Instruction Manual

The LOWER and UPPER MRD was specifically designed for either the knee or shoulder joints to be used to help pre and post-surgical patients early in their rehabilitation when forces that affect the healing tissues need to be controlled. However, it can do much more which this manual will reveal.

The MRD'S can not only be used for pre and post surgery as mentioned, but also with traumatic injuries involving the upper and lower extremity, kinetic chain of joints. Because of the synergistic and integrated nature of the nervous system, the MRD's will impact the tone of muscles and the length of their myofascia that affect the position and motion of the shoulder, elbow, wrist, and hand with the UPPER MRD and the hip, knee, ankle, and foot with the LOWER MRD.

The UPPER AND LOWER MRD's are "open kinetic" chain devices a term used to describe a phase in the way the human body moves against the vertical forces of gravity and ground reaction force (GRF).

Simply when one bone is moved within a kinetic chain of joints, it creates some kind of movement or effect in adjacent, nearby joints along with affecting the muscles, tendons, fascia, and ligaments attached at the joints.

A kinetic chain is considered "open" when either the hand or foot is free to move and not affected by GRF. Conversely, a kinetic chain is considered "closed" when the hand or foot is fixed against the ground and reacting to GRF.

In function, the human body has to be able to do both. But with open kinetic chain movement, it is much easier to control the linear and rotational forces on a joint which is a necessity in the early healing phase of injured tissues or post surgery. The closed kinetic chain, on the other hand, where the hand and foot react to GRF, the movement will occur at multiple joints and at multiple joint axes. This simultaneous movement occurring at more than one joint or segment makes it much more difficult to control the linear and rotational forces. Therefore, the UPPER AND LOWER MRD'S are tools that should be used in the early rehabilitation phase after surgery or trauma.

In describing functional, human movement like walking, it is in fact a continuum, a sequence of open and closed kinetic chain activity. The UPPER AND LOWER MRD'S, therefore, have their place in this continuum of movement that ultimately leads to a more stable and optimum outcome from either surgery or trauma as the patient becomes more aggressive and functional in their movements requiring a response to GRF.

The UPPER AND LOWER MRD'S can be used either in the clinic or more importantly in the patient's home environment to begin the process of changing the patient's muscle memory or "myomemory" and remodeling scar tissue vital in preventing "arthrofibrosis." Therefore, the MRD's are an important key to a patient's recovery and return to function because as we all know "motion is life, motion is freedom!"

When I mention changing "myomemory" I am referring to the ability of a patient to reproduce a particular movement without intervention of the conscious part of the brain.

In short, turn your client's muscles on for a specific movement or skill to "autopilot." That can only occur with active, patient participation and practice and altering visual, vestibular, and proprioceptive sensory input.

Considering that approximately 90% of all neuronal activity of the human brain is somehow involved with vision and the eyes, the movement of the eyes is the key to transforming the neuronal patterns, the muscle and myofascial patterns that ultimately create posture and movement.

Simply, myomemory is the process of reorganizing and rewiring a patient's brain-muscle-myofascial connection. When a patient practices a new movement over and over again in conjunction with eye movements while using the MRD'S, they are literally decreasing the resistance within their own CNS to create a new neuronal or muscle pathway that will ultimately alter the position and motion of an isolated joint and the integrated posture and movement. This is referred to as "neuroplasticity," a process that involves adaptive structural and functional changes to the brain and its output.

Over time, our posture and movement and the muscle and myofascial patterns that create it can become dysfunctional altering the position and motion of a joint from the ideal eventually causing pathology. That is why surgical intervention in many cases is required. But, the surgery only addresses the joint dysfunction and pathology. It does not alter the muscle and myofascial memory that caused it.

The UPPER AND LOWER MRD'S can be useful tools in altering dysfunctional muscle and myofascial memory by creating new neuronal, muscle pathways.
With the transformation of muscle and myofascial memory, a patient's posture and movement will also change that will better prepare the client for weight bearing and closed kinetic chain, functional activities. Let's get started to transforming your client's "myomemory" and improving their function.

"KEY POINTS TO REMEMBER"

•WHEN POSITIONING A CLIENT TO PRACTICE A MOVEMENT ON EITHER THE UPPER OR LOWER MRD, MAKE SURE THE AXIS OF MOTION FOR THE PRIMARY JOINT WORKING IS ALIGNED WITH AXIS OF MOTION FOR EITHER MRD.

•POSTURE WHEN USING THE UPPER AND LOWER MRD'S IS IMPORTANT TO A SUCCESSFUL OUTCOME. MAKE SURE THE CLIENT IS IN A "NEUTRAL" STANDING OR SITTING POSTURE. THAT IS WHEN SITTING, THEIR WEIGHT IS EQUALLY DISTRIBUTED BETWEEN BOTH "SITS" BONES OF THE PELVIC GIRDLE AND THEY DEMONSTRATE A SLIGHT LORDOSIS OF THE LUMBOSACRAL SPINE.

IN STANDING,THEIR WEIGHT SHOULD BE EQUALLY DISTRIBUTED BETWEEN BOTH FEET FEELING EQUAL PRESSURE BETWEEN THE BALL OF LITTLE AND BIG TOES AND INSIDE AND OUTSIDE OF BOTH HEELS. FEET ARE PARALLEL TO EACH OTHER AND STRAIGHT AHEAD. THE HEAD, FACE, AND PELVIC AND SHOULDER GIRDLES ARE STRAIGHT AHEAD WITHOUT ROTATION. THE CHIN IS PARALLEL WITH THE FLOOR.

•WHEN BEGINNING A PROGRAM, INSTRUCT YOUR PATIENT HOW TO “READ” THEIR PAIN. LET THEM KNOW THEY MAY INITIALLY EXPERIENCE PAIN WITH MOVEMENT, BUT THE PAIN WILL GO AWAY ONCE THEY STOP THE MOVEMENT. THAT IS “DYSFUNCTIONAL PAIN” AND IS EXPECTED BECAUSE THEY ARE WORKING TISSUES IN A NEW AND REMODELED WAY.

•IF THEY WORK THE TISSUES AND EXPERIENCE PAIN AND THE PAIN PERSISTS FOR HOURS AFTER DOING THE MOVEMENT, THAT IS MOST LIKLEY PAIN FROM INFLAMMATION. THE IDEA IS TO WORK THE HEALING TISSUES IN THE NEW, REMODELED WAY WITHOUT CAUSING INFLAMMATION. THIS SIMPLY IS NOT A SITUATION OF “NO PAIN, NO GAIN.”

•WHEN WORKING WITH “DYSFUNCTIONAL PAIN,” WORK UP TO THE POINT OF FIRST EXPERIENCING PAIN AND/OR STRETCH. DO NOT TRY TO WORK THROUGH THE PAIN. IF THE PAIN IS DYSFUNCTIONAL, THEY WILL BE ABLE TO GRADUALLY GAIN MORE AND MORE RANGE OF MOTION (ROM) WITHOUT INCREASING INFLAMMATION AND THEIR LEVEL OF PAIN. IF SLIGHT PAIN IS EXPERIENCED, WORK UP TO THE POINT WHERE FIRST EXPERIENCING A PULL OR STRETCH.

•THE TIME HOLDING THE END OF A MOVEMENT DEPENDS ON THE TISSUE YOU ARE TRYING TO ISOLATE. FOR MUSCLE, HOLD A POSITION FOR UP TO A MAXIMUM OF 30 SECONDS WHEREAS LONGER WILL LENGTHEN THE CONNECTIVE TISSUE (MYOFASCIA). IN THE EXERCISE DESCRIPTIONS, A MAXIMUM HOLD TIME OF 30 SECONDS IS USED.

•INITIALLY, HOLD THE POSITION FOR 5 SECONDS AND GRADUALLY INCREASE THE TIME OF HOLD.

•THE FREQUENCY OF DOING THE MOVEMENT VARIES WITH EACH PATIENT. HOWEVER, IT IS BETTER TO SPREAD THE REPETITIONS DONE THROUGHOUT THE DAY RATHER THAN DOING ONE TO TWO INTENSE SESSIONS. IF THE CLIENT IS USING THE MRD AT HOME FOR EXAMPLE, DOING A PRACTICE OF A MOVEMENT EVERY OTHER HOUR WHILE MONITORING THEIR PAIN, SWELLING, AND SKIN TEMPERATURE RESPONSE IS PREFERRED.

•HAVE CLIENTS DO 3-12 REPETITIONS EACH SESSION.

•REMEMBER THE BUILT IN GONIOMETER TO DOCUMENT INITIAL JOINT RANGE OF MOTION (ROM) AND PROGRESS.

•REMEMBER YOU CAN INCREASE THE INTENSITY OF EXERCISE BY THE HOLDING TIME, REPETITIONS, ROM, AND THE “VARIABLE RESISTANCE” CAPABILITY OF THE UPPER AND LOWER MRD’S.

•WITH THE LOWER MRD, THE SIMPLE MOVEMENT PRACTICED IS WITH KNEE EXTENSION AND FLEXION IN THE SAGITTAL PLANE. BY CHANGING THE SENSORY INPUT WITH THE POSITION OF THE EYES, HEAD AND NECK, AND FOOT AND ANKLE, YOU CAN AFFECT THE TENSION, TONE OF MUSCLES AND LENGTH OF THE MYOFASCIA THAT ULTIMATELY ALTER THE POSITION AND MOTION OF A JOINT IN ALL THREE PLANES.

•WITH THE UPPER MRD, THE SIMPLE MOVEMENTS PRACTICED ARE SHOULDER ABDUCTION/ADDUCTION IN THE FRONTAL PLANE, SHOULDER FLEXION/EXTENSION IN THE SAGITTAL PLANE, SHOULDER HORIZONTAL ABDUCTION/ADDUCTION AND SHOULDER INTERNAL ROTATION/EXTERNAL ROTATION IN THE TRANSVERSE PLANE.

•BY CHANGING EYE AND HEAD AND NECK POSITIONS, IN CONJUNCTION WITH THESE SHOULDER MOVEMENTS, YOU WILL ADDRESS THE POSITION AND MOTION OF THE SHOULDER JOINT IN ALL THREE PLANES.

•ALL MOVEMENTS WILL BE PERFORMED WITH THE EYES CLOSED TO LIMIT THE AFFECT OF REFLEXES REFERRED TO AS THE “VESTIBULAR-OCULAR REFLEXES.” THESE ARE EYE MOVEMENTS THAT REFLEXIVELY STABILIZE THE GAZE BY COUNTERING WITH THE MOVEMENT OF THE HEAD.

“THE LOWER MRD PROGRAM”

Progression of use:

1) **Have client familiarize themselves with the LOWER MRD by extending and flexing their knee in the sagittal plane using the active-assist handle. Emphasize that they are in control of their movement.**
2) **Extend the leg up at the knee into knee extension with the LOWER MRD’s arm to where first experiencing dysfunctional pain and/or stretch. Flex the leg back into knee flexion where first experiencing pain and/or stretch. Repeat as much as needed to familiarize client with the MRD.**

3) SAGITTAL PLANE MOTION:

Begin working the knee in the sagittal plane now altering the visual and proprioceptive input. During the knee flexion and extension movement, have the client keep their chin parallel with the floor and close their eyes. Move eyes out to the R and down and flex the R toes down toward the plantar surface of foot. With the LOWER MRD'S active-assist handle, have client move into knee flexion until first experiencing dysfunctional pain and/or stretch and hold. Initially, hold for 5 seconds and relax. Gradually increase the hold time to a maximum of 30 seconds. Relax toes of R foot and eyes R and down. During the knee extension phase, have the client move eyes out to the R and up and extend toes of R foot up toward the front of the knee. With the LOWER MRD'S active assist handle, bring R knee into knee extension until first experiencing dysfunctional pain and hold. Initially, hold for 5 seconds and gradually increase the hold time to a maximum of 30 seconds. Relax toes of R foot and eyes R and up. Do this sequence as just described of R knee flexion and extension 3-12 times.

The L knee is done in the same manner, but eyes are closed and moving out to the L up with L knee and toe extension and moving out to L and down with L knee and toe flexion.

You can have the client do this flexion and extension movement with both knees. If there is a significant fear of moving their involved leg, start with their uninvolved limb and then do the involved limb.

KEY POINTS TO REMEMBER FOR SAGITTAL PLANE MOTION:

•ALIGNMENT AND POSTURE IS IMPORTANT TO A SUCCESSFUL OUTCOME.

•EYES ARE CLOSED AND MOVE WITHOUT STRAIN. EYES MOVE OUT TO THE SAME SIDE AND DOWN AS EXTREMITY MOVING WITH TOE AND KNEE FLEXION AND OUT TO THE SAME SIDE AND UP AS EXTREMITY MOVING WITH TOE AND KNEE EXTENSION.

4) **FRONTAL PLANE MOTION:**

As the client gains confidence and has less fear of movement, begin frontal plane motion that involves tilting or side bending of the head and neck 15-30º as well as plantarflexion and dorsiflexion of the foot and ankle.

Have the client close their eyes and keeping their head and face straight ahead, position their head and neck so it is tilted or side bent toward their R shoulder and move their eyes out to the R and up. Point the R foot and ankle down away from the front of the knee into plantarflexion and with the active-assist handle, have the client flex their R knee to where first experiencing pain and/or stretch and hold. Initially hold for 5 seconds and gradually increase to a maximum of 30 seconds. Relax head and neck tilt R, eyes R and up, R foot and ankle plantarflexion, and R knee flexion.

Bring head and neck to vertical and straight ahead and close eyes. Move eyes out to the R and down. Have client bring R foot up toward front of knee into dorsiflexion and with the MRD active-assist arm, extend the R leg up into extension until first experiencing pain and/or stretch and hold. Hold this extended position of the R knee initially for 5 seconds and up to a maximum of 30 seconds. Repeat this cycle of R knee flexion and extension 3-12 times.

L knee flexion is done in the same manner with eyes closed and side bend or tilt of head and neck toward L, eyes move out to the L and up, and foot and ankle in plantar flexion. With L knee extension, head and neck is brought to vertical and straight ahead and eyes closed. Have client move eyes out to the L and down and dorsiflex their L foot and ankle.

KEY POINTS TO REMEMBER FOR FRONTAL PLANE MOTION:

- **ALIGNMENT AND POSTURE IS IMPORTANT TO A SUCCESSFUL OUTCOME.**
- **EYES ARE CLOSED AND MOVE OUT TO SAME SIDE AND UP AS DOING THE KNEE FLEXION AND OUT TO THE SAME SIDE AND DOWN AS DOING THE KNEE EXTENSION.**
- **HEAD AND NECK IS TILTED ABOUT 15-30º TOWARD SAME SIDE AS FLEXING KNEE AND VERTICAL AND STRAIGHT AHEAD WHEN EXTENDING KNEE.**
- **FOOT AND ANKLE IS PLANTARFLEXED WITH KNEE FLEXION AND DORSIFLEXED WITH KNEE EXTENSION.**

5) FRONTAL/TRANSVERSE PLANE MOTION:
Involves turning head and neck with eyes closed and eye movement. Have client close their eyes and keeping their chin parallel with floor, turn their head and neck toward R shoulder. Move eyes out to the R and down. With the MRD active-assist arm, have the client flex or bend their R knee back to where first experiencing pain and/or stretch and hold. Hold initially for 5 seconds and gradually increase to a maximum of 30 seconds. Now, have client extend or straighten the R knee up to where pain is first experienced and/or stretch and hold. Again, hold initially for 5 seconds and gradually increase to a maximum of 30 seconds. Relax head and neck rotation R, eyes R and down, and R knee. Repeat 3-12 times.

Keeping the client's eyes closed and their chin parallel with the floor, have client turn their head and neck to the L and move eyes out to the R and up. With the MRD active-assist arm, have the client flex or bend their R knee to where first experiencing pain and/or a stretch and hold. Hold initially for 5 seconds and gradually increase to a maximum of 30 seconds. Now, have client extend or straighten the R knee to just where pain and/or stretch is first experienced and hold. Again, hold initially for 5 seconds and gradually increase to a maximum of 30 seconds. Relax head and neck rotation L, eyes R and up, and R knee. Repeat 3-12 times.

The L leg is done in the same manner. First eyes are closed, head and neck is turned toward L shoulder, and eyes L and down while doing L knee flexion and extension movements. This is followed by eyes are closed, head and neck turned to R shoulder, and eyes L and up while doing L knee flexion and extension movements.

KEY POINTS TO REMEMBER FOR FRONTAL/ TRANSVERSE PLANE MOTION:

•ALIGNMENT AND POSTURE IS IMPORTANT TO A SUCCESSFUL OUTCOME.

•EYES ARE CLOSED AND LOOK OUT TO THE SAME SIDE AS KNEE FLEXION AND EXTENSION MOVEMENT.

•HEAD AND NECK IS TURNED TOWARD THE SAME SIDE AS KNEE FLEXION AND EXTENSION MOVEMENT WITH EYES LOOKING DOWN.

•HEAD AND NECK IS TURNED TOWARD OPPOSITE SIDE OF KNEE FLEXION AND EXTENSION MOVEMENT WITH EYES LOOKING UP.

6) SAGITTAL/TRANSVERSE PLANE MOTION:

Involves turning the head and neck as well as inversion and eversion of the foot with eyes closed. Keeping chin parallel with the floor, have the client turn their head and neck toward the R shoulder and move eyes out to the L and down. Turn R foot outward (eversion) away from midline of body. With the MRD active-assist arm, have the client flex their R knee back to where first experiencing dysfunctional pain and/or stretch and hold. Initially hold for 5 seconds gradually increasing to a maximum of 30 seconds.

Now, have the client extend or straighten the R knee to where first experiencing dysfunctional pain and/or stretch is experienced and hold. Hold initially for 5 seconds gradually increasing to a maximum of 30 seconds. Relax head and neck rotation R, eyes L and down, R knee, and R foot. Repeat 3-12 times.

Keeping eyes closed and chin parallel with the floor, turn head and neck toward the L shoulder and move eyes out to the L and up. Turn R foot inward (inversion) toward the midline of body. With the MRD active-assist arm, have the client flex their R knee back to where first experiencing dysfunctional pain and/or stretch and hold. Hold initially for a 5 seconds gradually increasing to a maximum of 30 seconds.

Now, have the client extend or straighten the R knee up to where experiencing dysfunctional pain and/or stretch is first experienced and hold. Initially hold for a count of 5 seconds and gradually increase to a maximum of 30 seconds. Relax head and neck rotation L, eyes L and up, R knee, and R foot. Repeat 3-12 times.

The L leg is done in the same manner. First eyes are closed, head and neck is turned toward L shoulder, and eyes look out to the R and down while doing L knee flexion and extension movements. This is followed by eyes are closed, head and neck turned toward R shoulder, and eyes look out to the R and up while doing L knee flexion and extension movements.

KEY POINTS TO REMEMBER SAGITTAL/TRANSVERSE PLANE MOTION:
•ALIGNMENT AND POSTURE IS IMPORTANT TO A SUCCESSFUL OUTCOME.
•EYES ARE CLOSED AND MOVE OUT TO THE OPPOSITE SIDE OF EXTREMITY MOVING.
•WITH FOOT EVERSION AND KNEE FLEXION AND EXTENSION MOVEMENTS, NECK ROTATION IS TOWARD THE SAME SIDE AS EXTREMITY MOVING WITH EYES DOWN.
•WITH FOOT INVERSION AND KNEE FLEXION AND EXTENSION MOVEMENTS, NECK ROTATION IS TO THE OPPOSITE SIDE AS EXTREMITY MOVING AND EYES UP.