

## **Boot Problems and Boot Solutions** **by Linda Tremain, PT, ATC/L**

It has become evident that even the best skaters in the world can't compete without proper equipment. Now everyone is aware of the boot and blade related issues that plague the figure skating industry.

The problem has become so apparent that U.S. Figure Skating has developed a subcommittee that is responsible for identifying the problems, educating the industry from manufacturer to skater, and helping a select number of companies to develop new products targeting these long standing issues.

This series of two articles will report the findings and efforts to date of the U.S. Figure Skating Boot and Blades Subcommittee. Part One focuses on skating injuries and boot-related problems. Part Two will discuss product selection, solutions and product development, and how to prepare for the "new and improved" boots. We're excited to give you a glimpse of what is coming in the industry.

### **Injuries**

Although there are many types of figure skating injuries, let's take a look at those related to the rigors of daily training as opposed to those related to falls on the ice. [Note: All research cited in this article was performed independently by Linda Tremain, PT, ATC, and Carrie Katz, DPT, at the Olympic Skating Center in Lake Placid, N.Y., in 2002.]

The most common injury is to the low back with up to 34 percent of skaters currently experiencing pain. Up to 26 percent of the skaters experienced alignment and tracking problems of the kneecap (patella). Hip/groin pain and ankle sprains were each found in 23 percent of those surveyed. Various types of tendonitis in the foot and ankle were encountered at some point in their training by approximately 20 percent of individuals. Eighteen percent of skaters experienced numbness and tingling as a result of lacing too tight and therefore traumatizing the nerves supplying the foot, while 6 percent had experienced a stress fracture at one time in their career.

Deformities of the foot deserve special attention because they are common, in fact, too common in figure skaters. The most frequent finding is a bunion, or angulated big toe, noted in up to 57 percent of skaters. The navicular bone in the arch of the foot was enlarged 31 percent of the time.

These two injuries are likely related to improper fit or an uncorrected pronation problem of the boot/blade or foot. Pump bumps, or lumps on the back of the heel, are found in 49 percent of skaters as a result of heel slippage. Friction occurs when a boot or shoe is too wide in the heel for your foot type.

Hammer toes (gnarled and calloused on the top) also result from heel slippage and are found in 18 percent of skaters. The toes curl in attempt to hold the shoe or skate on the foot. Also related to excess motion and/or insufficient punching of the boot, ankle bursitis is found in 6 percent of skaters. Skin irritation and lace bite is found 14 percent of the time and can be related to stiff boots, poor fit, or simply lacing too tight.

Most of these injuries are directly related to poor boot fit and faulty alignment of the skate or skater. Look for some solutions to these problems in both parts of this series.

### **Problems**

Because these injuries can be a result of multiple factors, it is often difficult to pinpoint the exact cause. When we take a look at the common problems found in figure skating boots, we get a better understanding of the injuries and how boots might contribute to injury rates.

Boots that are proportionately too heavy for the skater can impact performance as well as contribute to injury. Do you know how heavy your boots are compared to your body weight? Weigh both boots. Weigh yourself. Take your boot weight and divide it by your body weight. Multiply times 100. This is your ratio of skate weight to body weight. The average skate weight to skater weight is 5 percent. Ratios more than 5 percent appear unnecessary and may contribute to an increased rate of injury. For example, practicing spirals with a lighter boot would be less stressful on the muscles of the low back.

Compared to other sports, ice is the hardest landing surface and it has virtually no shock absorption. Therefore, the joints in the foot, ankle, knee, hip and back must do all the work to absorb the shock upon impact.

As figure skating boots are designed today they decrease the ability of the foot and ankle to bend. That means that a skater's foot and ankle are not able to absorb the shock as they should. Instead, the additional forces are transferred to the knee, hip, and back and can lead to unnecessary strain and load on these joints.

So, the bendability of the ankle in and out of the skate is very important. Do you know your bendability score?

Here is how you measure bendability. Without skates, put your toes behind a line. Bend your knees over your toes as far as possible without lifting your heels. Have someone measure how far your knees move beyond your toes. Repeat the test in skates with the tip of your blade behind the same line. Once again, be careful not to lift the heels.

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If your bendability score is poor or fair without skates, start stretching your calves daily! But the real question is did you bend more or less in skates? The goal is to be able to bend equally well or better in skates than out of skates within one or two months of wear. If you bend less, your boots could be too stiff.

### Good Boots and Boot Defects

Boot defects are an unfortunate but normal part of making a mostly handmade product. Boot manufacturers have been made aware of the problem within the industry, but quality control varies from company to company. Boot defects have been found in up to 20 percent of boots manufactured.

So how do you know if you have a good boot? Carefully examine the boot before purchase. Place it on a level surface and look from the back to see if appears vertical. Ignore the seam as it is often not in the center. Look to see if it equal amounts of the boot fall on either side of an imaginary center line. Make sure that the boot is sitting squarely on top of the heel and is not crooked. Determine whether the sole of the boot is level on the bottom and in contact with the flat surface.

Minor irregularities can be leveled before the blade is secured by your mounting professional. Always make sure to select the straightest pair of boots that you can, and return any custom boots with faulty alignment before mounting the blade.

Boot fit problems have been encountered by virtually every skater. Many of the foot deformities outlined above are a direct result of poor fit. Knowing your foot size, structure and past problems is the best place to start.

Resist the temptation to buy a size larger to accommodate for growth. Next, make sure you know the width of your forefoot and your heel. In fact, have this measured at the shoe store just to be sure. If you have a significant width discrepancy within your foot, then it would be best to get a semicustom skate to accommodate this difference. Heat molding is beneficial for managing minor lumps and bumps, but large deformities need to be addressed with custom skates.

Boot problems are not new to the industry. They have existed for years, frustrated many, and caused a tremendous amount of unnecessary injury. Fortunately, there are new solutions on the horizon for many of the issues addressed above.

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In November of 2003, the U.S. Figure Skating Boot and Blade Subcommittee met with the seven largest boot manufacturers in North America to discuss the future direction of figure skating boots. Key areas discussed were boot weight, defects, shock absorption and bendability. Although many of the specific details are top secret, we can give you a sneak peek into the future of figure skating.

### Possible Solutions to Problems

**Weight:** For years, boots have been made mostly of leather. Unfortunately, leather is a heavy material that absorbs water and therefore becomes even heavier with wear. To reduce boot weight, companies are starting to look at and incorporate new lighter materials. Thermoplastics seem to be one possible solution. Be prepared, these boots will look different. Although they might not be as sleek in design as a leather boot, they should be safer and have the potential to enhance performance.

**Boot Defects:** Up to 20 percent of boots have been found to be defective. It is hoped that the incidence of defects declines as manufacturers strive for a consistently reproducible product and as consumers become more educated. Manufacturers need to improve quality control at the factory level.

Smart consumers will learn to check the product themselves. Look from the back of the boot to see if roughly half the boot falls on each side of an imaginary center line and that the boot is mounted vertically in relationship to the heel. Make sure the bottom of the boot is level with a flat surface and the boot is vertical.

Carefully inspect each pair of boots thoroughly and send back any faulty products immediately. In my physical therapy practice, I often see skaters with pain and/or injuries that appear to be associated with boot defects. It is always frustrating to see young skaters in pain off the ice, and spending money on medical care for something that could have been prevented with careful inspection of every pair of new boots.

**Stiffness:** It is evident that boots have become too stiff over time. In the near future, you will see more flexible boots enter the market. Some will have mobile ankle joints and others might incorporate softer lighter materials with better capacity to bend. If your ankles are strong and flexible, you will find skating and jumping in these boots more similar to jumping on land.

Those dependent on boot stiffness to compensate for weak ankles are likely to have the greatest challenge when the new boots arrive. Plan ahead and begin an ankle strengthening and calf flexibility program now! See how to prepare for the new products at the end of this article.

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### Proper Boot Selection

**Brand:** Regardless of changes made within the industry, it is important for the skater to be able to select the best boot possible for them. No one brand is the best brand for everyone. Resist the urge to buy what everyone else is buying and select the best product for you. Since many skate shops represent only a few manufacturers, do not hesitate to try another store to get other opinions and to test different products.

**Stock Versus Custom:** Whenever possible, purchase stock boots. The advantage is that you can often try a number of pairs in the same size so you can select the ones that are defect-free and fit the best. If it isn't possible to wear stock boots, make sure that you are properly measured for the correct width and length of your foot for semi-custom or custom skates.

Remember, if you have any significant lumps and bumps on your feet, customs are the only way to go because heat molding can only do so much. Always make sure that your heel fits snugly in the back of the boot so that you don't get pump bumps or hammer toes. Presuming you place your heel all the way back in the boot before lacing, you should not be able to pump your heel up and down in the boot.

**Orthotics:** Custom foot orthotics are recommended for those with difficulty getting to an outside edge or with significant bunions, bursitis on the ankle bones, or navicular (bone in the arch) enlargement as these findings correlate with uncorrected pronation (flat foot) problems. Orthotics will fit easily into custom or stock boots if you work with an individual who is accustomed to making low-volume, narrow-cut, intrinsically posted orthotics.

To eliminate rocking in the skate, I am now recommending subortholene orthotics that allow a flexible accommodation to the pitch of the skates. If you need orthotics, work only with medical professionals with past experience fitting skating orthotics. Orthotic fabrication is, unfortunately, both an art and a science. Consult with other skaters and coaches to find a physical therapist, doctor or podiatrist in your area. While some may advocate hard orthotics, I find that something with more flexibility and shock absorption is a better choice for managing the harsh and repetitive impact encountered in figure skating.

**Weight:** Look at how the skate weight compares to the skater's weight, and try to keep this relationship below 5 percent (with blades) when possible. Going above this percentage could potentially increase your risk of injury and/or negatively impact your performance. For example: If you weigh 90 pounds, the combined total weight of your skates should not exceed 4.5 pounds.

**Stiffness:** Take your bendability score (from Part One) into consideration before selecting your next pair of boots. If you have six to 12 months wear in your current skates and still have poor to fair bendability (0–6 cm knee over toe) in skates, order your next pair with less stiffness and/or strength.

Resist the temptation to buy a certain stiffness based on the level of your jumps. It is better to use your bendability score as an indication of appropriateness of boot stiffness. If you discover that you are overbooted, most manufacturers will remove up to 20 percent of the boot strength to increase the bendability of your current skates.

Expect that you should need to replace your boots every six to 12 months. This is the industry standard and expected life of the product. Wear beyond this time indicates that the boots were too stiff and they may have potential for causing injury.

**Persistent Pressure Spots:** Remember that heat-moldable products can be remolded several times. If you are still having pressure problems, reheat and remold again. If pressure problems or redness persists, have the boots punched or stretched until the redness and pressure is relieved. There is no reason to let a small bump turn into a large bump. Take care of your pressure spots until they are resolved!

### Product Development

Change is around the corner. Riedell is in the concept design and development phase with the subcommittee to integrate new ideas and concepts into future product development.

Both Graf and Jackson are currently testing new products with some of the national-level novice and junior skaters. Testing will continue for several months before the boots are ready for mass manufacturing.

### Prepare for New Products

**Stretching:** In the meantime, make sure that your body is prepared for the increased ankle mobility of the new boots. If your bendability score out of boots is poor or fair, start stretching your calves daily. While stretching, make sure to keep your foot in a straight line and stretch with the leg straight and bent. If you feel pressure in the front of your ankle rather than in the calf, consult a physician and/or physical therapist specializing in manual therapy. They will loosen the joint restriction that prevents the muscle from stretching.

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**Strengthening:** It will be important to strengthen through a greater range of motion than ever before. Let's take advantage of some helpful training exercises from the dance world.

Start with simple heel raises on one foot. As you do this exercise, watch your alignment in the mirror. Make sure that the heel rises up directly over the second toe and the ankle does not roll in or out. Work on eliminating any ankle wobble as you rise up and lower down. When on the ball of your foot, make sure that you feel contact of your first and fifth toes to the ground, but focus the weight over the second toe.

Once you can perform this exercise smoothly, add a light-weight band around your ankle while you raise and lower. Change the angle of the band so that the band pulls from all directions like on the face of a clock. With smooth, slow controlled motion, try two to four repetitions in each of the 12 different directions.

Foot articulation: Many skaters have stiff feet from years of skating and jumping in stiff boots. In fact, the stiffness of the boot causes muscle atrophy and joint stiffness somewhat similar to wearing a cast.

Foot articulation is necessary for proper shock absorption to prevent injury and to create a powerful push-off and increased vertical jump height. The best place to work on articulation of the foot is by using the jump board on the pilates reformer. You can find a trained pilates instructor near you by calling 1-800-4pilates.

In absence of a jump board, try the pilates footwork series. Stand with your heels together and toes about three to four inches apart. With your heels glued together at all times, lift your heels off the ground as high as possible. With the heels fully raised, bend your knees while keeping the spine and pelvis up tall. Keep the knees bent and proceed to press your heels down to the floor. Finish the sequence by straightening the legs back to the starting position. Repeat 10 times this direction and then reverse the pattern.

To reverse, bend the knees and keep the heels down. Lift the heels and keep the knees bent. Straighten the legs while keeping the heels lifted. Finish by pressing the heels to the ground with the legs straight.

### **A Time for Change**

The sport of figure skating is about to undergo the most significant equipment change it has seen in decades. The intent is to reduce injury and time off the ice while enhancing performance.

Imagine the potential. While there are bound to be challenges as we go through this transition, following the recommendations in this article will help you to prepare for the change and ease your transition in to a new exciting era of figure skating. Are you ready?

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