- A developmental disorder found almost exclusively in girls
- Symptoms appear after an early period of apparently normal or near normal development until six to eighteen months of life, when there is a slowing down or stagnation of skills
- Often misdiagnosed as autism or cerebral palsy
- RTT causes problems in cognitive, sensory, emotional, motor and autonomic function. Can affect learning, speech and communication, sensory sensations, mood, movement, breathing, cardiac function and psychomotor skills
- Disabilities caused by Rett Syndrome range from mild to severe.
- More on Rett Syndrome

Autistic Disorder (AD)

- Most common
- Cognitive impairments
- Deficits in verbal and non-verbal communication
- Deficits in social understanding
- Unusual behaviours, restricted activities

Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS)

- Common
- Also called atypical autism

- Severe and pervasive impairment in some areas such as reciprocal social interaction, or restricted activities and interests but the strict criteria for autistic disorder are not met

Asperger Disorder (also called Asperger's Syndrome, Asperger Syndrome, and AS)

- Common
- Mild to severe impairments in social interaction and understanding
- Restricted and repetitive activities and interests
- Language and cognitive development not delayed
- Deficits in communication

Related Conditions

Several other medical conditions also include some features of PDD, such as Down Syndrome, Prader-Willi Syndrome, Fragile X Syndrome, Landau-Kleffner Syndrome, William's Syndrome or Tourette's Syndrome but PDD does not actually include these medical conditions.

From: Autism Society Canada
<http://www.autismsocietycanada.ca/>

SENSORY PROCESSING DISORDER (SPD)

Sensory processing is an overarching term that refers to the method the nervous system uses to receive, organize and understand sensory input. It is considered an internal process of the nervous system that enables people to figure out how to respond to environmental demands based on the sensory information that was available to make the person aware of what is going on both around the person (e.g., from auditory and visual input) and from within the person's body (e.g., from touch, joint receptors).

Sensory Processing Disorder (SPD, formerly known as "sensory integration dysfunction") is a condition that exists when sensory signals *don't* get organized into appropriate responses. A person with SPD finds it difficult to process and act upon information received through the senses, which creates challenges in performing countless everyday tasks. Motor clumsiness, behavioral problems, anxiety, depression, school failure, and other impacts may result if the disorder is not treated effectively.

Children whose Sensory Processing Disorder conforms to the under-responsivity subtype typically require a great deal of stimulation in order to become alert and active, a behavior often seen in children with autistic spectrum disorders. Meanwhile, other children with ASD have symptoms more similar to the over-responsive subtype of SPD. Because Autism and SPD both have over-responding and under-responding categories, they are sometimes mistaken for another.

Children may be assessed by an Occupational Therapist using a Sensory Profile and may be identified as one of the following: Sensation Seeking, Low Registration, Sensation Avoiding or Sensory sensitive.

Areas that are assessed include auditory, visual, tactile, vestibular and proprioception (*being aware of where your body is positioned in relation to other parts of your body. Receptors in the muscles and joints help to coordinate movements*)

Therapeutic riding provides a lot of multi sensory input which can be calming for children with SPD thus helping them to be regulated and alert for learning and paying attention. It may also provide the input necessary to decrease behaviours that are seeking or avoiding.

Slow rhythmical movements of the horse are calming while a choppy gait, stop/start and direction changes are alerting.

Be aware of and explain noises that may startle a child with a low auditory threshold such as rain on the roof or fire alarms

Vision is often a strength so add visual pictures or symbols to enhance learning

DOWN SYNDROME

Down syndrome is a naturally occurring chromosomal arrangement that has always been a part of the human condition. The occurrence of Down syndrome is universal across racial and gender lines,

Down syndrome is not a disease, disorder, defect or medical condition. It is inappropriate and offensive to refer to people with Down syndrome as "afflicted with" or "suffering from" it. Down syndrome itself does not require either treatment or prevention.

Down syndrome commonly results in an effect on learning style, although the differences are highly variable and individualistic, just as in the physical characteristics or health concerns. The most significant challenge is to find the most effective, productive methods of teaching each individual. The identification of the best methods of teaching each particular child ideally begins soon after birth, through early intervention programs.

People with Down syndrome experience the following:

- decreased intelligence, coordination, balance, manual dexterity and communication/language skills;
- reduced tone in all muscles;
- increased laxity (looseness) in ligaments (strong, connective-tissue cords which join bone to bone and are essential in stabilizing joints); as a result, the person's joints may hyper-extend (overstraighten) and the rider may be very flexible;
- hearing impairment may occur in 80% of people with Down syndrome and is due to recurrent ear infections which the individual may outgrow by age 10;
- delayed speech and articulation difficulties;
- arms and legs are short in relation to the trunk;
- a tendency toward being overweight;
- shallow hip sockets, although hip dislocation is uncommon;
- instability in the cervical (neck) spine: the first two cervical vertebrae, which are close to the base of the skull, may dislocate due to hyperlaxity (increased looseness) of the ligaments and the shape of one vertebra. Neurological signs such as weakness and/or numbness in any of the extremities, change in bowel or bladder function, or change in gait usually precede the actual dislocation by months or years. Caution is advised due to the remote possibility of quadriplegia or death (see Section C, Chapter 1, Atlanto-Axial Instability)

- congenital heart deficits, which are quite common in people with Down syndrome and may limit their tolerance of exercise and their ability to progress in riding.

For suggestions to help make riding a safe, beneficial and enjoyable activity, please refer to Intellectual/Developmental Disability.

EMOTIONAL DISORDERS

People with *emotional disorders* may have difficulty in learning and living skills. Children with emotional disorders may attend a specialized school or special-education class within school. Riding is often recommended as a valuable extra-curricular exercise since it offers a positive recreational and social activity. People with emotional disorders may experience the following:

- normal, low or high intelligence;
- behavioural disturbances which may result in difficult interpersonal relationships;
- high expectation of failure and may act out or resist competition due to fear of failure;
- frustration and unhappiness with low self-esteem.

Notes for Instructors:

- People with emotional disorders may not respond well to other people but may respond well to the horse. As a result, they may be interested in becoming involved in caring for the horse, and they may be able to develop and express positive emotions in relation to the horse.
- People with emotional disorders may not make friends easily, particularly with their own age group, but they may connect well with those involved in the riding program, as well as with the horse.
- People with emotional disorders respond well to a challenge, as long as it is within their capability, and they are given appropriate support and encouragement.
- Quiet, rhythmical and melodic background music can be of assistance, particularly in calming children with emotional disabilities.
- Make use of cooperative activities, as opposed to competitive games, and reward with positive feedback.
- Clip reins to the halter if rider tends to be rough.

FETAL ALCOHOL SPECTRUM DISORDER

FASD is the **leading known cause of preventable developmental disability** among Canadians.

FASD cannot be cured and has **lifelong impacts on individuals, their families, and society**. Effects, including alcohol-related birth defects, can vary from mild to severe and may include a range of physical, brain and central nervous system disabilities, as well as cognitive, behavioural and emotional issues.

Individuals with FASD may exhibit some of the following primary characteristics:

- Memory problems
- Difficulty storing and retrieving information
- Inconsistent performance ("on" and "off") days
- Impulsivity, distractibility, disorganization
- Ability to repeat instructions, but inability to put them into action ("talk the talk but don't walk the walk")
- Difficulty with abstractions, such as math, money management, time concepts
- Cognitive processing deficits (may think more slowly)
- Slow auditory pace (may only understand every third word of normally paced conversation)
- Developmental lags (may act younger than chronological age)
- Inability to predict outcomes or understand consequences

HEARING IMPAIRMENT

People with *hearing impairments* can be divided into two groups:

- 1) People who are deaf (when referring to the entire deaf population and their culture, the term “the deaf” is acceptable). These people have very little residual hearing, although they may have some, and with hearing aids, they may be more sensitive to sounds and vibrations than most hearing people.
- 2) People who are hard of hearing. These people are not deaf, but have a hearing loss, for which they may wear an amplification device or system.

It is a common misconception that all deaf and hard-of-hearing people can lip read. As with any skill, some people are better at lip reading than others. Only a part of speech is visible on the lips. As a result, even the best lip readers cannot follow all that is said.

Another misconception is that deaf people are mute – that is, physically unable to speak. Deaf people are not mute; they have the organs of speech, but their deafness impairs their ability to learn speech, which is very dependent on hearing. Some deaf people may also choose not to use their voices because they are concerned that they will be misunderstood, or that they will speak using inappropriate pitch or volume. In the past, terms like “deaf-mute” and “deaf and dumb” were not uncommon. Today, most deaf people consider these terms to be offensive. “Deaf”, “hard of hearing” or “hearing impaired” are acceptable terms.

The speech of deaf and hard-of-hearing people may sound different than that of hearing people. This does not indicate any kind of intellectual disability. There is no connection between a deaf person’s speech and his or her intellect.

Notes for Instructors:

- Before your first lesson with deaf or hard-of-hearing students, meet with them and try to establish what means of communication they are most comfortable with, e.g. speech (understood using residual hearing), lip reading, sign languages, amplification system, or some combination of these. Many deaf people have strong preferences, while others do not.
- If applicable, learn a few basic signs before the first lesson, meeting with the riders beforehand to ensure that the signs you use are familiar to them and that you are signing correctly – it can be helpful to ask the riders to teach you some signs and to have volunteers learn basic signs as well.
- If you use speech in teaching these riders, talk slowly and clearly, making sure that your head is turned toward the rider and that the light is on you not behind you. Backlighting tends to place your head in silhouette, making it difficult to see your face clearly and therefore, to lip read.
- Whether you use speech or sign language, be expressive. A central tool in communication with and among the deaf is mime (the use of facial expressions, gestures and suggestion).
- Use demonstration as a technique in teaching deaf and hard-of-hearing people to ride, as the visual image is a valuable learning aid.
- Be aware that a great deal of background noise makes it difficult for the rider to make use of any residual hearing, as it is hard to differentiate among noises.
- Make use of a wall mirror, so that the rider can see his or her position and make appropriate corrections.
- If the rider uses an amplification device or system, ensure that as the instructor, you make use of this device in communicating with the rider.
- In the interest of eventual integration into non-disabled activities, the use of official horse show signals to designate walk, trot, jog, canter, reverse and halt may be used by the instructor. See appendix for hand signals.

INTELLECTUAL/DEVELOPMENTAL DISABILITY

An individual with an *intellectual* or *developmental disability* develops at a less than average rate and has difficulty in learning and social situations. Intellectual disability is defined in terms of a person's ability to perform on standardized intelligence tests.

Intellectual or developmental disability can have a variety of causes:

- genetic anomalies – e.g. Down syndrome;
- infections during the prenatal stage of development or in infancy – e.g. intellectual disability that results from the mother having German measles;
- brain damage due to toxic agents during the mother's pregnancy or in infancy – e.g. RH incompatibility, lead poisoning;
- trauma (injury) – e.g. due to asphyxiation or brain injury from accidents;
- metabolic disorders affecting growth or nutrition – e.g. P.K.U., fetal alcohol syndrome;
- environmental factors – e.g. malnutrition, deprivation.

Education is the most important element in support of people with intellectual or developmental disabilities. A good education program includes individualized programs, appropriate expectations by the teacher, and a variety of positive role models in the most stimulating environment possible. A program which is designed with these considerations in mind will optimize the success of people with intellectual or developmental disabilities.

Riding is an excellent activity, providing structured physical exercise which is important for developing coordination, fitness and well-being. It also provides an opportunity to improve self-confidence and social skills. In teaching, the instructor should recognize the student's individual needs.

LEARNING DISABILITY

People with *learning disabilities* may not have an intellectual disability or a visible physical disability. They may exhibit a significant discrepancy between their academic performance and their assessed intellectual ability. They may experience disabilities in the following areas:

- receptive language (listening, reading);
- language processing (thinking, conceptualizing, integrating);
- expressive language (talking, writing, spelling);
- mathematical computations.

These disabilities may come into play in academic, social and sports-related activities. When a person has a learning disability, he/she may not be able to perceive and organize information to produce anticipated responses. For example, the person with a learning disability may hear but be unable to make sense of the words that are spoken; he/she may see letters but perceive them as being upside down or backwards, and therefore the letters provide no meaningful information. If the person confuses incoming signals and cannot categorize them, responses to identical information may differ each time that same stimulus is presented.

Every individual, learning disabled or not, has his or her own style of learning. In teaching, the riding instructor may observe that the individual may be:

- inattentive;
- very active or conversely, very lethargic;
- awkward, clumsy and uncoordinated;
- unable to perceive where he or she is in terms of time and space;
- unable to follow directions well or unable to follow two separate directions given one after another;
- unfamiliar with or unable to respond appropriately to commonly known phrases or symbols;
- lacking in organizational skills;
- lacking in ability to articulate speech well.

People with learning disabilities are often familiar with failure. Riding offers them an opportunity to succeed in an activity in which they interact with and direct another being, the horse. In riding, the horse, which has an innately patient, gentle and cooperative nature, becomes an important part of the individual's experience of challenge and success. This positive experience helps the person with a learning disability to acquire many skills which may have been elusive in other situations.

In teaching people with learning disabilities, the riding instructor should strive to meet the rider's individual needs, recognizing that short-term goals are more reasonable than more global goals. Any new

task should be introduced gradually, with the objective of maximizing the student's opportunity for success. Repeat the activity to optimize learning, but try to make repetitions varied and interesting, and always geared toward success. The use of appropriate and carefully chosen games can be helpful in encouraging learning and ensuring that the rider enjoys the sessions. If the rider has difficulty assimilating the information by one method of teaching, it is important to use other approaches or methods. Some people learn by watching and others learn more by doing or from verbal instruction.

Noted for Instructors when teaching riders who have learning disabilities, intellectual or developmental disabilities:

- Aim for success and recognize that small achievements are as important as major accomplishments.
- In teaching new skills, progress from simple to more complex concepts in a logical and clear fashion.
- Teach one skill at a time and ensure that the student has learned that skill before moving on to the next one.
- Make ample use of learning aids such as visual aids, demonstrations and games.
- Show the riders what you mean as well as telling them.
- Make use of games to provide added enjoyment and recreation, and as another means of learning.
- Adjust your instructions according to the pace of the students' learning, taking into account that riders with intellectual or developmental disabilities may be apprehensive about the size and movement of the horse, and they may have difficulty with motor skills.
- If possible, occasionally have a mounted instructor ride with the students, as they will learn from demonstration and from having a visual image of what you expect of them.
- Use field trips as an added learning tool. For example, take the riders to visit horse shows, other horse-related events and stables, and introduce them to the work involved in caring for the horse such as grooming, feeding, cleaning stalls, tacking-up, etc.
- Give instructions slowly and clearly and repeat them, taking into account that some people with intellectual or developmental disabilities take anti-seizure or tranquilizing medication which can slow down their physical and mental reactions.
- Change activities frequently, as people with intellectual or developmental disabilities may have a reduced attention span.
- Clip the reins to horse's halter if the rider tends to pull excessively on the reins.

SMALL STATURE

People who have *small stature* can be categorized as follows:

- 1) People with achondroplasia who have experienced a lack of development in the growth centres of the long bones of the arms and legs, whose limbs are very short and whose body and head are of average size.
- 2) People who have symmetrically small size who have experienced decreased growth and whose head-to-body proportions are average.

Achondroplasia is a congenital disability. Symmetrical small size may be due to a variety of reasons, such as fetal alcohol syndrome, which can be caused by the mother's use or abuse of alcohol during certain stages of pregnancy.

Riding is an activity which people with small stature can learn well and in which they can excel.

Notes for Instructors:

- People with small stature may require a smaller, close-contact saddle.

VISUAL IMPAIRMENTS

People may experience visual impairment to varying degrees during life through disease or injury, or they may be born with it. Vision losses may be sudden or gradual. In either case, the individual will require time and appropriate intervention to adjust to life as a non-sighted person.

Vision loss can be partial or complete. When it is partial, vision can be restricted in the following ways:

- reduced to short-distance vision only;
- vision may be blurred;
- eye movement may cause the viewed image to seem to be vibrating or constantly moving;
- loss of vision in the right eye or the left eye, or in the right or left visual field;
- tunnel vision, in which only objects directly in front of the eye can be seen.

People with visual impairments may:

- use a white cane or guide dog as a mobility aid;
- rely on speech and other sounds for judging distance.

Blind people use echoes and traveling sounds to facilitate their movements, therefore they may find it easier to move about in a quiet environment as opposed to a noisy one.

Notes for Instructors:

- Use your voice and speak even while you are moving.
- Describe where you are. This will provide added information to the rider concerning the physical environment.

- To further assist riders with visual disabilities in understanding the physical layout of the riding centre, the program may develop a three-dimensional model of the centre, which can act as a kind of “touch” map for briefing riders.
- Counting the number of strides down the side of the arena may help the rider to determine that the horse is approaching a corner.
- Some riders find that aids such as an electronic beeper at the corners of the riding ring or arena are helpful, or that a speaker in each corner playing taped music helps to define, by sound, the limits of the area.
- It can be helpful to teach riders one-on-one as this can assist them in concentrating on your voice and on the echoes of their horses’ movement.
- In trail riding, ensure that the rider is assigned a leader.

8. CONTRAINDICATIONS AND PRECAUTIONS TO THERAPEUTIC RIDING

The following conditions may represent precautions or contraindications to therapeutic horseback riding if present in potential participants. Therefore, when completing the physician's referral, please note whether these conditions are present and to what degree:

1. ABSOLUTE CONTRAINDICATIONS

ORTHOPAEDIC

- Acute arthritis
 - Acute herniated disc or prolapsed disc
 - Atlantoaxial instabilities
 - Coax arthrosis (degeneration of hip joint)
 - Structural cranial deficits
 - Osteogenesis imperfecta
 - Pathological fractures
 - Spondylolisthesis
 - Structural scoliosis >30 degrees, excessive kyphosis or lordosis or hemivertebra
 - Spinal stenosis
- Hip subluxation, dislocation or dysplasia (one hip)**

NEUROLOGICAL

- CVA secondary to unclipped aneurysm or angioma
- Paralysis due to spinal cord injury above T6 (adult)
- Spina bifida associations- Chiari II malformations, hydromyelia, tethered cord
- Uncontrolled seizures within the last 6 months

MEDICAL

Obesity or >170 lbs

OTHER

- Age under 2 years old
- Any condition that the instructor, therapist, physician or program does not feel comfortable accepting into the program

1. RELATIVE CONTRAINDICATIONS AND PRECAUTIONS

ORTHOPAEDIC

- Arthrogyrosis
- Heterotopic ossification
- Hip subluxation, dislocation or dysphasia
- Osteoporosis
- Spinal fusion/fixation, Harrington Rod (within 2 years of surgery)
- Spinal instabilities/abnormalities
- Spinal orthoses
- Anticoagulants
(bleeding risk)

NEUROLOGICAL

- Amyotrophic Lateral Sclerosis
- Fibromyalgia
- Guillain Barre Syndrome
- Exacerbation of Multiple Sclerosis
- Post Polio Syndrome
- Hydrocephalic shunt

MEDICAL / PSYCHOSOCIAL

- Abusive or disruptive behaviour
- Cancer
- Hemophilia
- History of skin breakdown or skin grafts
- Abnormal fatigue
- Incontinence (must wear protection)
- Peripheral vascular disease
- Sensory deficits
- Serious heart condition or hypertension
- Significant allergies
- Surgery within the last three months
- Uncontrolled diabetes
- Indwelling catheter

FLEXION/EXTENSION X-RAY REQUIRED FOR ATRAUMATIC FACTORS THAT MAY BE ASSOCIATED WITH AN UNSTABLE UPPER CERVICAL SPINE

- Down syndrome

- Os odontoideum
- Athetoid cerebral palsy
- Rheumatoid arthritis of cervical vertebrae
- Congenital torticollis
- Sprengel's deformity
- Ankylosing spondylitis
- Congenital atlantooccipital instability
- Klippel-Feil syndrome
- Chiari malformation with condylar hyperplasia
- Fusion of C2-C3
- Lateral mass degeneration change at C1-C2
- Systemic lupus
- Morquio disease
- Non-rheumatoid cranial settling
- Subluxation of upper cervical vertebrae due to tumours or infection
- Idiopathic laxity of the ligaments
- Grisel's syndrome
- Lesch-Nyhan syndrome
- Marshall-Smith syndrome
- Diffuse idiopathic hyperostosis
- Congenital chondrodysplasia

9. TERMS AND DEFINITIONS

TERMS DESCRIBING ANATOMICAL POSTURES AND DIRECTIONS OF REFERENCE AND MOVEMENT

<p>ANATOMICAL POSITION – face forward with palms of hands facing forward</p> <p>ANTERIOR (ventral) – front of body</p> <p>POSTERIOR (dorsal) – back of body</p> <p>MEDIAL – nearest midline of body</p> <p>LATERAL – farthest from midline of body</p> <p>PROXIMAL – nearest to trunk (e.g. shoulder is proximal to elbow)</p> <p>DISTAL – farthest from trunk (e.g. hand is distal to elbow)</p> <p>SUPERIOR (cephalad) – towards the head</p> <p>INFERIOR (caudad) – towards the feet or tail-end</p> <p>CEPHALOCAUDAL – refers to the long axis of the body, in a direction from head to tail</p> <p>PRONE – position of the body lying face down and flat</p> <p>SUPINE – position of the body lying flat on back</p> <p>FLEXION – to bend the body or a part</p> <p>HYPEREXTENSION – movement of any joint beyond the joint’s normal position of extension</p> <p>ABDUCTION – movement away from the midline</p> <p>ADDUCTION – movement toward the midline</p> <p>CIRCUMDUCTION – movement of a limb or body part in a manner which describes a cone; it involves a combination of four basic movements: flexion, extension, abduction and adduction</p> <p>ROTATION – turning or revolving on a long axis</p> <p>LATERAL ROTATION (external rotation) – rotating outward, away from the body’s midline</p>	<p>MEDIAL ROTATION (internal rotation) – rotation inward, toward the body’s midline</p> <p>SUPINATION – turning the hand so that the palm faces forward (lateral rotation of the forearm)</p> <p>PRONATION – turning the palm of the hand backward (medial rotation of the forearm)</p> <p>PLANTAR – the sole of the foot</p> <p>PLANTARFLEXION – movement at the ankle joint of the sole of the foot downward; this is really extension at the ankle</p> <p>DORSIFLEXION – flexion at the ankle joint; bending the top of the foot upward</p> <p>EVERSION – movement of the sole of the foot outward</p> <p>INVERSION – movement of the sole of the foot inward (medially)</p> <p>LATERAL FLEXION – movement of the head and/or trunk laterally away from the midline of the body</p> <p>SHOULDER GIRDLE – composed of the two scapulae, two clavicles and sternum (shoulder blades, collar bones and breast bone)</p> <p>ELEVATION – upward movement of the shoulder girdle (“shoulder shrug”)</p> <p>DEPRESSION – downward movement of the shoulder girdle</p> <p>PROTRACTION – moving the shoulder girdle forward</p> <p>RETRACTION – moving the shoulder girdle backward</p>
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10. CanTRA SELF-TEST

- 1) (T or F) We use saddle seat covers for spina bifida riders.
- 2) (T or F) A horse should always be lunged without side reins first.
- 3) When fitting hats on hydrocephalus riders, what has to be considered?
- 4) (T or F) Down syndrome is a genetic defect.
- 5) (T or F) Multiple sclerosis riders tend to tire quickly in hot and humid weather.
- 6) (T or F) Taping riders feet in stirrups is a method of supporting riders.
- 7) (T or F) Reins should always be kept knotted up within rider's reach when not in use.
- 8) Name 3 types of cerebral palsy.
- 9) (T or F) A rider with psychomotor seizures must never ride.
- 10) (T or F) Learning disabled exhibit a significant discrepancy between academic performance and assessed intellectual ability.

Answers to Self-Test

- 1) T
- 2) T
- 3) Shunt behind ear / use light-weight helmet.
- 4) T
- 5) T
- 6) F
- 7) T
- 8) Spastic, Athetoid, Ataxic
- 9) F
- 10) T