

# BRIDGING BIONICS PERFORMANCE PROGRAM Curriculum

# Abstract

A training manual to better understand the techniques used at Bridging Bionics to enhance our clients' quality of life through improving movement.

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# **Bridging Bionics Performance Program**

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# **BRIDGING BIONICS PERFORMANCE PROGRAM**

### Long Term Objective: Enhance movement ability to improve quality of life

The criteria to achieve this objective is dependent upon progressing through the stages of motor control. As you read and learn about these stages it is important to bear in mind that neurologically affected individuals may have specific challenges at each level. Spinal cord injury, stroke, cerebral palsy, Parkinson's, Multiple Sclerosis and a host of other neurological diseases that interrupt nerve transmission and communication to muscle groups will impart difficulties to movement ability. Generally, there are movement pattern deficiencies that will be characteristic for specific conditions related to spasticity and weakness, for example specific types of cerebral palsy or incomplete spinal cord lesions. Yet, even within these specific conditions there can still be wide variations in function and ability. We must pay attention to which areas of motor control require the most attention on an individual basis.

In many cases full return of mobility, stability, or strength is not the goal, rather, we are seeking improvement of the body areas impacted as well as development in other body segments. For example, an incomplete spinal cord lesion at T12 may result in bilateral weakness into both legs. In such cases, there may never be full neurological innervation to stimulate the muscles of the legs to walk without assistance however, the individual can still make significant improvements with other areas of motor development. For example, there are often mobility restrictions of the hips, knees, or ankles that occur secondary to spasticity or prolonged sitting that can be addressed to improve standing or the ability to move into and out of positions. Core muscle weakness can be enhanced to make the body more stable so that the individual can sit upright for longer periods and have better transfer of force through the body into the arms or legs. Improving posture can facilitate better balance and building upper extremity strength makes it easier for an individual to transfer. All of the above can make a dramatic difference in the lives of individuals both with daily activities and specific skills. Small steps of improvement are the goal and the reward.

Time and experience as well as communication with other team professionals will help you in your role to identify the elements that need work and how to develop your client's movement abilities. Below is a summary of the stages based upon the work of many prominent individuals in the field of motor learning.

#### 1. Mobility



Mobility entails the ability to move body segments (I.e. arm, leg or trunk) through a full range of motion and to initiate and maintain muscular control of the segment through the full range.

Mobility restrictions are due to a variety of soft tissue ailments including joint capsule scarring, muscle shortening, fascia restrictions, as well as neurological abnormalities that may cause increased muscle tone (spasticity) and muscle weakness. Mobility restrictions may be symmetrical or asymmetrical but more often with neurologically effected individuals, they are asymmetrical with one side of the body and/or the upper or lower body more effected. Mobility restrictions in one segment of the body results in greater stresses and unevenly distributed loads on connecting joints and muscles groups in other parts of the body. For example, a hip joint that will not fully flex, extend, and rotate will causes greater stresses upon the joints and muscles of the knee and low back when walking, squatting, or kneeling or trying to get into certain positions. A shoulder joint may lose the ability to fully rotate externally or internally because of postures associated with prolonged sitting and/or the repetitive movement patterns associated with propelling a wheel chair. This lack of mobility will result in additional stresses not only within the shoulder joint and muscles groups but also upon the elbow and scapula as well other body joints and muscles. Any segment of the body where there is a loss of motion will eventually result in muscle imbalances that will alter the forces across its joint and corresponding joints. This sequence will inevitably lead to chronic injuries such as sprains, strains, nerve pathologies and other soft tissue injuries. Hence the need to improve mobility is vital for body symmetry, balance, posture, health, and function.

To enhance mobility, postures with a low center of gravity and large base of support are utilized, for example lying on the back, side lie, stomach, and quadruped (all fours). Assistance to facilitate motion into positions such as rolling onto the side or bridging the hips off the floor are incorporated in this phase and depending on the case may be necessary to be continued long term. A combination of passive, active assistive, gentle resistance, and a variety of other techniques are also utilized that will be discussed in the exercise section. Physical therapists often will address specific tissue and joint restrictions unrelated to muscle tone abnormalities with a variety of treatments including joint mobilization, tissue massage, heat, laser, and stretches. Tone abnormalities particularly spasticity may benefit from techniques including rhythmic rotation, supportive weight bearing with vibration, deep pressure, and gentle stretching. Communication between physical therapists and trainers working with clients is essential to better understand the mobility restrictions that each client presents, and the intervention approaches being utilized.

# 2. Stability



Stability is the ability to control posture both statically and dynamically.

Posture relates to how the joints of the body stack up or align. It is often designated to the three curves of the spine but also should encompass the other bones and joints of the body including the feet, knees, hips, shoulders, etc. as all of the joints move freely through space in multiple directions. Stability pertains to the postural alignment of every position and movement; sitting, standing, bending, squatting, walking, reaching, etc. all require a balance of muscle forces to support the joints of the body. Think of it as an orchestra of muscle firing patterns, some muscles turn up their volume while others turn off depending on the pattern of movement and what is required.

Neurologically effected individuals often present with challenges in these firing patterns. Decreased muscle firing ability because of a spine injury, brain damage, or biochemical imbalance can cause weakness or increased muscle tone that appears in the form of spasticity and impedes normal mobility. Whenever there are muscle weaknesses and/or imbalances and tightness, stability will be compromised, and postural abnormalities will occur. Many neurologically effected individuals present with a lack of stability prevalent in the core muscles of the abdominals, the low back extensors, and the gluteals. Enhancing the stability of these core muscles is essential to control spine position, a necessity to efficiently transfer force through the body and to control the lever arms of the shoulder and hip. Muscle imbalances of the core may be further exaggerated by tightness of the hip joint and surrounding muscles. Such conditions are often the result of adaptive shortening from one sustaining a position for too long (sitting), repetitive movements, as well as neurological adverse muscle tone (spasticity). In all cases mobility should be addressed prior to stability.

Stability is achieved utilizing isometric contractions in non-weight bearing positions (supine, prone, etc.) and progressing to co-contractions in weight bearing positions (kneeling, sitting, etc.). Techniques involving isometrics can apply to the core muscles as well as the extremities. It is also important to keep in mind that neurologically effected individuals impacted by tone abnormalities often must compensate for weakness in one part of the body by overloading other areas. For example, paraplegics with lower extremity weaknesses will tend to overload their shoulders as a result of the constant overuse necessary for transfers, crutch walking, or propelling a wheel chair. In such cases addressing stability of the shoulder joint will be especially important for long term function and quality of life. A combination of open chain isometric exercises, weight bearing shoulder postures with isometrics applied (I.e. prone on elbows or quadruped), and resistive guided exercises will be beneficial.

# 3. Controlled Mobility



Controlled mobility is the third stage that builds upon the previous elements of stability and mobility. *Controlled mobility brings movement into the picture in the form of weight shifting and dynamic balance within specific positions or postures.* 

Within this stage, movement in all three planes of motion is developed as well as the ability to move into and out of positions. Gentle resistance through manual contacts or tubing is utilized to enhance proprioceptive feedback while the individual weight shifts through increments of ranges and in multiple directions (front/back, medial/ lateral, and rotation). Numerous training tools such as the TRX suspension trainer may be

incorporated during this phase to better assist the client with transfers between positions (I.e. kneeling to standing) or weight shifting within a position. The end goal of this phase is to enhance dynamic balance necessary for movement into and out of postures and increased movement ability within a posture (I.e. standing weight shifting).

### 4. Skill



Skilled movement is the ultimate objective that entails the normal timing and sequencing of muscle firing patterns associated with daily tasks and more advanced recreational and sporting activities.

Skill relates to extremity patterns required to navigate through the environment. Examples including walking, reaching, or performing other whole body coordinated movement patterns such as swinging a golf club or carving a ski turn. Development of the previous stages of motor development are essential in order to progress with skill. Upper and lower extremity diagonal patterns (lifts and chops) that combines movement in three planes of motion is a big component of skill training. These patterns stimulate daily functional tasks that reinforce the normal sequence and timing of muscles. Repetitive training refines these patterns with the goal that they become expressions that will transfer to daily life and become efficient blue prints of movement.



#### Strength:

Although not included as a specific stage of motor control, strength is an essential part of each phase. Strength is much more than muscle fiber development, it entails a variety of factors that improve force development.

Muscle coordination, improved nerve transmission, hip and shoulder mobility, stability especially of the core, and dynamic balance and weight shifting ability, will all improve force output and thereby strength. The objective is never to build big, bulky muscles that often deter from quality movement but to enhance the ability of the body to transfer force through it thereby making it stronger. Each stage of motor development serves a purpose to build strength.

Also, the concept that the whole is greater than the sum of its individual parts applies to the body. Each development position (supine, side lie, prone, quadruped, etc.) provides

an opportunity to work on specific isolated weaknesses and mobility restrictions. For example, in the side lying position, weakness of the outer hip muscles (the abductors and external rotators) may be addressed with deep pressure vibration to the muscle belly, stretching, and isolated exercises such as side lie leg lifts. Improvement in muscle tension of these individual muscles will serve the body well when integrative whole-body movements such as squatting or walking are performed. Enhancing isolated body segment mobility, stability, and strength will always improve the overall picture of full body movement. This concept is referred to as *isolate to integrate*. Both ends of the spectrum are important for strength as they feed off one another.



#### **Positional Development:**

Positional development refers to the position utilized to develop the various stages of development (mobility, stability, controlled mobility, and skill). Each position has bias and advantages to develop specific body segments and muscle firing patterns. For example, supine is the position that is utilized to perform a bridge exercise that will enhance gluteal hip extension strength as well as stretch the hip flexors. Both elements will serve as a progression into more advanced positions (higher center of gravity and decreased base of support) including standing and whole-body movements. Kneeling is another example of a position that will build hip extension strength of the gluteals, stretch the hip flexors, improve postural balance, as well as develop co-contraction stability of the spinal extensors and abdominals. Techniques such as alternating isometrics (discussed in the exercise section) can further enhance muscle activation with both the supine bridge and kneeling postures. Both bridging and kneeling serve as building blocks to acquire the necessary hip mobility and hip/core stability that is required to perform higher developmental movements including squatting and walking. Below are the basic development positions.

Supine, side lie, prone, quadruped, kneeling, 1/2 kneeling, long sitting, sitting, standing plantigrade, standing upright (parallel or split stance).

#### **Functional Movements:**



The human body is capable of performing a variety of compound movements that are reflections of the tasks performed in daily life. These movements include: Bending, squatting, lunging, rotating, pushing, pulling, and walking. As previously discussed the building blocks for these movements are rooted in the developmental positions that are necessary to enhance body mobility, stability, controlled mobility, and skill. Most often these movements are performed in some type of combination and in multiple planes of motion. Visualize a squat to pick up a bag of groceries followed by an ascent and push of the bag overhead while rotating the body to the left to set the bag on an overhead shelf. This is a skilled movement pattern requiring manipulation of the upper extremities in space. Similarly walking is a skilled movement requiring manipulation of the lower extremities through an environment. When observing these movements always appreciate the importance of mobility in the ankles, hips, or shoulders. Consider the stability of the core muscles to maintain an upright posture. Recognize the controlled mobility necessary to shift the body's center of gravity up and down or side to side as it moves from one position to another. Become aware that individuals unable to stand independently who sit much of the day must still perform some combination of these movements and will need to acquire a degree of all these elements to efficiently move. Sitting upright in a wheel chair and manipulating the upper extremity to push, pull, or rotate necessary for daily tasks still requires a high degree of shoulder mobility, core stability, weight shifting, and dynamic balance.

Training these elements in a variety of developmental positions as well as refining these combination movements will bring about optimal results.

#### Safety and Challenges:



Before progressing with any exercise program be sure to understand the clients' needs, goals, and challenges. Some clients may require additional spotting and support in a variety of positions. For example, clients who can stand upright and perform weight shifting activities but still present with weakness and balance deficits may require a constant hand on support or a "be ready" assist to prevent a fall. Always be sure to progress with caution and awareness and to communicate with other professionals on the team. Listed below are a few of the characteristics that present when working with neurologically affected individuals as well common treatment practices.

- Spasticity: In clients with high spasticity it is often helpful to use tone reducing techniques before and or throughout training session. Some basic techniques such as gentle rocking the knees will be discussed in the exercise session.
- Muscle fatigue: Individuals with neurological conditions often fatigue faster than able bodied people due to limited or disturbed muscle innervation. Make sure you take long enough breaks in between exercises. Communicate with client!
- Compensatory muscle activation: The provided exercise in different positions are designed to build strength in positions where no or little compensation strategies are needed for the client. Although because of muscle weakness some individuals will use compensatory strategies at times. Our goal can then be to minimize those

compensations but with respect that some individuals will require additional muscle group assistance to achieve the desired movement pattern.

- Deficits in sensation and proprioception can affect clients' ability to feel where the extremity is in space. Use mirrors for feedback as much as possible. Be cautious of pressure and friction on areas that lack sensation.
- Bone density is decreased in non-ambulatory clients, even if they stand regularly. This increases risk of bone fractures.
- Always consult with Physical Therapist when additional medical risks/ incidents arise (example autonomic dysreflexia, blood pressure issues, wound issues, pain).
- Muscle length and strength asymmetries are common in neurologically impaired individuals. Working towards minimizing these asymmetries will likely improve their function.

### Techniques:

Various techniques can be utilized to promote the different stages of motor development and can be applied to almost any movement pattern. Here a few of the most common techniques.

- Mobility Techniques: Passive range of motion, active assistive range of motion, and gentle guided resistance are utilized to increase extensibility of joints and muscles for greater ranges of movement. Quick stretches can also be incorporated to improve the ability to initiate motion.
- Stability Techniques: Alternating isometrics utilizes gentle isometric contractions across the joint to build muscle tone. The direction of force can be applied anterior/ posterior (front to back), medial/ lateral, or rotationally. Rhythmic stabilization is another stability technique to enhance muscle firing patterns by applying diagonal rotational isometric resistance.
- Controlled Mobility Techniques: *Slow reversal holds* utilize small ranges of motion in various planes with isometric contractions at the end ranges. The objective is to develop neuromuscular control to move body segments more smoothly and rhythmically through a larger range of motion.
- Skill: Diagonal pattern training that incorporates guiding and gently resisting the extremities through multiple planes simultaneously is a powerful technique to enhance skill. Manual resistance, tubing, and bands can be utilized with these techniques.

#### The Exercise Progressions:

Prior to running through the progression, it is necessary, before each exercise is performed that posture and muscle activation is set to the best of each client's abilities. Regardless of the position utilized, cue the client to set their posture, in other words shoulders back, long spine, head straight. In most cases we would like clients to achieve a neutral spine position (if you are unsure of what that looks like please read more about it). We also cue the clients to gently, yet firmly engage their abdominal and gluteal core muscles. This action helps to impart a degree of support to the spine and when combined with the neutral spine is the most efficient and safest posture to develop good movement patterns and avoid injury. It may be necessary to practice this sequence several times at the start of each session.

It is also recommended to begin with positions that offer a low center of gravity and wide base of support that will better ensure mobility and stability elements. Some exercise techniques will be bias to the trunk while others will focus on the extremities. Repetitions will vary from three or four to eight to ten in most instances with quality of movement always more important than the actual number. Look for improvements in mobility, muscle contractions, and efficiency of movement as you progress with each exercise.

The exercise program described below is to provide the professional (trainer or PT) with a general guide or model of the techniques that can be done in each position. It is by no means complete as there are many exercises beyond the scope of this manual that can be performed in each position. Listed below are a few that will give you a flavor of how to run through the positions, techniques and variations, and an explanation of the various stages of motor control that are developed.



- i. Activity: Hooklying trunk rotation
- ii. Manual Contacts: Inside/outside of knees
- iii. Purposes:
  - A. Mobility: Initiate rotational movement lower trunk and hips, decrease spasticity
  - B. Stability: Enhance rotational isometric contractions of the lower trunk, hip, knee musculature
- iv. Techniques:
  - A. Mobility: Passive ROM, Active Assistive ROM, gentle resistive, hold relax active motion
  - B. Stability: Alternating Isometrics middle ranges progressing to end ranges



- i. Activity: Crunch
- ii. Manual Contacts: Abdominal wall, front of shoulders
- iii. Purposes:
  - A. Mobility: Initiate trunk flexion
  - B. Stability: Enhance isometric contraction abdominal wall
- iv. Techniques:
  - A. Mobility: Assistive, active
  - B. Stability: Isometrics shortened range



- i. Activity: March
- ii. Manual Contacts: Under low back, if assisting knees
- iii. Purposes:
  - A. Mobility: Initiate hip flexion
  - B. Stability: Enhance low back stability
- iv. Techniques:
  - A. Mobility: Passive, active assistive, gentle resistive hip flexion
  - B. Stability: Above while engaging abdominals, lats



- i. Activity: Bridge
- ii. Manual Contacts: Pelvis and knees
- iii. Purposes:
  - A. Stability: Promote lower trunk, hip stability: facilitate hip extension/ knee flexion stability and patterns of movement
  - B. Controlled Mobility: Weight shifting with bridge
- iv. Techniques:
  - A. Stability: Alternating isometrics, rhythmic stabilization
  - B. Controlled Mobility: Weight shifting isometrics



# Position: Supine one knee straight one knee bent

- i. Activity: D1 pattern
- ii. Manual Contacts: Foot, knee
- iii. Purpose:
  - A. Mobility: Initiate pattern ankle dorsi flexion, knee flexion, hip flexion, adduction switch over to hip extension, abduction, knee extension, ankle eversion
  - B. Stability: Enhance abdominal contractions
  - C. Skill: Coordinated lower extremity combination movement pattern
- iv. Techniques:
  - A. Mobility: Quick stretch to initiate dorsi flexion and hip flexion
  - B. Stability: Abdominal muscle reeducation
  - C. Skill: Guided and gently resistive lower extremity diagonal pattern

## Position: Side lying



- i. Activity: Roll
- ii. Manual Contacts: Pelvis and/ or shoulders
- iii. Purposes:
  - A. Mobility: Initiate rolling
  - B. Stability: Develop isometric contracts and co-contractions upper and lower trunk
- iv. Techniques
  - A. Mobility: Passive, active assistive, active range of motion, gently resistance
  - B. Stability: Isometrics, alternating isometrics, rhythmic stabilization

# Position: Side lying



- i. Activity: Roll with punches or pulls
- ii. Tools: Tubing
- iii. Purposes:
  - A. Mobility: Initiate rolling
  - B. Stability: Contractions upper lower core, shoulder girdle
  - C. Controlled Mobility: Weight shifting rotationally
  - D. Skill: Combination movement pattern trunk rotation with pull or pull

## Position: Side lying



- i. Activity: Side lying leg lift and clam
- ii. Manual Contacts: Hip, knee, or outer hip
- iii. Tools: Vibration tool
- iv. Purposes:A. Stability: Enhance outer hip musculature contractions
- v. Techniques:
  - A. Stability: Assistive, active assistive, resistive while facilitating outer hip with manual pulse pressure or vibration tool

## Position: Prone



- i. Activity: Back extension and shoulder I's, T's, W's, Y's
- ii. Manual Contacts: Back of shoulders
- iii. Tools: Vibration tool
- iv. Purposes:
  - A. Mobility: Initiate back extension contraction and initiate movement in clients with decreased tone of trunk and/ or shoulder.
  - B. Stability: Increase tonic holding contraction of back extensors and posterior shoulder musculature
- v. Techniques:
  - A. Mobility: Assistive, active assistive, gentle resistive back extension or shoulder movements into the I, T, W, or Y position
  - B. Stability: Isometric holds in back extension position

**<u>Position</u>**: Prone with pelvis under a soft block and one knee bent



- i. Manual Contacts: Pelvis and under knee, outer hip
- ii. Activity: Hip extension heel kick
- iii. Tools: Vibration tool
- iv. Purposes:
  - A. Mobility: Increase hip extension mobility, hip flexor length
  - B. Stability: Enhance low back stability, hip extensor contractions (gluteal)
- v. Techniques:
  - A. Mobility: Passive, active assistive, active range of motion; passive stretch into hip extension, knee flexion
  - B. Stability: Isometric contractions end range hip extension

### **<u>Position</u>**: Prone on elbows



- i. Manual Contacts: Shoulders
- ii. Activity: Upper body weight shifting progressing to arm lift
- iii. Purposes:
  - A. Stability: Increase dynamic shoulder girdle stability through weight bearing
  - B. Controlled mobility: Promote upper body weight shifting
- iv. IV. Techniques:
  - A. Stability: Alternating isometrics, rhythmic stabilization
  - B. Controlled Mobility: Weight shifting slow reversal hold progressing into one arm reach

# Position: Plank



- i. Manual Contacts: Shoulders or Pelvis
- ii. Activity: Hold position, weight shift
- iii. Purposes:
  - A. Mobility: Initiate movement from prone on elbows into plank
  - B. Stability: Increase contraction of core muscles with bias to abdominal wall
  - C. Controlled Mobility: Promote weight shifting ability
- iv. Techniques:
  - A. Mobility: Assist into position
  - B. Stability: Alternating isometrics, rhythmic stabilization
  - C. Controlled Mobility: Weight shifting slow reversal holds

## Position: Quadruped



- i. Manual Contacts: Shoulders and Pelvis
- ii. Activity: Hold position, weight shift, or lift arm and/or leg
- iii. Purposes:
  - A. Mobility: Initiate movement by assisting client if needed from prone into quadruped position
  - B. Stability: Increase contraction of the core muscle of the entire trunk, facilitate co-contractions of shoulder and hip girdle muscles
  - C. Controlled Mobility: Promote weight shifting ability and dynamic balance
- iv. Techniques:
  - A. Mobility: Assist into quadruped position, assist with arm or leg lift
  - B. Stability: Alternating isometrics, Rhythmic stabilization
  - C. Controlled Mobility: Weight shifting slow reversal holds, progress to lift arm and/or leg

# Position: Kneeling



- i. Manual Contacts: Shoulders and Pelvis
- ii. Activity: Hold position, weight shift, or reach with arm, push, pull, rotate, diagonal patterns
- iii. Purposes:
  - A. Mobility: Initiate mobility by assisting into position, improve hip flexor length, decrease spasticity of quads
  - B. Stability: Increase contractions of core muscles, co-contraction of abdominals and back extensors, and hip girdle muscles (gluteal)
  - C. Controlled Mobility: Promote dynamic balance
  - D. Skill: Increase manipulation ability of upper extremity and core patterns
- iv. Techniques:
  - A. Mobility: Assist into kneel position if needed, stretch hip flexors
  - B. Stability: Alternating isometrics, rhythmic stabilization
  - C. Controlled Mobility: Weight shifting slow reversal holds
  - D. Skill: Manipulation of upper extremities and core patterns (push, pull, UE diagonals, core rotation, chops, lifts)

## Position: Half kneeling



- i. Manual Contacts: Shoulders and Pelvis
- ii. Activity: Hold position, weight shift, or reach with arm, push, pull, rotate, diagonal patterns
- iii. Purposes:
  - A. Mobility: Initiate transfer into position, increase hip flexor length, decrease quadriceps tone
  - B. Stability: Increase contractions of core muscles and hip girdle (gluteal)
  - C. Controlled Mobility: Promote dynamic balance weight shifting abilities
  - D. Skill: Increase manipulation ability of upper extremity and core patterns
- iv. Techniques:
  - A. Mobility: Assist into half kneel position if needed, stretch hip flexors
  - B. Stability: Alternating isometrics, rhythmic stabilization
  - C. Controlled Mobility: Weight shifting slow reversal holds
  - D. Skill: Manipulation of upper extremities and core patterns (push, pull, UE diagonals, core rotation, chops, lifts)

# Position: Long sitting



- i. Manual Contacts: Shoulders and Pelvis
- ii. Activity: Hold position, weight shift, or reach with arm, push, pull, rotate, diagonal patterns
- iii. Purposes:
  - A. Mobility: Initiate transfer into position, Increase hamstring and gastroc length
  - B. Stability: Increase co-contraction core muscles
  - C. Controlled Mobility: Promote dynamic balance in sitting
  - D. Skill: Increase manipulation ability of upper extremity and core patterns
- iv. Techniques:
  - A. Mobility: Assist into position, stretch gastrocs when feet pressed into wall
  - B. Stability: Alternating isometrics, rhythmic stabilization
  - C. Controlled mobility: Weight shifting slow reversals holds
  - D. Skill: Manipulation of upper extremities and core patterns (push, pull, UE diagonals, core rotation, chops, lifts)



#### Position: Sitting on therapy table, chair, Swiss Ball

- i. Manual Contacts: Shoulders and Pelvis
- ii. Activity: Hold position, weight shift, or reach with arm, push, pull, rotate, diagonal patterns
- iii. Purposes:
  - A. Mobility: Initiate transfer into sitting
  - B. Stability: Increase co-contraction core muscles
  - C. Controlled Mobility: Promote dynamic balance weight shifting ability in sitting
  - D. Skill: Increase manipulation ability of upper extremities and core patterns (push, pull, rotate, UE diagonals, chop, lifts)
- iv. IV. Techniques:
  - A. Mobility: Assist into position, stretch gastrocs when feet pressed into wall
  - B. Stability: Alternating isometrics, rhythmic stabilization
  - C. Controlled mobility: Weight shifting slow reversals holds
  - D. Skill: Manipulation of upper extremities and core patterns (push, pull, UE diagonals, core rotation, chops, lifts)

## Position: Standing Plantigrade



- i. Manual Contacts: Shoulders and Pelvis
- ii. Activity: Hold position (assist weight bearing on elbows or hands), weight shift, reach arm, extend leg
- iii. Purposes:
  - A. Mobility: Initiate weight bearing standing, stretch heel cords, decrease extensor tone
  - B. Stability: Increase shoulder, core, hip muscles firing patterns necessary for upright activity
  - C. Controlled Mobility: Promote dynamic balance standing weight shifting ability
  - D. Skill: Increase upper and lower extremity patterns necessary for standing and gait
- iv. Techniques:
  - A. Mobility: Assist into position, stretch heel cords (plantar flexors)
  - B. Stability: Alternating isometrics, rhythmic stabilization
  - C. Controlled Mobility: Weight shifting slow reversal holds
  - D. Skill: Manipulation upper and lower extremities (flexion, extension, abduction)

### Position: Standing



- i. Manual Contacts: Pelvis and shoulder (spotting from behind)
- ii. Activity: Hold position (assist holding support such as ballet bar), weight shifting, single leg step, reach arm, push, pull, rotate, UE diagonal pattern
- iii. Tools: Tubing
- iv. Purposes:
  - A. Mobility: Increase ankle mobility, stretch heel cord, decrease extensor tone
  - B. Stability: Increase lower extremity, core muscles contractions necessary for standing support
  - C. Controlled Mobility: Promote dynamic balance weight shifting ability in standing
  - D. Skill: Initiate lower extremity stepping pattern necessary for gait, upper extremity manipulation to reach, push, pull, rotate in standing posture
- v. Techniques:
  - A. Mobility: Assist into position, stretch heel cords
  - B. Stability: Alternating isometric, rhythmic stabilization
  - C. Controlled Mobility: Weight shift slow reversal holds
  - D. Skill: Step pattern training, UE tubing resistance multidirectional

## Position: Standing



- i. Manual Contacts: Pelvis (support from behind)
- ii. Activity: Lower body bend, squat, weight shift, back step lunge, side lunge
- iii. Tools: TRX or ballet bar
- iv. Purposes:
  - A. Mobility: Assist into position, stretch heel cord, decrease extensor tone
  - B. Stability: Increase core contractions, hip girdle, lower extremity strength
  - C. Controlled Mobility: Promote dynamic balance and ability to move center of gravity up or down or side to side body (IE. descending/ ascending squat)
  - D. Skill: Enhance step patterns necessary for gait
- v. Techniques:
  - A. Mobility: Assist into position, hamstring, hip flexor stretches
  - B. Stability: Isometric contractions holds in position lower body
  - C. Controlled: Active range of body movement through each exercise
  - D. Skill: Step patterns, whole body movement combinations

#### Position: Standing



- i. Manual Contacts: Pelvis
- ii. Activity: Row, Plank, Push Up, Diagonal
- iii. Tools: TRX
- iv. Purposes:
  - A. Mobility: Assist into position
  - B. Stability: Facilitate core postural muscle firing patterns with bias to anterior, posterior or side (depending upon direction client is facing)
  - C. Controlled Mobility: Promote balance upper and lower body
  - D. Skill: Development of diagonal patterns in standing
- v. Techniques:
  - A. Mobility: Assist into position, shoulder mobility
  - B. Stability: Increase core, upper body muscle firing patterns
  - C. Controlled: Promote rotational dynamic balance (diagonal pattern)
  - D. Skill: Enhance whole upper/ lower body combination movements

#### **Specific Considerations:**

Shoulder musculoskeletal ailments such as rotator cuff impingement, bicep tendonitis, and a host of other chronic shoulder conditions are quite common in individuals that must primarily rely on their upper extremities to perform daily activity. Repetitive transfers from position to position, crutch walking, or propelling a wheel chair can place high demands upon the shoulder as well as other joints of the upper body. Bad posture combined with repetition of these movements often leads to imbalances of muscle forces across the shoulder joint. Imagine seated hunched over and propelling a wheelchair forward for five hours every day. Muscle imbalances and mobility restrictions are sure to develop and over time will lead to micro-trauma of the soft tissues that support the joint. This can be quite debilitating and painful especially in neurologically effected individuals that must compensate for their lower body weaknesses. The upper body, especially the shoulder is under constant stress. Therefore, it is vital to restore shoulder muscle symmetry and joint mobility to both alleviate and prevent chronic shoulder ailments. Hence a shoulder exercise rehab or preventative program should be a part of these individuals' weekly routine.

Below are some suggested exercises.



#### i. <u>Mobility</u>:

- A. Back of the shoulder stretch: Pull arm across body for 30 seconds
- B. Front of the shoulder stretch: With elbow by side and bent 90 degrees rotate forearm outward, hold for 30 seconds (Over ½ foam roller in supine hook-lying)
- C. Overhead arm reach: Hold for 30 seconds
- ii. Stability:
  - A. Isometrics against wall: External rotation, internal rotation, abduction.
    6 second holds x 8 repetitions each motion
  - B. Prone on elbows weight shifting: Alternating isometrics and weight shifting.
    6 second holds x 6 repetitions. (Quadruped?)
  - C. Internal and external rotation tubing or side lying?
- iii. <u>Strength</u>:
  - A. Prone on bench or swiss ball: I's, T's, W's progress to 3lb dumbbells. 3 second holds x 8 repetitions
  - B. TRX or tubing/ cable rows: 3 second holds x 10 repetitions
  - C. Diagonal Patterns: Tubing backhand diagonal pattern 10x

Soft tissue mobilization, vibration therapy, laser, and a host of other modalities and manual therapy techniques will further facilitate tissue repair, joint mobility, and muscle activation. All of which will help to decrease pain and restore functional movement abilities.