

MOM'S BOOT CAMP

By Peggy Stirling, CALA Certified, Author of *Catalogue of Arthritis Exercises and Multiple Sclerosis Supplement*. (Story submitted July 21, 2005)

On May 4, 2005, my 82-year-old mother had a total knee replacement. For the last couple of years, due to osteoarthritis, her range of motion has been quite restricted, and her mobility poor. Mother moved to Halifax (from Newfoundland) a number of years ago, after my father passed away. She did this to be near me, her only daughter. As with many people helping to care for an aging parent, the role reversal has become more and more evident. It is important (for both of us) that Mom be as mobile and independent as possible. To help her achieve this, I have 'hopped out' of retirement and back into the pool on a regular basis, directing an aquatic rehab program that will help Mother improve her mobility, independence, and quality of life. Here is our story, including the techniques we have used in the pool to enhance her recovery from knee replacement surgery. I hope these ideas will be useful to those of you who are designing aquatic programs of a similar nature.



Mother's recovery has been slow and painful. Normally, post surgery, the knee should be able to extend to 180°. After 6 weeks of physiotherapy at the hospital, she still could not get the desired full range of motion (I believe that the most she was able to achieve was about 150°-160° of extension). No further progress was apparent, and Mom was discharged from the hospital physiotherapy program. She could not walk unassisted or fully load bear. I was quite concerned thinking that this was as good as she was ever going to get. She was actually in worse shape than before her surgery! What to do?

A couple of times during the first 6 weeks after surgery, I was able to convince Mother to come into the pool and just walk in the water. She was not keen on this, because she was still in a lot of pain and found it quite exhausting. She is very fortunate to live in a condominium where there is a beautiful pool that is kept at about 86°F. Access to this pool is somewhat challenging to someone using a walker, as there is a set of stairs leading from the locker room to the pool deck. Fortunately, each day she goes to the pool, the entry process becomes a little easier.

Having had both of my hips replaced, I know the benefits of aquatic post-rehabilitation! I was determined that I would help Mom progress in her recovery. We decided that without fail, she would go into the pool at least twice a week. Mother also performed her home routine of exercises, 3 times a day. Mother had an appointment to see her surgeon August 2, but the physiotherapist agreed to see her again about two weeks after discharge from the hospital program, to make sure she hadn't lost any of the range of motion she had achieved up to that point. Following our training routine for a number of weeks, it was discovered that Mom's ability to straighten her knee had improved by 3°. Finally we were starting to get positive results! Even her attitude was noticeably improved, and she now looks forward to our pool sessions.

Following is an outline of our training routine called, "Mom's Boot Camp". Included are details of aquatic exercise techniques; important things to look for, and suggested corrections for common difficulties that might be encountered in a similar situation.



Specific Goals of the Pool Training Sessions:

1. Range of Motion:

One of our main goals has been the achievement of a full 180° of knee extension. Therefore, our pool activities focus on exercises that will lengthen the knee flexors (hamstrings, gastrocnemius) as well as the shortened ligaments and tendons around the knee joint. It is, of course, important to strengthen the knee extensors (quadriceps) and all the connective tissues that stabilize the knee.

2. Gait Training:

Because the knee is unable to fully extend, Mother has great difficulty generating the proper “heel-strike, roll-through” of a normal walking stride. Her ability to load bear is also minimal, shortening her stride and affecting her gait considerably. To help her normalize walking on land, each pool session starts off with a routine of water walking moves. Careful observation and correction is necessary to help her achieve better walking technique and work toward correct biomechanics.

3. Alignment Essentials:

Painful, dysfunctional movement affects all support structures in the body. With the assistance of buoyancy, Mother is able to stand tall, shoulders back, chin tucked in, abdominal muscles activated, and breathe normally.

Due to the pool characteristics and water depth, the area available for walking is only about 12 feet (3 meters) wide. Therefore, Mother does 10 laps while performing each of the following exercises:

(i) Forward walking. Cues:

- Focus on striking down with the heel first and rolling off the ball of the foot.
- Maintain proper postural alignment and an even, symmetrical stride in order to load bear equally on the affected and unaffected side.
- Try to eliminate any evidence of a ‘limping’ gait. This trains the body to accept a more normal load on each side. It helps to eliminate the alignment habits learned with a limp. On land, Mother was limping badly but in chest-deep water, the load on her legs is dramatically decreased, and her gait is more normal. Eventually we hope that the limp will subside on land too.
- Gradually increase the length of each stride. This will help increase range of motion at the knee. Specifically, a long stride will provide a greater stretch to the hamstrings, and gastrocnemius muscles (during heel strike), and will lengthen hip flexors (during full hip exten-

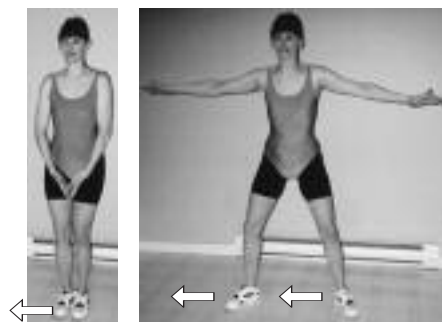
sion) just before the push off of the back foot. For the first couple of weeks we didn’t focus too much on the arm movement. Using breast stroke arms at first increases stability and buoyancy. This helps increase confidence and reduce the load on the knee. We have now progressed to a normal flexion and extension of the shoulder joints (normal reciprocal ‘walking’ arm actions where the right arm swings forward with the left leg; the left arm swings forward with the right leg).

(ii) Reverse walking. Cues:

- While walking backward, focus on placing toe / ball / heel down completely and purposefully (Mom had a tendency to just place the toes down and keep the knees bent in a semi-squat position as she hobbled backwards).
- Stand tall and reach back with each leg as far as comfortably possible. This exercise is important to stretch the quadriceps, hip flexors and gastrocnemius muscles, as well as strengthen the gluteals and hamstrings.
- Start with reverse breast stroke arms, then progress to reciprocal shoulder flexion and extension. Balance and proprioception are challenged with reverse walking.

(iii) Side steps. Cues:

- Maintain proper alignment while performing a step-together-step-together in the frontal / coronal plane. Adductor and abductor muscles of the thigh are alternately activated and elongated, improving strength and range of motion around the hip. Core musculature is challenged by lateral forces on the trunk.
- Gently scull hands/arms to assist maintenance of balance to start.
- To progress, add a balance challenge by placing hands on hips.
- To progress, add a slight squat. This creates a gentle, healthy challenge for the knees. Note: This move didn’t pose much of a problem for Mother, however I felt that she still needed to continue strengthening the inner and outer thighs to help support the knee structure. Unfortunately the depth of the water prevents her from bending the knees as far as we would like. Shallower water would provide more of a gravitational challenge.

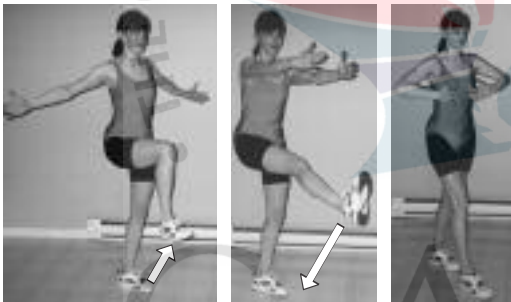


Side Step

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(iv) Stork step. Cues:

- Lift knee up to hip level, extend the knee with the leg raised. With the foot dorsi-flexed, step forward into a heel-strike-roll-through and repeat the step with the other leg. The support phase challenges the stabilizers of the standing leg, hip and torso. The lifted leg is being bent at the knee, encouraging normal range of motion in that knee joint. Extending the knee with the leg raised stretches the hamstrings, while it strengthens the quadriceps and hip flexors. Making sure that the foot is dorsiflexed stretches the Achilles' tendon and gastrocnemius / soleus, while it strengthens the dorsi-flexors (tibialis anterior, extensor digitorum longus).
- Focus on contacting the floor with the heel while the knee is almost completely straight on each step. This stride pattern encourages healthy range of motion in all joints involved in the kinetic chain.
- Challenge the walker to focus on each separate phase of the movement in order to improve technique and increase awareness of each aspect of the movement. (Mom was just lifting her leg at the hip with minimal knee action. By slowing it down and focusing on each phase she was also challenging her balance.)



Stork Step

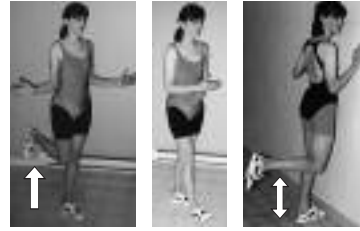
(v) Hamstring curl walk. Cues:

Note: The flexed knee must remain pointing straight down as the hamstring curl occurs at the beginning of each stride. This is a challenge to instruct. The tendency is to flex the hip as the knee bends. This may be due to tight hip flexors and quadriceps, or just because it is unusual to walk this way).

The following cueing sequence helped Mother understand the movement better:

- Bring the heel up towards the gluteals and then return it straight down to the pool bottom.
- Maintain dorsiflexion of the foot as much as possible and scuff the heel gently on the pool floor as the leg swings forward.
- Keep the knee nearly straight on the swing-through phase.
- Perform the usual heel-strike-roll-through, and transfer the weight to the moving leg.

- Repeat the process with the other leg: hamstring curl; heel scuffs the floor as the moving leg swings through; heel-strike-roll-through during weight transfer to the forward leg.

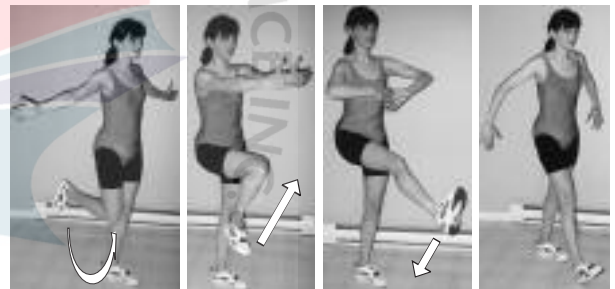


Hamstring Curl

(vi) Hurdler step. Cues:

This move combines the stork step and the hamstring curl. Keep the movement slow and focus on each phase of the step in order to challenge proprioception and balance as well as the muscles involved.

- Begin the movement with a hamstring curl (knee straight down, no hip flexion).
- Maintain the knee flexion and swing that flexed knee down and up to the front into knee and hip flexion. Perform the stork step from there.
- Remind the walker to keep the foot dorsi-flexed in order to stretch the tight muscles on the back of the leg.

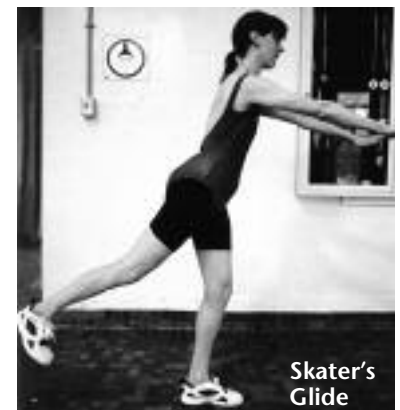


Hurdler Step

(vii) Skater's glide. Cues:

This move provides another opportunity to extend the knee and strengthen hip extensors.

- Slowly and alternately extend the hip and reach the heel backward in a skating action. The knee joint is fully extended (activating quadriceps) as the gluteals and hamstrings extend the hip joint. An added benefit is that hip flexors are stretched and torso stabilizers strengthened. These benefits have helped Mother to stand taller and not be constantly leaning forward when doing some of her other moves.



Skater's Glide

Although there are several other water walking moves to choose from, the ones outlined here have been the most effective for this situation. We have not used walking patterns where one leg crosses in front of the other. This might place too much stress on weakened structures within the knee. In the months ahead, as Mother's strength improves, we will begin to explore more walking options.

Following, are a variety of moves designed to increase range of motion and strength of the knee joint. These exercises were done while using the pool wall for stabilization:

- (i) Toe taps: to stretch the calf while strengthening shin muscles. At first Mom found this move to be nearly impossible with the heel planted on the pool bottom. We modified the movement by having her lift the foot off the pool bottom as she performed dorsi and plantar flexion of the ankle joint. After several attempts she finally progressed to doing the toe taps with the heel planted.
- (ii) Repeater knee 'flexions' (narrow quad kicks): these were done with the knee at hip level to strengthen knee extensors and lengthen hamstrings. Keeping the foot dorsi flexed provides further strengthening of the foreleg as in toe taps above.
- (iii) Repeater hamstring curls: keep the front of the torso against the wall to prevent hip flexion during the movement. After each curl, bring the heel down to the pool bottom, lengthening the hamstrings and working the quadriceps on knee extension phase.
- (iv) Heel press: while maintaining excellent postural alignment, flex, then extend the hip and knee in the sagittal plane. Concentrate on full knee extension on the end of each movement.



- (v) Repeater pendulum: thigh abductor and adductors, torso musculature, lateral and medial muscles of the foreleg are all challenged and strengthened in this move.
- (vi) Hip kick: hip flexors are strengthened during the 'up' phase; hamstrings and gluteus maximus are strengthened during hip extension. Torso stabilizers are challenged by the action of long leg levers.
- (vii) Karate kick: each phase of this move helps improve coordination and should be done slowly and carefully

Karate Kick



Normally in situations with joint replacements most pool programs start off in the deep water so that there is no load on the joints. When Mother started in the water I needed her to focus on walking techniques to work on supporting her body weight and straightening the knee joint. After a few weeks we did add a deep water component to the sessions for variety.

Deep Water Movements:

- Narrow bicycle
- Narrow tuck
- Cross country ski
- Tuck ski

We finish off each session with 10 minutes in the hot tub stretching all the muscles and joints that have been worked. The session in the hot tub is Mother's reward for a job well done.

Mom is still using a walker, but has recently started using a cane for short distances. I don't know how long it will take before she is able to function normally without any sort of assisting device, if ever. However, we will persevere. We are all getting older, and at Mother's age, a full, prompt recovery is not likely. I have to prepare myself that each day brings her closer to a point where she will become totally dependant on me or someone to care for her. However, I hope our exercise program will help make her remaining years as full and comfortable as possible.

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