

Lower Extremity Functional Progression

Back to tumbling and "stuck" landings after an injury

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When gymnasts injure their backs or lower extremities, they usually are placed on a rehabilitation program to improve the strength, flexibility, and proprioception of the injured area. Once the area is considered "healed," they are told to gradually return to gymnastics. Most health care providers do not fully understand the sport of gymnastics and cannot provide them with a safe progression back to the sport. For example, there are many "throwing progressions" for athletes that throw objects: baseball, football, shot put, discus, etc. Furthermore, programs for running, swimming, golfing and other athletic events have been developed. Unfortunately, there is a void in the literature on progressions for the injured gymnast.

The following program has been developed to provide gymnasts with a generalized program to return them to gymnastics. It is a gradual progression of closed chain dynamic loading forces. The gymnast is subjected to a gradual increase of forces to her lower extremity. It gives the athlete a means to progress from being able to jog pain free to landing tucked saltos. The forces associated with landing from gymnastics skills are high. The landing from a back tuck salto ranges from 8 to 10 times the gymnast's body weight. A 100 pound gymnast places 800-1000 pounds of force through her lower extremity with every back tuck salto landing!⁽²⁾ These forces can obviously add up quickly with multiple repetitions.

This program can also be used for improving gymnast's lower extremity alignment for jumping and landing. It is important that proper lower extremity alignment be maintained for these drills. This will help enhance the gymnast's power for "punching" the floor, absorb the force of landings safely, improve overall form, and protect her from injuries associated with poor alignment.

First the gymnast should be placed on strengthening and flexibility exercises for the involved area (i.e. ankle, knee, hip, or back). She should also be placed on a static proprioception training exercise progression (see the section "lower extremity static proprioception training"). Once the gymnast is able to jog pain-free, in addition to the static progression, she should be placed on a dynamic proprioception training exercise progression (see the section "lower extremity dynamic proprioception training"). Furthermore, once they are able to jog pain-free, they should also start the following jump and landing progression.

JUMP AND LANDING PROGRESSION

Perform 3 sets of 10 jumps. Progress in numerical order (i.e. Start 1a and 1b at the same time. Progress to 2a once 1a is pain free and to 3b once 2b is pain free. Continue through to number 8). Make sure the athlete maintains good body alignment while executing the jumps. The patella should stay in proper alignment between the 1st and 2nd toes when the knee flexes (see fig. #1). They should push through the feet and toes when jumping (see fig. #2 and fig. #3). They should also maintain good trunk posture by contracting their

abdominal and gluteal muscles. Progress only if the exercises are pain free. If the exercises cause increased pain and/or swelling, then back down a level or stop the exercises altogether until the injury is re-evaluated. Use a firm surface to jump upon. Panel mats work well. Soft cushion mats are not appropriate for this type of training. Jumps should be performed forwards and backwards to simulate both front and back tumbling.

JUMP AND LANDING PROGRESSION

When squatting and landing, the knee cap (patella) should align with the space between the first and second toe.



Fig.1.

When jumping, the gymnast should push through the toes while maintaining proper alignment as shown in part A. The knee cap (patella) should align with the space between the first and second toe. Part B shows improper alignment which is associated with pronation of the foot and improper foot "turn out."

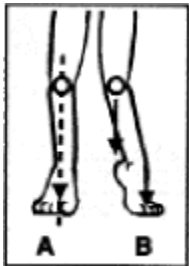
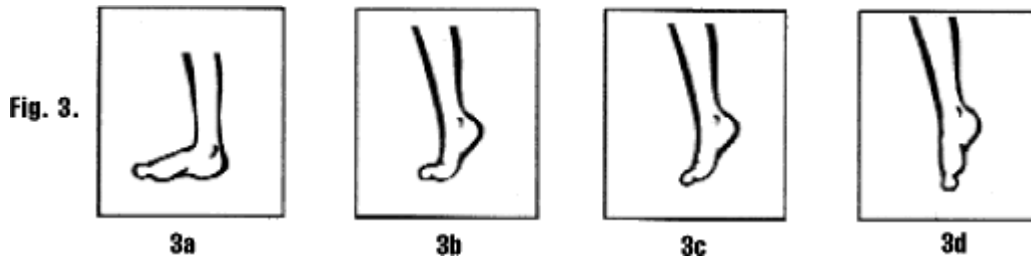


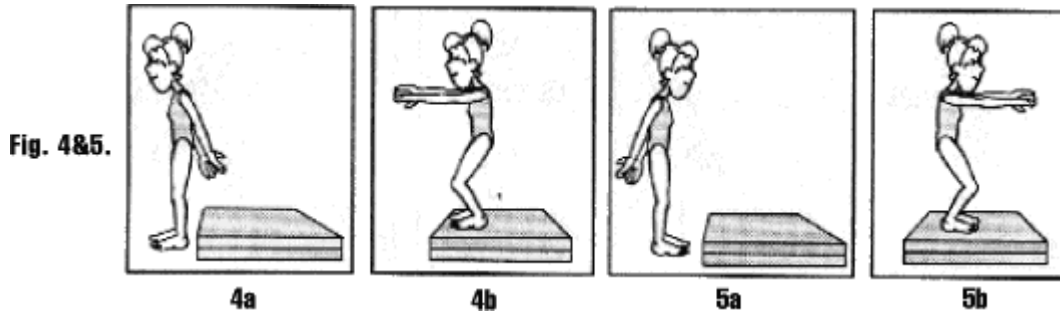
Fig. 2.

THE PROGRAM

These illustrations show how the gymnast should progress from foot flat on the floor to pushing all the way through the toes as she jumps off the floor. As she leaves the floor, her feet should be fully pointed.



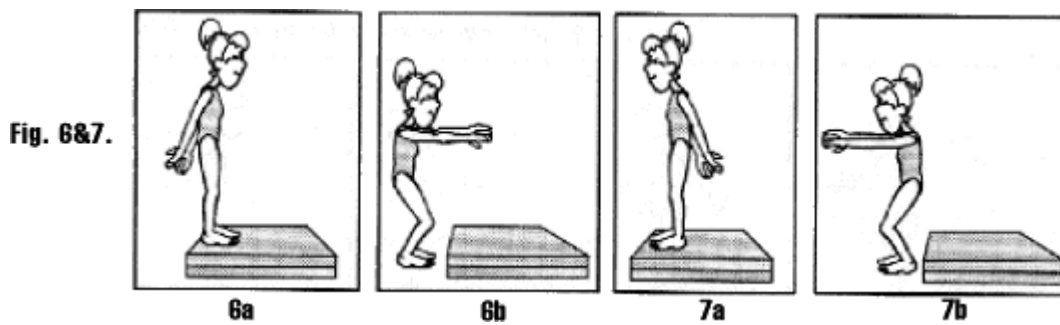
1a. 6-8 inch jump up 2 legged (see figures 4 & 5 below)



1b. start cartwheels, front walk overs, back walk overs on the floor exercise carpet

2a. 12-14 inch jump up 2 legged (same as figs. 4a-b & 5a-b except the mat level has increased)

2b. 6-8 inch jump down 2 legged (see figures 6 & 7 below)

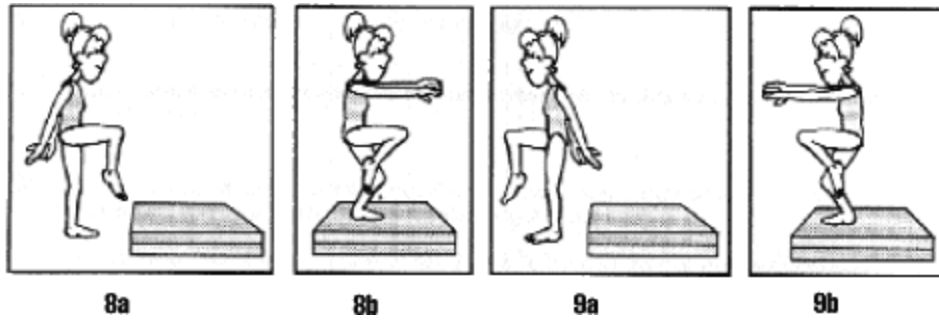


3a. 18-20 inch jump up 2 legged (same as figs. 4a-b & 5a-b except the mat level has increased)

3b. 12-14 inch jump down 2 legged (same as figs. 6a-b & 7a-b except the mat level has increased)

3c. 6-8 inch jump up 1 legged (see figures 8 & 9 below)

Fig. 8&9.



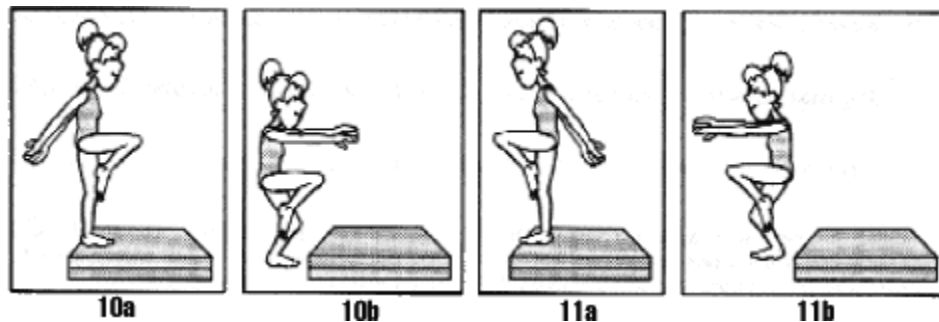
3d. start leaps and jumps in place on the tumble tramp and start basic jump rope drills on the tumble tramp

4a. 24 inch jump up 2 legged (same as figs. 4a-b & 5a-b except the mat level has increased)

4b. 18-20 inch jump down 2 legged (same as figs. 6a-b & 7a-b except the mat level has increased)

4c. 6-8 inch jump down 1 legged (see figures 10 & 11 below)

Fig. 10&11.



4d. (OPTIONAL) Start Plyometrics-begin with low intensity hops (i.e. squat jumps, rope jumping, skipping, etc.)

4e. Start round offs, front handsprings with 2 foot landings and back handsprings with 2 foot landings on the tumble tramp

5a. 24 inch jump down 2 legged (same as figs. 6a-b & 7a-b except the mat level has increased)

5b. 12 inch jump up 1 legged (same as figs. 8a-b, & 9a-b except the mat level has increased)

5c. (OPTIONAL) Advance plyometrics to medium intensity (Double leg tuck jumps, alternate leg bounds, double leg quick response hops for distance and for height, etc.)

5d. Start individual skills on the floor exercise carpet: round-offs, back handspring step-outs, and front handspring step-outs

5e. Start combinations on the tumble tramp: Round-off back handspring step-out, front

handspring step-out round-off, and back handspring back handspring step-out

6a. 36 inch jump down 2 legged (same as figs. 6a-b & 7a-b except the mat level has increased)

6b. 12 inch jump down 1 legged (same as figs 10a-b & 11a-b except the mat level has increased)

6c. 18 inch jump up 1 legged (forward only, same as figs 8a-b)

6d. Start combinations on the floor exercise carpet: Round-off back handspring step-out, front handspring step-out round-off, back handspring back handspring step-out, and front handspring 2 foot landing

6e. On the tumble tramp, start increasing force of tumbling combinations and practicing the "rebound" for the final skill to be added in the series: Round-off back handspring rebound and/or round-off back handspring back handspring rebound, and front handspring (two foot landing) front handspring step-out

7a. 48 inch jump down 2 legged (same as figs. 6a-b & 7a-b except the mat level has increased)

7b. 18 inch jump down 1 legged (same as figs 10a-b & 11a-b except the mat level has increased)

7c. On the floor exercise carpet, start increasing force of tumbling combinations and practicing the "rebound" for the final skill to be added in the series: Round-off back handspring rebound and/or round-off back handspring back handspring rebound, and front handspring (two foot landing) front handspring step-out

8a. Start back and front tucked saltos and then progress back to full tumbling in a logical order once the tucks are pain free and have good form. Based upon the location of the injury and the direction the gymnast twists, certain skills may be more stressful to the injured area than others. A good biomechanical evaluation of the skills and the injury may help to customize a safe and effective progression with the tumbling skills.

8b. (OPTIONAL) Advance to high intensity plyometrics: single leg speed hops, depth jumps, box jumps, etc.

LOWER EXTREMITY PROPRIOCEPTIVE EXERCISES

The sports medicine literature explains that muscle weakness plays a minor role in chronic ankle instability in relationship to the major role proprioception plays, yet, most rehabilitation programs emphasize strength training of the ankle. ^(1, 3) This is especially true in most gymnastics clubs. In general, coaches will instruct their gymnasts on proper rubber tubing exercises to strengthen the ankles. However, very few coaches will remember to have the gymnast perform any proprioception training.

Proprioception is defined as "a specialized variation of the sensory modality of touch that encompasses the sensations of joint movement (kinesthesia) and joint position (joint

position sense)" ⁽³⁾. The actual joint and muscle neural receptors involved in this process are quite complex and we will not attempt to explain it here. For now, think of proprioception training as balance training. Whenever a gymnast injures a joint and the structures around the joint, her proprioception may be compromised. What this means to you as her coach is her ability to balance effectively is decreased. Thus, not only will this increase her chance of reinjury but also will adversely affect her performance.

Fortunately, the body is able to enhance its proprioception when trained properly. Even though the exercises listed here are primarily meant for the ankle, they are actually beneficial for any weight bearing joint (i.e. ankle, knee, hip, and spine). The extra bonus here is that even if the gymnast has never injured herself, this type of training may still improve her ability to balance. For upper extremity proprioception training, see the upper extremity rehabilitation section of this book.

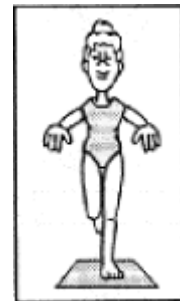
Listed below is a progression of proprioception training exercises. They are listed in order of difficulty. Please understand, these exercises are not meant to substitute for proper medical care performed under the supervision of a health care professional. Use these exercises with caution. If started too early in the rehabilitation process, further injury may occur due to the unsteady nature of these drills. Do not start this exercise progression until the gymnast can walk pain-free.

The first set of drills are considered to be static, since the gymnast's feet should not leave the surface of the floor. This exercise progression is the first to be performed in the proprioception phase of the gymnast's rehabilitation process. Since the feet do not leave the ground, it is safer than the dynamic drill progression. The dynamic drills are labeled in this fashion since the gymnast's feet will leave contact with the floor. These drills are more dangerous, since they will stress the lower extremity much more than the static drills.

STATIC DRILLS

ONE FOOT BALANCE

Once the gymnast can walk pain-free, the static drills may be started. Begin with 1 foot balances with the eyes open. I recommend that this exercise be performed for at least 5 minutes per ankle 1-3 times per day. Once the gymnast can hold her balance for 1 minute, she should attempt this drill with her eyes closed. The tubing kicks can also be started at this point.



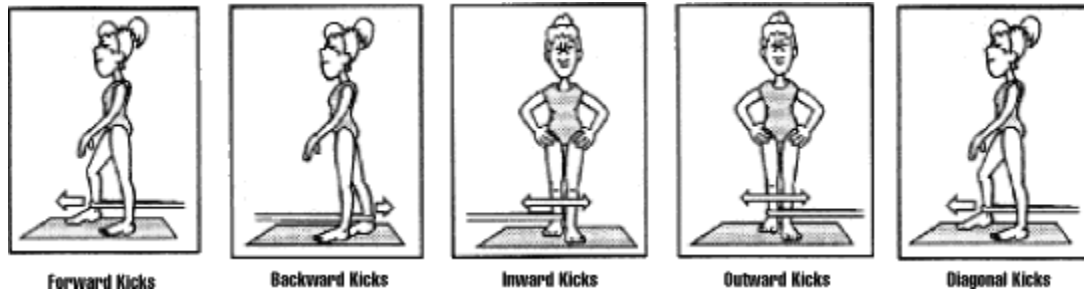
One Foot Balance

Balance yourself on one foot. Start with your eyes open. Your goal is to maintain your balance for 1 minute. Progress to balancing with your eyes closed.

TUBING KICKS

Tubing kicks are meant to increase the difficulty of balancing on one foot. It is recommended that the gymnast start with only 1 set of 10 reps in each direction and progress up to 2 sets of 50 reps in each direction ⁽⁵⁾. Start with a tubing that offers light resistance and increase the resistance of the tubing as the gymnast improves. Eyes should remain open at first. Once she is able to perform 1 set of 25 reps in each direction, have her attempt the drill with her eyes closed.

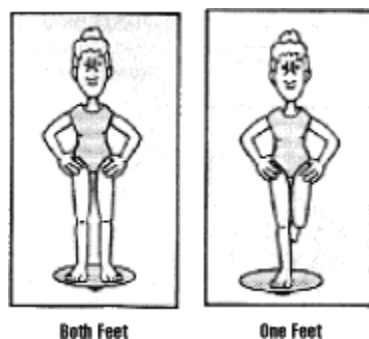
Stand on the injured leg with the knee just slightly bent. Attach tubing around the uninjured leg and bend at the knee enough so that the foot is off the ground. Kick the uninjured leg in the directions shown. The kicks should be quick and short (oscillations). Attempt with eyes open but progress to having eyes closed.



WOBBLE BOARD BALANCE (BOTH FEET)

Wobble board balances with 2 feet and eyes opened are started once the gymnast is performing the tubing kicks with her eyes closed. Practice the wobble board balances for at least 5 minutes per session with 1-3 sessions occurring each day. Once she is able to hold her balance for 1 minute with her eyes open, she can perform the drill with her eyes closed. It is not uncommon for gymnasts to have difficulty with balancing on a wobble board with their eyes closed for more than 30 seconds. However, I would like for them to continue to try until they can hold their balance for 1 minute.

Stand on a wobble board with both feet. Feet should be approximately shoulder width apart. Attempt to balance with eyes open. The goal is to maintain balance for 1 minute. Next, attempt to balance with eyes closed.



WOBBLE BOARD BALANCE (ONE FOOT)

Single leg wobble board balances are started once the gymnast can balance with 2 feet and the eyes closed for 30 seconds. Of course the gymnast should start with her eyes open and progress to having her eyes closed as she improves her balance. Once again the goal is to be able to balance for 1 minute. Practice time per session is the same as with balancing using both feet.

Stand on a wobble board with one foot placed on the center of the board. Attempt to balance with eyes open. The goal is to maintain balance for 1 minute. Next, attempt to balance with

eyes closed.

DYNAMIC DRILLS

The dynamic drills are instituted once the gymnast can jog pain-free. The key to performing these drills correctly is to regain balance between each hop. This is not a plyometric drill. The gymnast should hop, regain her balance fully, then hop again. She should not hop quickly. The first of these drills is the single leg rebounds.⁽⁴⁾ The gymnast should carefully hop in place. She should perform 3 sets of 10 hops. Once the gymnast can perform 3 sets of 10 hops well with the eyes open, she should then start over again with eyes closed.

SINGLE LEG HOPS

Hop in place on the injured leg. The hops should only be 6 to 8 inches high. Try to maintain good form. Keep the knee cap (patella) centered between the 1st and 2nd toe. Hop at first with eyes open. Once it becomes easy to perform with the eyes open, then attempt this drill with your closed.

SQUARE HOPS FORWARD AND BACKWARD

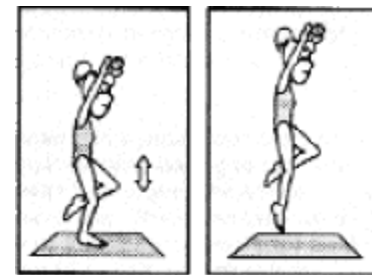
The square hops forward and back are started once the gymnast can hop in place with open eyes. The same progression is used with this drill as was explained above for the single leg rebounds. Of course, the eyes should remain open at first.

Tape a square on the spring floor or on panel mats. The sides should be 12 inches long. Place your toes on the back line of the square. While maintaining your hands on your hips, hop forward so that your toes are now touching the front line. Then hop back to your original position and repeat. Start with eyes open then progress to hopping with your eyes closed.

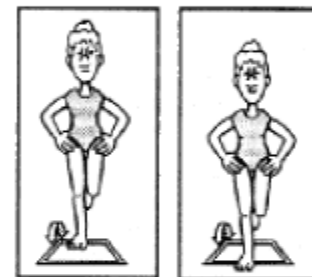
SQUARE HOPS SIDE TO SIDE

Square hops side to side places more stress to the structures in the ankle and knee than the forward and backward hops. This motion may actually be very similar to the action which injured the gymnast. Therefore, this drill is to be approached with caution. However, it is very important that the gymnast perform this task. It will help progress the gymnast safely back to more uncertain landings that will occur as she returns to full practice. The progression for this exercise is the same as described above for the single leg rebounds. Once again the eyes are to remain open at first.

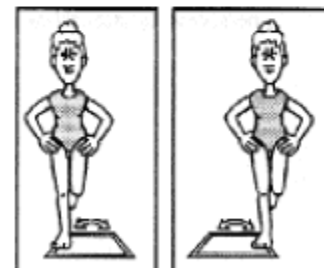
Tape a square on the spring floor or on panel mats. The sides should be 12 inches long. Place the foot on the right



Single Leg Hops



Square hops Forward & Backward



Square hops Side to Side



side line of the square. While maintaining hands on hips, hop sideways to the left side line. Then hop back to the right side and repeat. Start with eyes open then progress to hopping with eyes closed.

FIVE POINT STAR

The final phase in this process is the 5 point star drill. The gymnast must be able to hop forward, backward, sideways, and diagonally to accomplish this drill. This task is started once the gymnast is able to hop from side to side with her eyes closed. She should start by attempting one consecutive star pattern and progress up to 5 consecutive star patterns in a row. This drill is also to be attempted with the eyes closed while someone helps to direct the gymnast and give her verbal feedback on her attempts.

Tape a five point star on the floor. The length of each line should be 18 to 24 inches long. Stand on one leg and hop to each point of the star in the direction of the arrows. The body should always be facing forwards. Therefore, the gymnast will be hopping forward, side to side, backward, and on a diagonal. Start with eyes open then progress to hopping with eyes closed.

I also recommend that proprioception training be incorporated into your daily practice schedule as part of your injury prevention program. Gymnasts can balance on one foot while waiting in lines. Balancing on one foot on a balance beam is a good basic exercise. This can be advanced to balancing in a half releve position and then up to a full releve holding in the demi point position. (Don't let them sickle their feet!) Add some variety to their injury prevention program and select different drills for them to do at different events and/or change the drills periodically throughout the season.

Credits

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