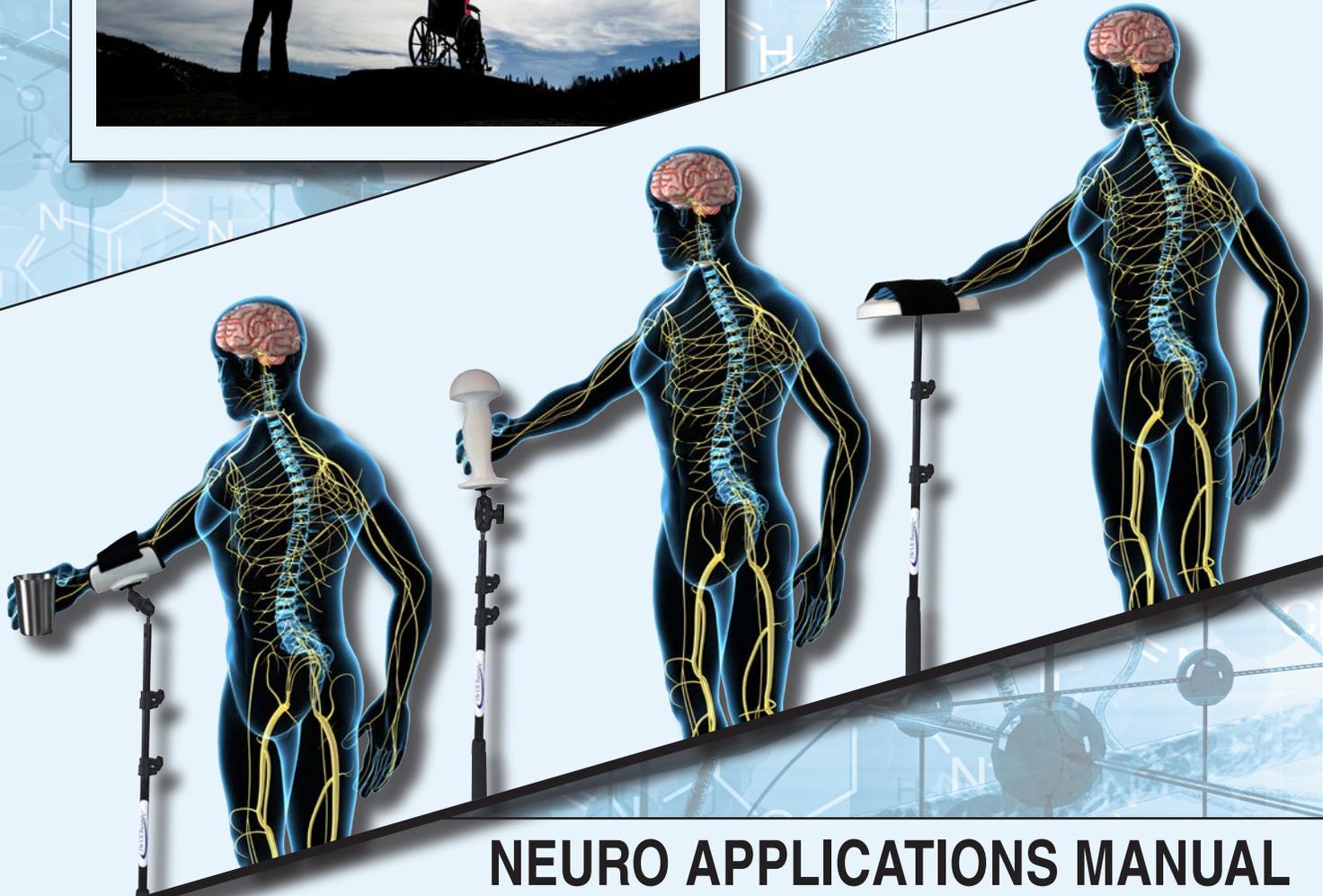


The UE Ranger[®]



NEURO APPLICATIONS MANUAL

PREFACE

Neuromuscular rehabilitation of the upper extremity is a therapeutic specialty designed for people recovering from diseases, trauma, or other disorders of the nervous system. For purposes of reaching the greatest scope, the context of this manual is focused on post stroke rehabilitation. It is recognized however that within the diverse presentation of all neurological disorders, impaired upper extremity function is a common and often devastating obstacle. Thus, we thank you for embarking on the journey to recovery with the assistance of the UE Ranger®.

Current research based rehabilitation practices are providing sound hope to persons in need as well as reassuring treatment rationale to therapists. Many studies have examined how the brain heals itself after a neurological injury. The concept of neural plasticity is one such mechanism utilized by the brain to restore necessary communication in response to meaningful therapeutic movements. The UE Ranger's capacity to naturally support movement production renders such information accessible by the healing brain and ultimately insuring an imprint of favorable change.

While advancing research provides both peace of mind and professional guidance, the desired outcome continues to require dedication to the principles of healing motion. Optimal neurological based recovery will require the integration of multiple strategies towards restoring one's functional ability. Inevitably, the mind and hands behind this tool will fulfill the greatest potential reward. Fortunately for those in need, the UE Ranger® was therapeutically designed with healing motion in mind. Matching the versatility of human motion while unweighting the forces of nature, the UE Ranger® meets each person at their personal impairment level and is capable of imparting both sensitive and meaningful impressions towards the healing of one's motion.

Clinical Note of Great Significance: It is of the utmost importance that when a therapist recognizes the need to intervene with an external support, its greatest value is achieved when normal movement production is left unimpeded and the individual's greatest current physical capacities are enhanced. Providing excessive support interfering or diminishing of either of these respective components will compromise the greatest of intentions and therefore notable consideration in this regard is paramount.

Further, please take advantage of the means in which The UE Ranger® can help assist with trunk control, contracture prevention, strengthening, balance, pain reduction, movement control, spasticity management, sensory stimulation, joint range of motion, weight bearing, coordination, and functional mobility practice, including gait.

We at Rehab Innovations, Inc. applaud the courage and devotion of recovering individuals and medical practitioners alike in always striving for an optimal outcome per each and every meaningful therapeutic influence imparted. We partner with you in this commitment and encourage you to let us know how we can assist you further in reaching this pursuit.

Sincerely,



Dan S. Miller, PT, MS

NURTURE THY BRAIN AND THE REST WILL FOLLOW



CONTENTS

Components of the UE Ranger®.....	4
Instructions For Applying the Grip Assist Strap.....	7
Neurological Rehabilitation Foundational Principles.....	9
Treatment Considerations.....	10
Body Awareness and Breathing.....	10
Trunk Control and Seated Posture.....	11
Spasticity Management.....	12
Basic Movement Exercises.....	14
Execution Guidelines.....	16
Neuromuscular Re-education.....	17
Production of Movement Guidelines.....	18
Supraspinatus Reintegration.....	19
Serratus Anterior Reintegration.....	20
Shoulder External Rotators Reintegration.....	22
Triceps Brachii Reintegration.....	24
Lower Trapezius Reintegration.....	26
Wrist Extensor Reintegration.....	28
Functional Mobility Interventions.....	30
Reaching.....	30
Activities of Daily Living.....	32
Weight Shifting While Seated.....	33
Weight Shifting While Standing.....	34
Standing Balance.....	35
Gait.....	35
Transfers.....	36

As you impart on this journey to personally heal or to assist in another’s recovery, know that it was your wellbeing and your personal efforts that brought us together to collaborate on your behalf.

Heal Well to Move Well,

Liz Woodruff, PT, DPT, NCS

Tara Ruppert, OTD, OTR/L, CHT

Anne Kintner

Dan Miller, PT, MS

Prior to Applications - Conditions of Sale, Warranty, and Limitations

The UE Ranger® is an upper extremity rehabilitative - assistive motion device which is designed to compliment the natural motion of the involved upper extremity (UE). This capacity allows a patient to avoid unnatural and unnecessary forces throughout the full upper extremity. It is imperative that a patient be instructed by their rehabilitation professional in the proper biomechanics of the upper extremity to avoid compensations and a chance of injury from being promoted. Rehab Innovations, Inc. warrants that this product is free from manufacturing defects, is fit for the ordinary purposes for which this product is designed and conforms to the descriptions stated herein. Satisfactory results should be obtained if this product is used according to the foundational principles and application guidelines within this manual and with the directions and recommendations of the patient’s health care professional. Unintended consequences may result due to such factors as improper use or without consultation and guidance of a health care professional all of which are beyond the control of Rehab Innovations, Inc. or the seller, thus all such risks shall be assumed by the buyer. Under no circumstances shall the buyer be entitled to any remedy or damages. Remedies for incidental and consequential damages are specifically excluded.

COMPONENTS OF THE UE RANGER®

Please take adequate time to inform yourself of the individual components as well as their combined applications. This knowledge will ultimately assist the rehab professional and recovering individual in maximizing optimal recovery.

3 CUSTOM MOLDED INTERCHANGEABLE UPPER EXTREMITY SUPPORTS

These interchangeable upper extremity supports were designed to support the progressive and varied needs of either the left or the right most involved upper extremity. Each support utilizes the same quick release pin making it easy to change from one support to another. Each hand support has a neoprene strap with velcro attachments designed to comfortably support and secure the involved hand or forearm within the molded support. The straps should be secured in a comfortable yet snug position, enough to prevent the person's hand or forearm from sliding. Hand wash and air dry as needed for cleaning.

FOREARM SUPPORT WITH ADJUSTABLE MULTI-PLANE FIXED JOINT

Designed to offer a generalized weight bearing support of the upper extremity while allowing functional hand use (**figures 1 and 2**). Once the desired wrist or forearm position is determined strap the forearm onto the cuff by looping the strap through the plastic slot and attaching it to the top of the strap. The remaining upper extremity can be positioned in a multitude of alignments given the therapeutic goal. To adjust the multi-plane

joint, unlock the collar by turning the thumb bolt counter clockwise. After the desired position is reached be sure to re-secure the locking collar by turning the thumb bolt clockwise to a tightened position. This support is beneficial when more stability and support is needed for the upper extremity. This support is also useful for more independent hand and wrist functional tasks when proximal (foundational) weakness is present.



▲ FIGURE 1



▲ FIGURE 2

CLOSED HAND SUPPORT WITH ADJUSTABLE MULTI-PLANE FIXED JOINT

Designed to accommodate a variety of handgrip capabilities that can be mechanically positioned in many different alignments (**figures 1-3**). The versatility of this support allows for a multitude of movements and exercises to be performed.



▲ FIGURE 1



▲ FIGURE 2



▲ FIGURE 3



▲ FIGURE 4

Rotate the support to find the most therapeutic and accommodating position. To adjust the multi-plane joint, unlock the collar by turning the thumb bolt counter clockwise. After the desired position is reached be sure to re-secure the locking collar by turning the thumb bolt clockwise to a tightened position. The involved hand can be placed around the middle or on top of the hand support. To improve grip stability use the grip assist strap to secure the hand or simply use the less involved hand. This support may be beneficial for individuals with hand contracture that may have difficulty maintaining position on the open hand support (figure 4). For instructions on applying the grip assist strap see pages 7 and 8.

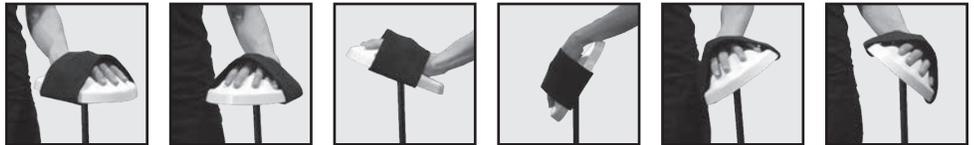
OPEN HAND SUPPORT WITH MULTI-PLANE ARTICULATING JOINT

Designed to support the natural fluid motions of each joint of the upper extremity (shoulder girdle, elbow, forearm, and wrist) during open and closed chain kinetic functional applications (figure 1). Place the hand on top of the support positioning fingers in the grooves as able to accomplish an open hand position. Secure the hand with the strap.



▲ FIGURE 1

The individual may need assistance from the other hand or a rehab professional to maintain position during functional movements if tone or contractures affect positioning. This support is helpful for those individuals that need less upper extremity support. Advanced multi joint movements of varying difficulties can be utilized with this support as the individual progresses. Targeted wrist and forearm exercises with this open hand support can be used given the user's stage of recovery and available function.

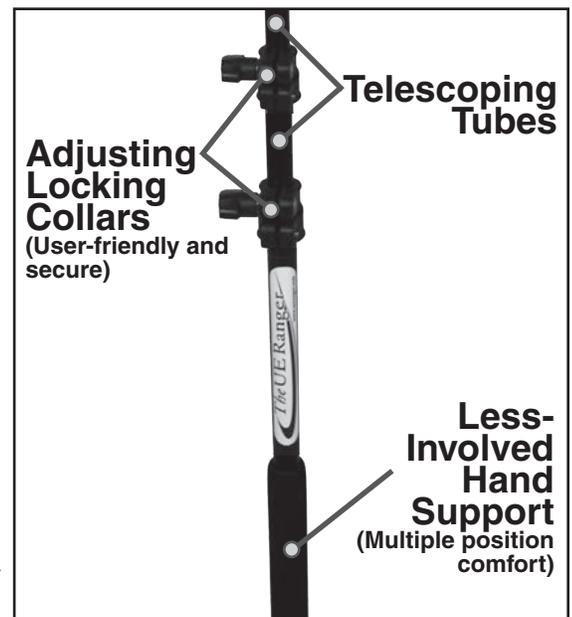


TELESCOPIC TUBING WITH ADJUSTING LOCKING COLLARS

Designed to support multiple user applications with consideration of all healing stages, skill levels, and joint mobility. This telescoping tube allows the user to adjust the height to be used in multiple positions, therefore offering optimal therapeutic influences. To adjust the overall length of the telescopic tube, unlock the collar(s) by turning the thumb bolt counter clockwise. After the desired height is reached, re-secure the locking collar(s) by turning the thumb bolt clockwise to a tightened position.

***Use Caution as you would with any typical bolt and thread combination. Do not overly tighten any of the UE Ranger® thumb bolts as this can result in stripping the threads of the thumb bolts, rendering them unusable.**

LESS-INVOLVED HAND SUPPORT Designed to support the guidance and force produced by the less-involved upper extremity in multiple open chain kinetic functional applications.



WEIGHT-BEARING DETACHABLE BASE PLATES WITH A SKID RESISTANT RUBBER PAD

Designed to support the natural movements of each upper extremity joint during closed kinetic chain functional applications. The larger base plate has a semi rigid joint that is useful when more positional stability is needed (**figure 1**). The smaller base plate has a flexible multi-plane articulating joint that allows greater movement when less stability is needed (**figure 2**). Attach the desired base plate by simply inserting the joint into the bottom of the telescopic tubing (**figure 3**).



▲ FIGURE 1



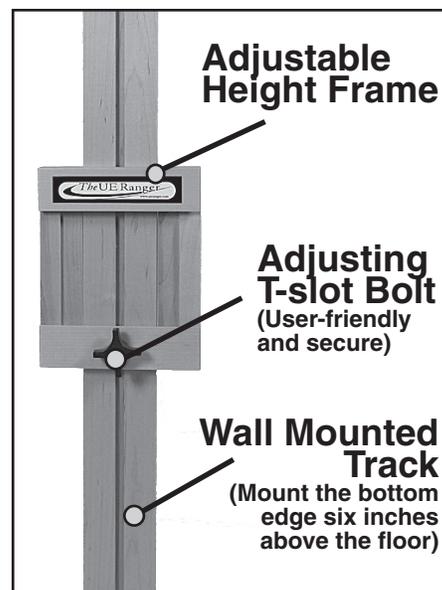
▲ FIGURE 2



▲ FIGURE 3

WALL MOUNT Designed to support an expansion of the UE Ranger® applications which are instrumental to effectively produce progressively graded gravity opposed movements. It is designed to support specific and progressive closed kinetic chain neuro-muscular re-education, functional strengthening, flexibility, and endurance applications. Securely insert the smaller articulating base plate of the UE Ranger® into the Wall Mount frame by first angling the top of the base plate up and under the top portion of the frame as shown in (**figure 1**). Progressively guide the base plate up and under the top portion of the frame to a point where the bottom of the base plate clears the bottom portion of the frame, allowing the base plate to then be received and rest securely within the full frame as shown in (**figures 2 and 3**).

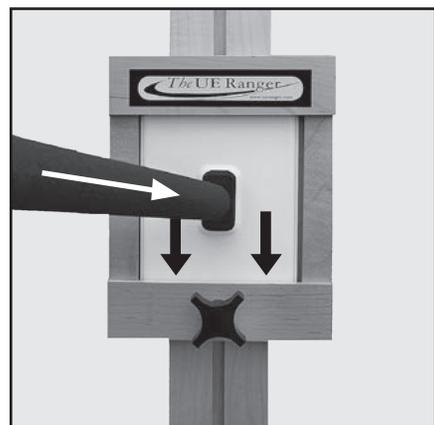
*****CAUTION*** To retain stability of the base plate in the receiving frame, it is important through each application to apply a *SLIGHT* amount of pressure through the tubing and into the Wall Mount frame as diagrammed by the white arrow in (**figure 3**).**



▲ FIGURE 1



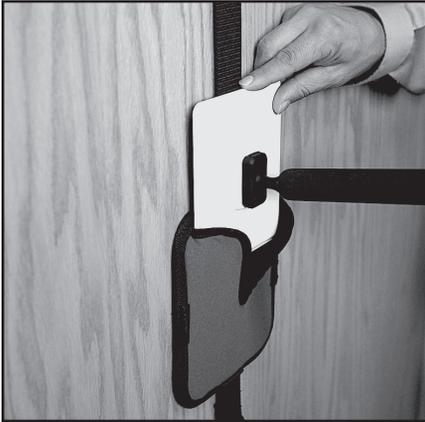
▲ FIGURE 2



▲ FIGURE 3

DOOR MOUNT HOME USE OPTION

Designed to support a person's Home Exercise Program, a portable Door Mount version of the Wall Mount is available and sold individually or with the UE Ranger® NeuroHome Series. It can be securely fastened to a standard seven foot door and the small articulating base plate inserts as shown in (figures 4 and 5).



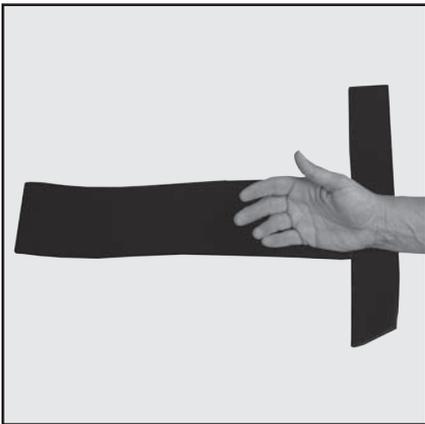
▲ FIGURE 4



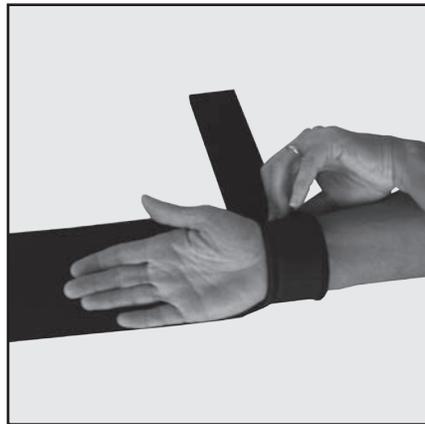
▲ FIGURE 5

INSTRUCTIONS FOR APPLYING THE GRIP ASSIST STRAP

If this strap is needed to stabilize the hand, first secure the wrist portion by laying the wrist on the soft side of the fabric (figure 1). Utilizing the Velcro hook secure the strap in a snug fashion around the wrist as shown in (figures 2 and 3).



▲ FIGURE 1

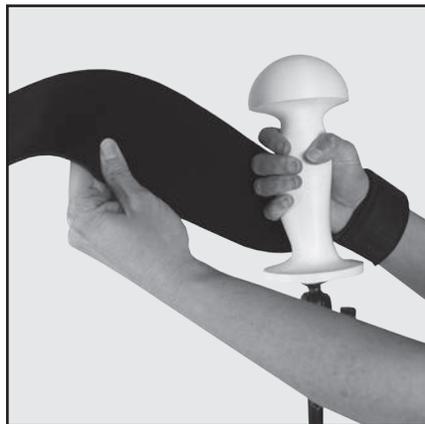


▲ FIGURE 2



▲ FIGURE 3

Once the strap is secure on the wrist, rotate the hand on the closed hand support until a comfortable or an ideal therapeutic position is found. Begin pulling the strap around the hand (figure 4) and firmly pull in an upward angle as the strap secures the fingers (figure 5).



▲ FIGURE 4



▲ FIGURE 5

From the upward pulling angle continue securing the strap by laying it down on the back of the hand and finish by completely pulling it around. (figures 6-8)



▲ FIGURE 6



▲ FIGURE 7



▲ FIGURE 8

If more wrist support is desired, unhook the wrist portion after the fingers are secure on the closed hand support (figure 9). Pull the bottom piece (figure 10) and firmly attach it to the velcro on the strap currently holding the fingers in place (figure 11).



▲ FIGURE 9



▲ FIGURE 10



▲ FIGURE 11

Finish by laying the top wrist piece over the bottom wrist piece (figures 12-14). The grip assist strap can also be utilized to secure the hand to other everyday objects, like bottled water, to encourage functional use of the involved upper extremity during activities of daily living.



▲ FIGURE 12



▲ FIGURE 13



▲ FIGURE 14

NEUROLOGICAL REHABILITATION FOUNDATIONAL PRINCIPLES

A neurological insult to the brain, whether from a stroke or another cause, can result in muscle weakness that can significantly affect mobility. Along with weakness, an individual may also experience muscle stiffness, impaired sensation, decreased balance, and coordination difficulties, among others. These symptoms can vary depending on the area of the brain that was affected. Rehabilitation measures can assist in resolving these symptoms during the healing process.

Recovery after an injury to the brain can occur through the functional use of an individual's combined nerves, muscles and joints within the coordination of meaningful and purposeful movements. The brain has the ability to reorganize and change itself through a complex process termed neuroplasticity. This involves repetitive practice for meaningful change to occur. The UE Ranger® was designed specifically to target the neuro-muscular healing requirements of the affected upper extremity. This device allows a variety of exercises to be repetitively performed and can be adapted to the specific needs of the individual.

This manual will guide rehab professionals and recovering individuals alike in exercises that can be performed to re-establish optimal movement, reduce risk of injury, and enhance function in daily life tasks. No two users are alike, thus the described exercises are simply a starting guide to the possibilities within the tool.

It is recognized that recovery of function can either occur through the body's inherent nature to compensate, or ideally by returning to similar movement patterns used before injury. It is encouraged in the journey to restore one's optimal healing potential that one strives to improve impairments as able versus supporting or perpetuating compensations. The UE Ranger® offers this ability to produce a therapeutic impression without the promotion of substitutions, this capacity will be referred to throughout as the **THERAPEUTIC THRESHOLD defined as: when in which any intended intervention actually is producing a therapeutic influence from which the body can respond favorably versus supporting or perpetuating compensation.** This described therapeutic threshold requires strict attention and focused awareness on the part of both the rehab professional and the recovering individual to ensure optimal results. To support this approach, a review of therapeutic intention for each of the exercises included in this manual as well as a means of fulfilling this intention with the UE Ranger® will be offered.

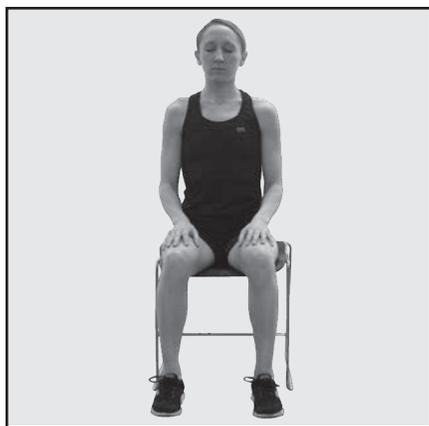
TREATMENT CONSIDERATIONS

BODY AWARENESS AND BREATHING

Body awareness and breathing may be affected after a neurological event like a stroke. Breathing, for example, may be altered if an individual experiences diminished strength of the primary respiratory muscle, the diaphragm. Decreased proprioception (awareness of the body's position in space) can occur after a neurological event affecting posture and mobility. Participating in body awareness and combined diaphragmatic breathing exercises may be helpful to promote relaxation, improve use of the diaphragm, avoid breath holding during exercise, and improve awareness of body position and movement. This can be a useful method to prime the body to both respond favorably to exercise as well as improve tolerances of daily living activities. Ideally with improvements in these areas, the body will tolerate exercise better and substitutions will be minimized. The exercise example provided below can be completed to serve as a foundation to reach a therapeutic threshold and maximize recovery.

Begin by sitting with equal pressure through your pelvis (sit bones) and feet, hands on your thighs, and upright posture using a backrest as needed. Close your eyes, quiet your mind and become aware of your breathing (**figure 1**).

- Focus your attention on your nasal passages and the air going through them while breathing for 5 breaths.
- Shift your attention to your face. Allow your forehead to relax followed by your jaw, feeling them get heavy.
- Take 10 deep breaths feeling your abdomen expand while inhaling and fall while exhaling.



▲ FIGURE 1

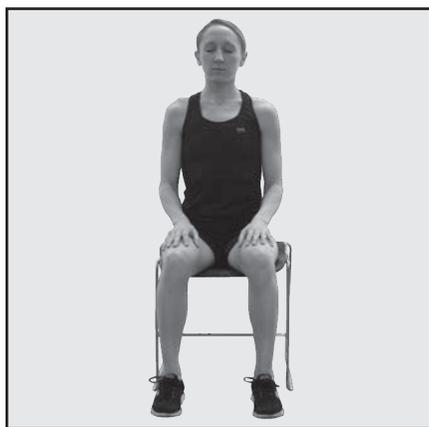


▲ FIGURE 2

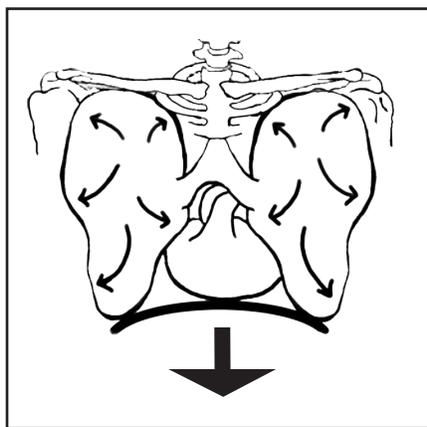
When first learning this exercise, place one hand on your abdomen and one hand on your chest to feel the movement (**figure 2**). Make sure your abdomen is moving (activating your diaphragm) with minimal initial movement from your chest (avoiding substitutions).

- Allow your shoulders to relax and then let go of any tension in the front of your upper arms. Feel the weight of your arms be supported on your thighs (**figure 3**).

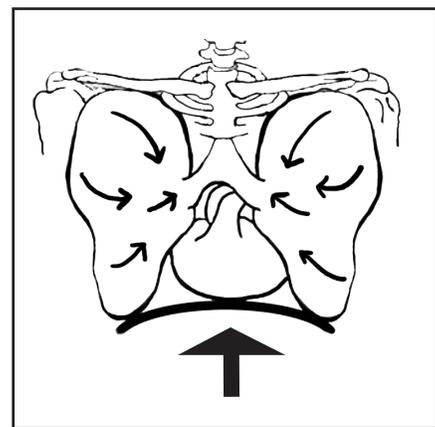
- Take 10 deep breaths feeling your diaphragm contract while inhaling and relax while exhaling (**illustrations A and B**).
- Let your forearms, wrists, and hands relax while feeling the weight of them supported on your thighs.
- Take 10 deep breaths feeling your abdomen expand while inhaling and fall while exhaling.



▲ FIGURE 3



▲ ILLUSTRATION A



▲ ILLUSTRATION B

TRUNK CONTROL AND SEATED POSTURE

Loss of trunk control can occur in persons who have had a stroke or other neurological disruption. Impairments in trunk control can include weakness, loss of stability, stiffness and decreased proprioception that may lead to the following:

- Impaired upper and lower limb control
- Increased risk for falls
- Potential for spinal deformity and contracture
- Mechanical pain
- Decreased sitting and standing tolerance
- Decreased balance
- Decreased independence in activities of daily living

Early intervention and long term emphasis on restoring trunk control is important to maximize return of function. Optimal seating position with equal weight bearing through pelvis and feet, neutral pelvis, and midline trunk helps to provide a stable base to enhance the production of functional movements. Some common seated malalignments to watch out for include the pelvis tilting backward, unequal weight bearing through the pelvis, and trunk leaning. Recognizing such patterns, while understanding the long-term consequences can assist in maximizing one's functional mobility on their healing journey.



▲ FIGURE 1

Trunk control can be practiced in many ways with the assistance of the UE Ranger®. Initially when practicing trunk control, sitting on a stable surface with optimal seating posture and support of the UE Ranger® provides an ideal base to build upon (**figure 1**).

Once adequate trunk stability is present on a stable surface, trunk control can be progressed and challenged by sitting on a stability ball if tolerated and appropriate (**figures 2 and 3**).



▲ FIGURE 2



▲ FIGURE 3

More advanced tasks such as marching (**figure 4**), reaching (**figure 5**), trunk rotation (**figure 6**) and forward weight shifting (**figure 7**) can provide dynamic tasks that can challenge an individual.



▲ FIGURE 4



▲ FIGURE 5



▲ FIGURE 6



▲ FIGURE 7

SPASTICITY MANAGEMENT

Through the recovery process from a stroke, an individual may experience spasticity (increased resistance to stretch, especially at increased speeds). This can significantly affect an individual's ability to move. A person can experience difficulty straightening their elbow, extending their wrist and fingers, and rotating the arm outward among others due to spasticity. Notably, contractures and decreased range of motion can develop if spasticity is not addressed. It is also important to consider how spasticity affects exercise and function. If an individual has increased spasticity, exercises may need to start with assistance from the person's less involved extremity or a therapist to maximize range of motion and function. Different UE Ranger® supports can also help with spasticity management by choosing the support that most effectively assists the involved extremity during treatment. Further, there are a variety of treatment techniques that could be beneficial for spasticity management including stretching (**figures 1-5**) and weight bearing on the extremity in a lengthened position (**figure 6**).



▲ FIGURE 1



▲ FIGURE 2



▲ FIGURE 3



▲ FIGURE 4



▲ FIGURE 5



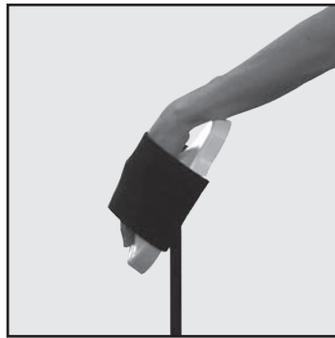
▲ FIGURE 6

Targeted stretching into elbow extension, shoulder external rotation, as well as wrist and finger extension can also be beneficial as these are common areas affected. Please refer to the **BASIC MOVEMENT SECTION** on the following two pages for pictures of the described movements. Activation of the muscle opposite to the spastic muscle with or without the addition of electrical stimulation can assist with spasticity management and can be utilized with the support of the UE Ranger®. These are examples of ways to manage spasticity with the use of the UE Ranger®, however there are other interventions that can also be used in conjunction to maximize outcomes.

BASIC MOVEMENT EXERCISES



Wrist Extension



Wrist Flexion



Wrist Ulnar Deviation



Wrist Radial Deviation



Forearm Supination



Forearm Pronation



Elbow Flexion



Elbow Extension



Elbow Extension



Elbow Flexion



Elbow Flexion



Elbow Extension



Shoulder Internal Rotation



Shoulder External Rotation



Shoulder Flexion



Shoulder Extension



Shoulder Flexion



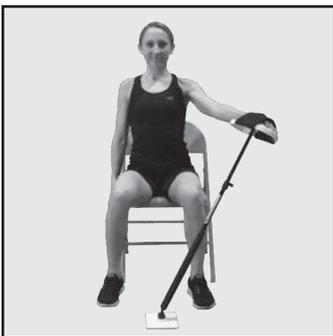
Shoulder Extension



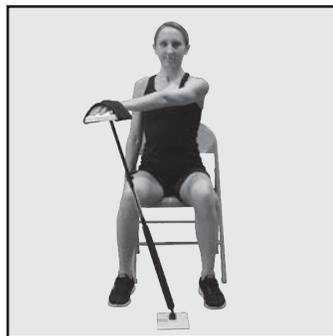
Shoulder Flexion



Shoulder Extension



Shoulder Horizontal Abduction



Shoulder Horizontal Adduction



Scapular Protraction



Scapular Retraction



DI PNF Scapular Pattern



DI PNF Scapular Pattern



DII PNF Scapular Pattern



DII PNF Scapular Pattern

INTERVENTION BASICS

As a person is rehabilitating, influencing favorable change is an essential principle towards reaching a successful recovery. The UE Ranger® provides the external support to allow movements to be executed at optimal therapeutic thresholds (when any intended intervention is producing a therapeutic influence from which the body can respond favorably versus supporting or perpetuating compensation). Ideally individuals are treated at their current impairment level and provided graded therapeutic interventions while minimizing compensatory substitutions. The appropriate hand or forearm support and exercise position should be utilized based on the individual's impairments, level of function, seated and standing balance, as well as treatment goals. Postural control, weakness and spasticity can alter movement production and therefore needs to be taken into consideration when attempting to maximize optimal movement patterns. Neurological plasticity can result in adaptive and desirable changes while some can be maladaptive. Due to this, care must be taken to attempt to complete optimal movement patterns such that unfavorable motions are not learned.

INTENTION OF MOVEMENT

The intention (meaning neither automatic nor a given) of the movements of the upper extremity being rehabilitative in nature may include the following considerations existing within a therapeutic threshold:

- Maximizing normal active movement control while minimizing substitutions
- Reaching current soft tissue end ranges to minimize contractures
- Utilizing optimal shoulder joint mechanics, supporting the ability of the arm to move interdependently of the shoulder blade while also ensuring appropriate shoulder blade movements interdependent of the torso and collarbone

PRODUCTION OF MOVEMENT

The UE Ranger® is designed to facilitate therapeutic movement production within different stages in the recovery process. An individual may need to initially start with manual guidance from a therapist and over time progress to movement being produced on their own. Production of movement for the involved arm can be from a combined effort of the following contributions depending on the user's impairments and needs:

- Manual guidance and facilitation (**figure 1**)
- Assistance from the non-involved upper extremity (**figure 2**)
- Volitional initiation of the involved upper extremity (**figure 3**)

NOTE: a variety of strategies can be utilized to assist with improving motor control such as visual and verbal cues, motor imagery, sensory stimulation techniques, and neuromuscular techniques.



▲ FIGURE 1



▲ FIGURE 2



▲ FIGURE 3

NEUROMUSCULAR RE-EDUCATION

The following sections are designed to assist the rehabilitation professional in optimally treating individuals with targeted motor impairments. Some muscles that may be more difficult to regain appropriate activation of during the recovery from stroke will be explained in detail including: supraspinatus, serratus anterior, shoulder external rotators, triceps brachii, lower trapezius, and wrist extensors. Improving appropriate activation of these muscles can assist with all productions of upper extremity movement such as reaching progression with optimal shoulder mechanics while ideally minimizing compensations.

ISOLATED MUSCLE FACILITATION AND RE-INTEGRATION

When aiming to achieve the normal upper extremity biomechanics, it is important to start at the individual's current impairment level and attempt to activate the appropriate targeted muscle(s) while minimizing substitutions. Facilitating an inhibited muscle, while attempting to minimize compensatory muscle use involves progressively recruiting appropriate motor units while reducing unwanted motor unit activation. Motor units are generally recruited in order of smallest to largest as contraction intensity increases, thus starting with subtle muscle activation and progressively increasing muscle contraction over time can assist with ensuring appropriate muscle coordination. This recruitment principle can be compared to a standard on/off light switch with that of a dimmer light switch. In a standard switch you have an abrupt on or off outcome, while using a dimmer switch you have the ability to grade how much light is produced. When attempting to activate an inhibited muscle, subtle activation (such as in a dimmer light switch) versus abrupt activation (such as in a standard on/off switch) can help ensure the correct muscle is activated while minimizing substitutions.

KEY REQUIREMENTS IN ACTIVATING THE TARGETED MUSCLE(S) ARE IDEALLY AS FOLLOWS:

- A relaxed shoulder girdle and autonomic nervous system (including a relaxed mind and proper diaphragm breathing)
- Complete weight of the involved arm supported on the UE Ranger® minimizing compensatory guarding
- Sufficient joint mobility of intended movements
- Sufficient understanding of the intended movement

SIGNS OF FAILURE TO EXECUTE CORRECTLY:

- Holding of the breath
- Visibly compensating
- Provocation and or progression of pain beyond baseline
- Absence of palpable facilitation of intended muscle
- Presence of palpable facilitation of excessive unintended motor activity

SIGNS TO STOP OR ALTER THE EXERCISE:

- Onset of pain
- Fatigue impeding the ability to facilitate the intended muscle activation
- Onset of compensatory efforts such as a shoulder shrug, holding one's breath, or increased spasticity

Please take the time to educate yourself on each of the following exercises. The intent of these exercises is to facilitate the motor activity of the weakened muscles initially in an isolated manner, decrease over active muscles, and progressively integrate their designed role into the neuro-muscular control mechanisms relevant for daily living activities. The Open Hand support is optimal to accommodate the full movements described; however the Closed Hand or Forearm Support can be implemented given the patients current impairment level as well as to support specific challenges. Starting with passive or active assisted range of motion may be needed initially when learning the movement pattern. Pictures are provided for examples of appropriate or anticipated progression of capacity from sitting to standing.

SET UP BASICS

Adjust the UE Ranger® so that the open hand support (or other support options as required) suspends the weight of the person's involved arm as listed in each targeted muscle isolation section. Make slight adjustments as needed to most effectively activate the targeted muscle(s) without facilitating an over powering pectoralis group, deltoid, levator scapulae and or upper trapezius. **Make sure to allow the UE Ranger® to completely support the weight of the involved arm as to enable new (dimmer switch) activations to be facilitated free of compensatory guarding.**

PRODUCTION OF MOVEMENT BASICS

Having the individual visualize a functional task movement prior to using the UE Ranger® can help to connect previous motor planning sequences and assist with re-establishing normal neuro-muscular movements patterns. Examples are provided within each of the targeted muscle sections.

The overall movement for each muscle isolation and reintegration exercise is very minimal to assist in appropriately activating the correct motor units. It is helpful to begin with first thinking of initiating the intention of the overall movement yet without fully executing the entire motion.

At the point of facilitating the intended muscle(s), the individual should be instructed to return to the resting position and repeat the movement as prescribed. As the facilitation becomes more efficient, then instruct the individual to gradually follow through into the functional intention of the movement as a whole.

Always adhere to the signs to stop or alter the exercise.

SUPRASPINATUS REINTEGRATION

SET UP

In sitting, adjust the UE Ranger® so that the elbow is bent to approximately 75 degrees (or a mild downward angle) as shown in **(figure 1)**. A second seated option can be used with the less-involved hand support positioned across the lap and the open hand support placed perpendicular to the floor as shown in **(figure 2)**. In standing, adjust the UE Ranger® so that the open hand support is equal to the person's styloid process of the ulna (near a person's natural carrying angle of the elbow) as shown in **(figure 3)**.



▲ FIGURE 1



▲ FIGURE 2



▲ FIGURE 3

PRODUCTION OF MOVEMENT

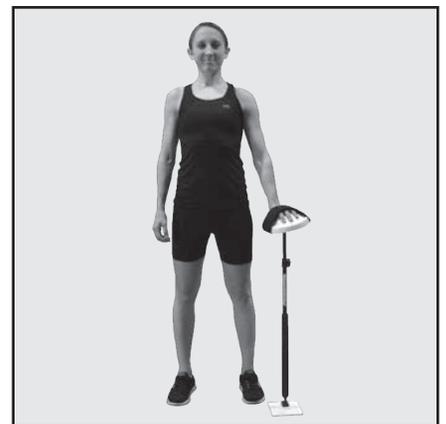
Visualization cue - Educate the individual to visualize initiating the pouring out of a can of soda into the scaption plane to assist in activating the correct muscle(s). This progressive investment of visualization provides a mechanism of reintegrating functionally coordinated motor activity.



▲ FIGURE 4



▲ FIGURE 5



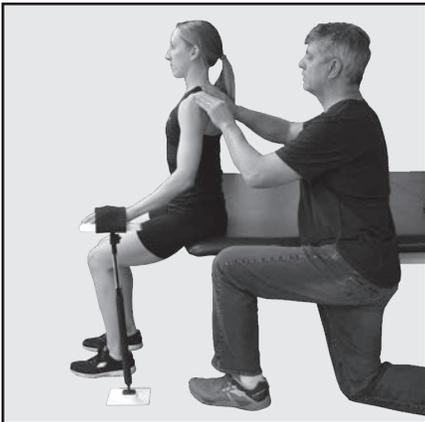
▲ FIGURE 6

The individual should initially focus on the contact pressure of their thenar eminence into the hand support with slight pronation and slight ulnar deviation. Then instruct the individual to slightly turn their palm or thumb downward, while allowing their elbow and arm to “float” away from their body into a slight abduction direction as shown in **(figures 4-6)**.



▲ FIGURE 7

During the movement the individual should focus the contact pressure of their thenar eminence into the hand support – not by pushing with the hand but rather by subtle activation of the supraspinatus (**figure 7 and supported by the concentric circles on the hand support as in a target**).



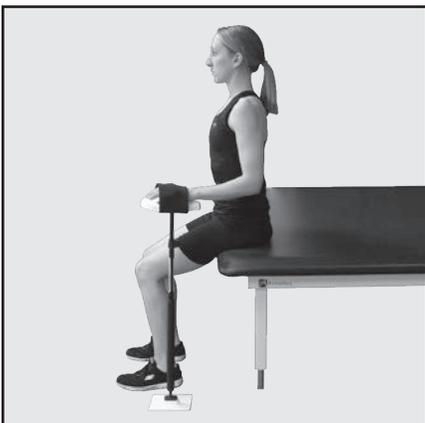
▲ FIGURE 8

To ensure the exercise is completed correctly palpate for compensatory muscle activation such as from the levator scapulae and upper trapezius as pictured with the right hand while cueing and facilitation of the supraspinatus can be completed as needed to improve activation as pictured with the left hand (**figure 8**).

SERRATUS ANTERIOR REINTEGRATION

SET UP

In a seated or standing posture, position the base of the UE Ranger® within appropriate proximity of the same side foot as the most involved upper extremity. Adjust the UE Ranger® so that the elbow is bent to 85 degrees or a slight downward angle as illustrated in (**figures 1 and 2**). If the person needs to improve their accuracy of control, have them support the rear edge of the hand support with their less-involved hand as shown in (**figure 3**).



▲ FIGURE 1



▲ FIGURE 2

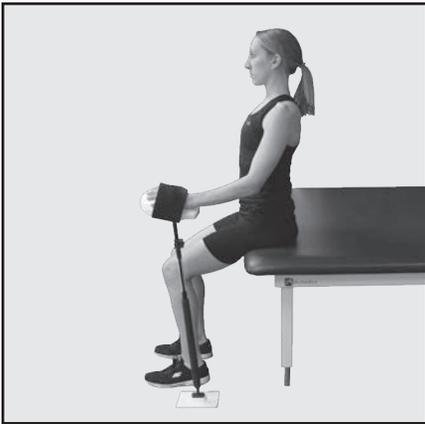


▲ FIGURE 3

PRODUCTION OF MOVEMENT

Visualization cue - Educate the individual to visualize shaking a person's hand to assist in activating the correct muscle(s). This progressive investment of visualization provides a mechanism of reintegrating functionally coordinated motor activity.

Instruct the individual to initiate a production of forward movement combined with slight supination and slight radial deviation while applying pressure of the hypo-thenar eminence into the hand support as illustrated in **(figures 4 and 5)**. Have the individual focus on scapular protraction or drawing in of the scapula towards the torso and relaxation of the pectoral and rhomboid muscle groups. Contact pressure of the hypo-thenar eminence into the hand support is completed not by pushing with the hand but rather by subtle activation of the serratus anterior during the motions described **(figure 6 and supported by the concentric circles on the hand support as in a target)**.



▲ FIGURE 4

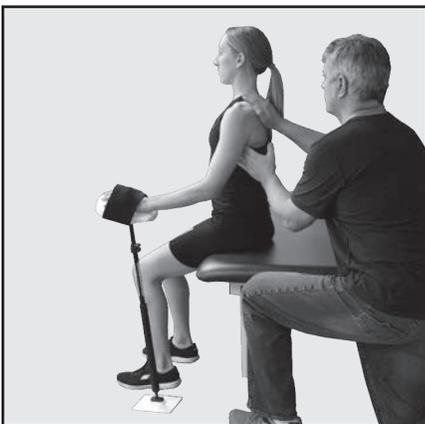


▲ FIGURE 5



▲ FIGURE 6

To ensure the exercise is completed correctly, palpate for compensatory muscle activation in this case the upper trapezius as pictured with the right hand. Cueing and facilitation of the serratus anterior can be completed as needed to improve activation as pictured with the left hand **(figure 7)**.



▲ FIGURE 7

SHOULDER EXTERNAL ROTATORS REINTEGRATION

SET UP

In a seated posture, position the base of the UE Ranger® within appropriate proximity of the same side foot as the most involved upper extremity. Next, adjust the tubing so that the elbow is bent to 95 degrees or a slight upward angle, as to most comfortably support the weight of the involved arm as shown in **(figure 1)**.

In a standing position adjust the UE Ranger® so that the overall height positions the elbow at approximately 75 degrees of flexion when the hand is anterior to the umbilicus as shown in **(figure 2)**. If the person needs to improve their accuracy of control, have them support the rear edge of the hand support with their less-involved hand as shown in **(figure 3)**.



▲ FIGURE 1



▲ FIGURE 2



▲ FIGURE 3

PRODUCTION OF MOVEMENT

Visualization cue - Educate the individual to visualize laterally reaching for an object to assist in activating the correct muscle(s). This progressive investment of visualization provides a mechanism of reintegrating functionally coordinated motor activity.



▲ FIGURE 4

As a mechanism of progressively reorganizing synergistic coordination, first instruct the individual to activate, as previously learned, the supraspinatus muscle followed by the serratus anterior muscle. Upon activation and awareness of the engagement of these muscles, progress to initiate the engagement of the shoulder's external rotator muscles.

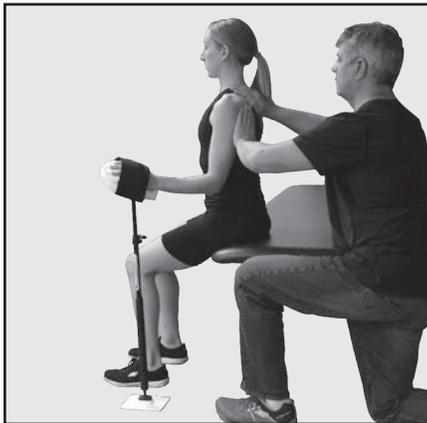
Instruct the individual to initiate movement of shoulder external rotation and slight forearm supination as shown in **(figure 4)**.

The individual should focus a contact pressure of the hypo-thenar eminence into the hand support – not by pushing with the hand but rather the intension executed by the motions described (**figure 5 and supported by the concentric circles on the hand support as in a target**).

While the emphasis is with integrating the external rotator muscles, combining the bias resultant supination motion generally amplifies both the serratus anterior and the bicep brachii muscles, both helpful in progressing to the eventual reintegration requirements involving functional reach and grasp. Observe for any spasticity that may require adjustments to the exercise.



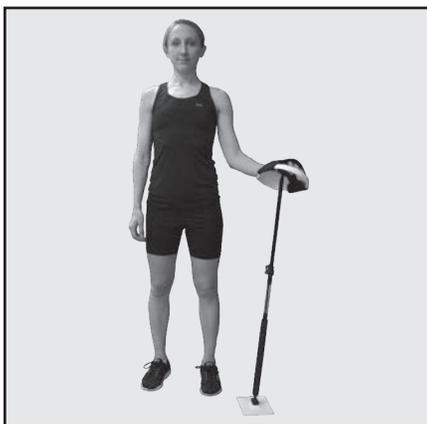
▲ **FIGURE 5**



▲ **FIGURE 6**

To ensure the exercise is completed correctly, palpate for compensatory muscle activation of the upper trapezius as pictured with the right hand. Cueing and facilitation of the external rotators can be completed as needed to improve activation as pictured with the left hand (**figure 6**).

Persons in the early stages of improving the activation of the external rotators may meet opposition from the internal rotators. To assist in re-establishing coordinated control while activating the external rotators, a person should maintain a light contact of their elbow against their side and complete the motion in a slow and controlled manner. This will support the proper rotation of the shoulder joint and deter encouragement of the commonly hypertonic muscles (internal rotators and bicep brachii). Coordinative communication can be enhanced by the encouragement of a slow return to the starting position via eccentric domination of control of the external rotators and bicep brachii, and eventual controlled concentric involvement of the internal rotators.



▲ **FIGURE 7**

As a person becomes skilled with this exercise, instruct them to pre-set the scapula (focus on scapular protraction or drawing in of the scapula towards the torso and relaxation of the pectoral and rhomboid muscle groups) by supporting their humerus slightly away from their body in the scaption plane. Then, as shown in (**figure 7**), have them reproduce the same arc of combined external rotation and supination as previously described. This combined effort requires a higher level of coordination, yet also offers an integration opportunity with a person's upper and lower extremities working together in a functional manner.

TRICEPS BRACHII REINTEGRATION

SET UP

In a seated or standing position, as shown in **(figures 1 and 2)**, position the base of the UE Ranger® either between or comfortably in front of the feet such as to support a relaxed and balanced posture. Next, adjust the tubing so that the elbow is bent to 100 degrees or a slight upward angle, as to most comfortably accommodate the weight of the involved arm.



▲ FIGURE 1



▲ FIGURE 2



▲ FIGURE 3

If the individual needs to improve their accuracy of control, have them support the rear edge of the hand support with their less-involved hand as shown in **(figure 3)**.

PRODUCTION OF MOVEMENT

Visualization cue - Educate the individual to visualize extending their arm as if reaching forward for an object to assist in activating the correct muscle(s). This progressive investment of visualization provides a mechanism of reintegrating functionally coordinated motor activity.

As a mechanism of reorganizing synergistic coordination, first instruct the individual to set the activation of the supraspinatus and serratus anterior muscles as previously learned. When this activation and resultant awareness is available, progress to initiate movement of combined elbow extension and slight shoulder external rotation (while avoiding forearm supination) into and within the combined scaption and tilted transverse planes as demonstrated in **(figures 4 and 5)**.



▲ FIGURE 4



▲ FIGURE 5



▲ FIGURE 6

The individual should initially focus a contact pressure of their most proximal palmar surface migrating gradually towards their thenar eminence (**figure 6 and supported by the concentric circles on the hand support as in a target**), stopping when the triceps brachii is activated.

To ensure the exercise is completed correctly, palpate for compensatory muscle activation of the upper trapezius as pictured with the left hand. Cueing and facilitation of the triceps brachii can be completed as needed to improve activation as pictured with the right hand (**figure 7**).



▲ FIGURE 7

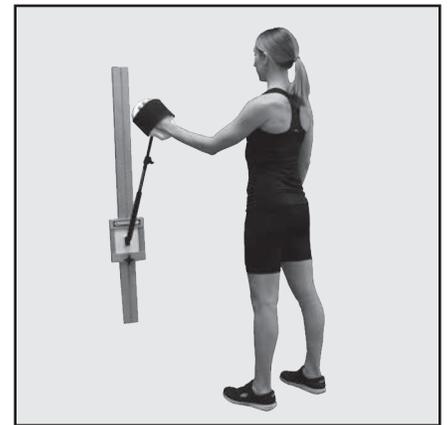
As the individual becomes comfortable with initiating the above sequence, progress the initial visualization into graded elevations while reaching for an object (**figures 8-11**).



▲ FIGURE 8



▲ FIGURE 9



▲ FIGURE 10



▲ FIGURE 11

LOWER TRAPEZIUS REINTEGRATION

SET UP

In a seated or standing posture, position the base of the UE Ranger® in one of the following options (the back edge of a stair, the Door Mount, or the Wall Mount). Next, adjust the tubing so that the shoulder is between 30 and 60 degrees of flexion and the elbow is bent 70 to 90 degrees as to most comfortably support the weight of the involved arm (**figures 1-3**).



▲ FIGURE 1



▲ FIGURE 2



▲ FIGURE 3

PRODUCTION OF MOVEMENT

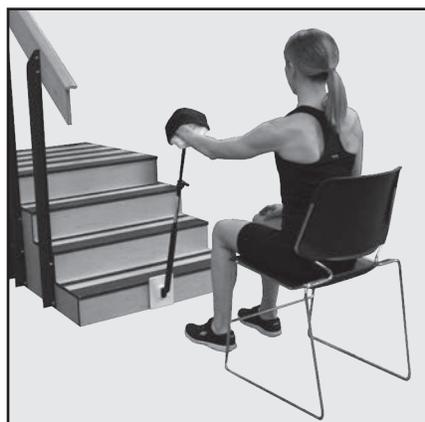
Visualization cue - Educate the individual to visualize extending one arm as if completing a hug to assist in activating the correct muscle(s). This progressive investment of visualization provides a mechanism of reintegrating functionally coordinated motor activity.

As a mechanism of progressively reorganizing synergistic coordination, first instruct the individual to progressively set, as previously learned, the activations of the supraspinatus and serratus anterior muscles, followed by the triceps brachii and external rotators. When the facilitation and resultant awareness of these engagements are achievable, progress to initiate the engagement of the lower trapezius.

Lower trapezius activation is targeted via shoulder flexion with transitional horizontal abduction (**figure 4**) followed by a merger of continued flexion and replacement of abduction with adduction (**figure 5**).



▲ FIGURE 4



▲ FIGURE 5

The individual should focus a contact pressure of the hypo-thenar eminence into the hand support – not by pushing with the hand but rather the intension executed by the motions described (**figure 6 and supported by the concentric circles on the hand support as in a target**).



▲ FIGURE 6



▲ FIGURE 7

To ensure the exercise is completed correctly, palpate for compensatory muscle activation of the upper trapezius or levator scapulae as pictured with the right hand. Cueing and facilitation of the lower trapezius can be completed as needed to improve activation as pictured with the left hand (**figure 7**).

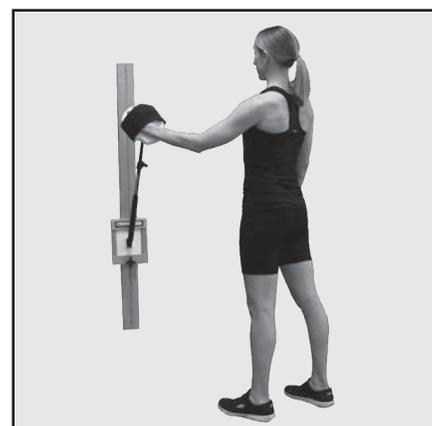
As the person becomes comfortable with initiating the above sequence, advance to visualize and continue extending the arm as if giving a hug (**figures 8-10**).



▲ FIGURE 8



▲ FIGURE 9



▲ FIGURE 10

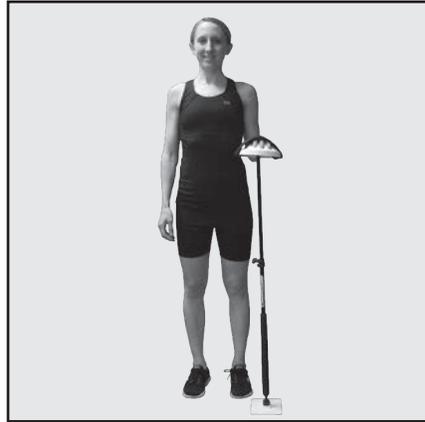
WRIST EXTENSOR REINTEGRATION

SET UP

In a seated or standing posture, position the base of the UE Ranger® either between the feet or comfortably in front of the foot such as to support a relaxed and balanced posture. Next, adjust the tubing so that the elbow is bent to 100 degrees or a slight upward angle as to most comfortably support the weight of the involved arm as shown in (figures 1 and 2).



▲ FIGURE 1



▲ FIGURE 2



▲ FIGURE 3

If the individual needs to improve their accuracy of control, have them support the rear edge of the hand support with their less-involved hand as shown in (figure 3).

PRODUCTION OF MOVEMENT

Visualization cue - Educate the individual to visualize extending their hand as if reaching forward to grasp an object to assist in activating the correct muscle(s). This progressive investment of visualization provides a mechanism of reintegrating functionally coordinated motor activity.

As a mechanism of progressively reorganizing synergistic coordination, first instruct the individual to progressively set, as previously learned, the activations of the supraspinatus and serratus anterior muscles, followed by the external rotators, triceps brachii and lower trapezius. When the facilitation and resultant awareness of these engagements are achievable, progress to initiate the engagements of the wrist extensors.



▲ FIGURE 4

Instruct the individual to initiate the combined movements of shoulder external rotation, shoulder abduction, and slight forearm supination as shown in (figure 4) to additionally initiate the motions of wrist extension.

The individual should focus a combined contact pressure of the most proximal palmar surface and that of the hypo-thenar eminence into the hand support – not by pushing with the hand but rather the intension executed by the motions described (**figure 5 and supported by the concentric circles on the hand support as in a target**).



▲ FIGURE 5



▲ FIGURE 6

To ensure the exercise is completed correctly, palpate for compensatory muscle activation of the pectoralis as pictured with the right hand. Cueing and facilitation of the wrist extensors can be completed as needed to improve activation as pictured with the left hand (**figure 6**).

The support of the UE Ranger® in reintegrating the wrist extensors provides opportunity for integrating the kinetic chain as a functional link dependent on both proximal stability as well as distal coordination. As the individual becomes comfortable with initiating the above motor sequence, advance to visualize and continue extending their hand towards an intended grasp (**figures 7-10**).



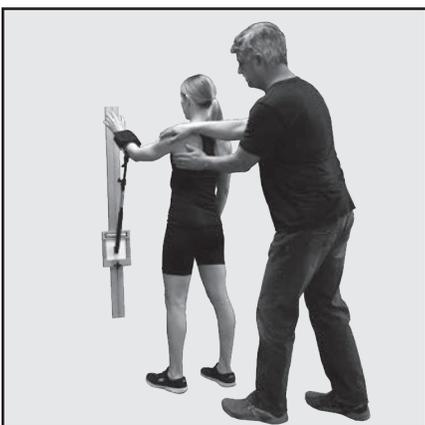
▲ FIGURE 7



▲ FIGURE 8



▲ FIGURE 9



▲ FIGURE 10

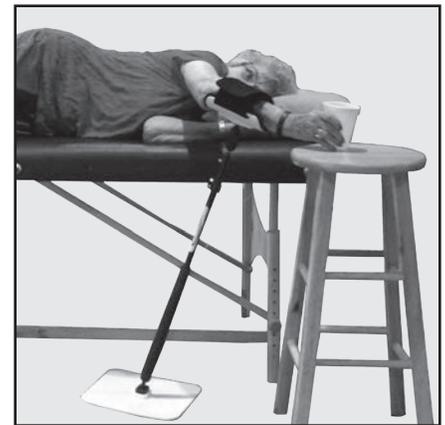
FUNCTIONAL MOBILITY INTERVENTIONS

Individuals recovering from a stroke or other neurological conditions may present with a wide array of physical impairments and resultant functional limitations. This section is devoted to providing examples of different treatment techniques that may be utilized to assist in one's individual recovery. It offers technique support towards maximizing functional mobility and independence based on one's goals and current level of function. The following exercises are simply examples. The intention is to show a treatment technique and the expectation is for each exercise to be modified to meet each person at their current impairment level. Modifications may include selecting the most appropriate hand or forearm support as well as the most appropriate base. The UE Ranger® is a versatile tool so consider the following exercises as a basis and expand accordingly to maximize the benefits. Please note that challenging a person's current capacities is not without risk. Such advances should only be performed by a trained medical practitioner. Further, strict devotion to one's safety at all times is essential. Always utilize professional safety precautions, including but not limited to using a gait belt and having adequate assistance.

REACHING

Reaching exercises are important as the act of reaching has influential affects that aid in restoring movement health. On a basic level, reaching exercises help maintain joint range of motion and offer muscle stretching, strengthening and endurance opportunities. Further, the act of reaching activates the muscles of the trunk facilitating core strength and control. Ultimately, repetitive reaching activities help to hardwire useful patterns of movement via motor relearning and neuroplastic change.

When the involved arm is appropriately supported a variety of repetitive reaching tasks can be practiced. If weakness does not allow a seated individual to complete the reaching activity without substitutions they may need to begin by lying on their side as in **(figure 1)**.



▲ FIGURE 1

When the individual is ready to progress in a seated position, utilizing the less involved arm may be helpful to assist the reaching movement shown in **(figures 2 and 3)**. Once adequate strength and mobility are present, targeting the involved arm challenges the reach progression as shown in **(figure 4)**. This can also be helpful to practice fine motor skills, grasp and release activities and functional tasks.



▲ FIGURE 2



▲ FIGURE 3



▲ FIGURE 4

The support of the UE Ranger® allows therapists to use techniques to assist with appropriate muscle activation while the user is completing a reaching task (**figure 5**). Trunk control, sensory stimulation with weight bearing of the involved arm, and increased awareness of the involved side can all be incorporated into reaching practice (**figure 6**).



▲ FIGURE 5



▲ FIGURE 6



▲ FIGURE 7

By inserting the small base into either the Wall Mount or the Door Mount shown in (**figure 7**) one can begin practicing reaching activities with elevation.

Reaching in standing can be progressed once the individual has adequate standing balance. As shown in (**figures 8-10**) the small base has been inserted into the portable Wall Mount. Allowing the UE Ranger® to support the weight of the arm from below offers an opportunity to elevate the arm without hiking the shoulder.



▲ FIGURE 8



▲ FIGURE 9



▲ FIGURE 10

For home use, the small base can be inserted into the Door Mount (**figures 11 and 12**) which offers the same functionality of the Wall Mount which is typically used within a clinical setting.



▲ FIGURE 11



▲ FIGURE 12

ACTIVITIES OF DAILY LIVING

In progressing oneself within life's opportunities to provide meaningful challenges it is strongly encouraged to both, challenge yourself with maximum involvement of your most involved arm while also preserving the previously learned rehabilitation principle of residing within an optimal therapeutic threshold. The phrase "use it or lose it" holds true for all post stroke and many other neurological recoveries, yet prior movements once taken for granted are not going to necessarily come back easy. Further, in order to progress from the early stages of movement production recoveries to more spontaneous and fluid motions, repetitive practice with dosage volumes in the thousands is of absolute necessity. Yet, looking back at how far you have come, the foundations are in place for you to succeed in this next level of recovery. Thus we strongly encourage you along with your therapist to select the most favorable UE Ranger® support to most effectively meet your current as well as progressive stages of life movement recovery requirements.

Daily living tasks with the involved arm can be completed with the support of the UE Ranger® and if needed, with assistance of the less involved arm. This support offers the opportunity for functional, repetitive activities to be performed at home or in the clinic. For example, activities like reading a book (**figure 1**), opening a lid (**figure 2**), washing a table (**figure 3**), and writing (**figure 4**) can all be practiced.



▲ FIGURE 1



▲ FIGURE 2



▲ FIGURE 3



▲ FIGURE 4

If using the involved arm for some functional tasks such as drinking (**figure 5**) or brushing one's teeth (**figure 6**) require additional support, a therapist or family member could assist with the motion.



▲ FIGURE 5

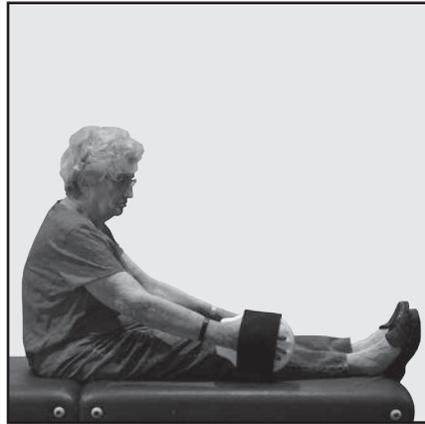


▲ FIGURE 6

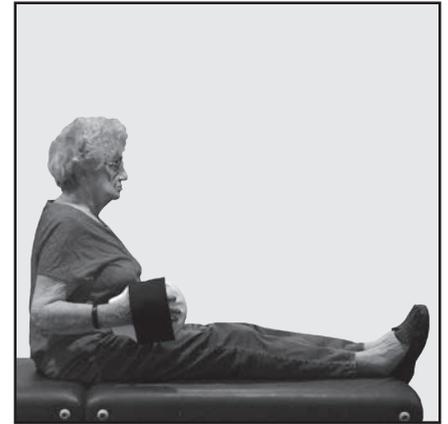
Tasks can be modified and a variety of positions can be utilized based on the individual's goals and current level of function. Practicing movement patterns for functional tasks such as washing your hair can be completed lying down as in (figure 7). A more advanced task such as donning pants can be practiced in long sitting if appropriate as shown in (figures 8 and 9).



▲ FIGURE 7



▲ FIGURE 8



▲ FIGURE 9

WEIGHT SHIFTING WHILE SEATED

Initially an individual should practice sitting in an optimal posture with equal weight bearing through the buttocks and the feet, utilizing the UE Ranger® to support the involved arm (figure 1). Weight shifting progressions can be practiced from this postural position.

Forward weight shifting can be practiced with one or two hands on the UE Ranger® support (figure 2). This activity can be helpful for sit to stand transitions and very beneficial to those that have difficulty leaning forward to stand. A variety of hand supports and positions can be utilized depending on the function of the individual's involved upper extremity and trunk control (figures 3 and 4). Once an individual gains confidence and improved trunk balance they can progress the sit to stand exercise by placing their feet further under them.



▲ FIGURE 1



▲ FIGURE 2



▲ FIGURE 3



▲ FIGURE 4

Practicing weight shifting to the side allows weight bearing through the upper extremity as well as off-loading the buttocks for pressure relief (**figures 5 and 6**). Scooting can be practiced with the more involved arm supported with the UE Ranger[®]. This allows the less involved buttocks to be moved forward (**figure 7**). This can be helpful when needing to scooch forward on a seated surface to improve the ability to stand up.



▲ FIGURE 5



▲ FIGURE 6



▲ FIGURE 7

This exercise can challenge trunk control during movement. A therapist can utilize handling techniques as needed to improve movement production and quality to maximize treatment outcomes.

WEIGHT SHIFTING WHILE STANDING

Initially, with the involved arm supported by the UE Ranger[®], an individual should practice standing in a balanced position with equal weight bearing through the lower extremities. Weight should be disbursed evenly through the feet, front to back and side to side (**figure 1**). Once this is achieved one can progress to weight shifting.

With the involved arm being supported by the UE Ranger[®] the therapist is able to assist with facilitation techniques or stability through the lower extremity as needed. Weight shifting exercises can be completed side to side as shown in (**figures 2 and 3**).



▲ FIGURE 1



▲ FIGURE 2



▲ FIGURE 3

Weight shifting exercises can also be completed in forward, backward, and diagonal directions as shown in (figures 4 and 5). This can then be progressed to advanced stepping, balance, and gait exercises once appropriate.



▲ FIGURE 4



▲ FIGURE 5

STANDING BALANCE

Balance exercises are not limited to the stroke population and can be helpful for many individuals. Given an individual's impairments, targeted balance exercises can be used to maximize standing stability. A variety of balance tasks can be completed with the support of the UE Ranger®. Provided in (figures 1-3) are a few examples, however this is just the beginning of the possibilities that can be explored and utilized.



▲ FIGURE 1



▲ FIGURE 2



▲ FIGURE 3

GAIT

The UE Ranger® can be useful for treatment of walking progression. The device can be helpful when needing to practice arm swing during gait and progressing to coordinating the arms with the legs (figures 1 and 2). Modifications can be made based on individual needs.



▲ FIGURE 1
36



▲ FIGURE 2

TRANSFERS

Transfers such as standing up from a chair or the floor can be difficult when recovering. Advanced exercises such as squats can assist with the strength and balance required to complete the task (**figures 1 and 2**).



▲ FIGURE 1



▲ FIGURE 2

Half kneeling (**figure 3**), kneeling (**figure 4**), or being on hands and knees (**figure 5**) can be helpful with complete floor transfers, however this can be an extremely challenging task for individuals. Kneeling exercises can also help with spasticity management.



▲ FIGURE 3



▲ FIGURE 4



▲ FIGURE 5