Boot Problems and Boot Solutions

Part One of a Two Part Series

This year 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 an 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. Rations 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 (see photo A). Repeat the test in skates with the tip of your blade behind the same line (see photo B). Once again, be careful not to lift the heels.

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.

Bendability score

<table>
<thead>
<tr>
<th>10+ cm</th>
<th>6-10 cm</th>
<th>3-6 cm</th>
<th>0-3cm</th>
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<tbody>
<tr>
<td>Excellent</td>
<td>Good</td>
<td>Fair</td>
<td>Poor</td>
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Bendability ratio

Worse bending in skates .............. Undesirable
Equal bending in and out of skates .... Desirable
Better bending in skates ............. Ideal

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. Please join us for some exciting information on new product ideas next month.

Linda Tremain PT, ATC/L has practiced sports medicine and manual therapy in the Chicago area for 15 years. For the past four summers, she has worked at the Olympic Ice Arena in Lake Placid, N.Y., where she provides fitness, physical therapy and the Pilates Method of Body Conditioning for skaters.
Boot Problems and Boot Solutions

By Linda Tremain, PT, ATC/L

Part Two of a Two-Part Series

Last month, in part one of this series, we took a look at figure skating injury rates and boot-related problems. In part two, we'll discuss possible solutions, proper boot selection, new products in development, and how to prepare for the "new and improved" boots.

Last November 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 details are confidential, we'll give you a peek into the future of figure skating.

Riedell is working with the subcommittee to integrate new ideas and concepts into future product development. And both Graf and Jackson are testing new products. Testing may continue for several months before the boots are ready for mass manufacturing.

Possible Solutions to Problems

Weight: For years, boots have been made mostly of leather, which is a heavy material that absorbs water and becomes heavier with wear. To reduce boot weight, companies are looking at new lighter materials, such as thermoplastics. These boots will look different, but while they might not be as sleek as a leather boot, they should be safer and may enhance performance.

Boot Defects: Up to 20 percent of boots have been found to be defective. Hopefully defects will decline as manufacturers strive for a consistently reproducible product, as they improve quality control at the factory level and as consumers become more educated.

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 make sure the boot is mounted vertically to the heel. The bottom of the boot should be level with a flat surface and the boot vertical.

Carefully inspect each pair of boots and send back any faulty products. In my physical therapy practice, I often see skaters with pain or injuries that may be caused by boot defects. It's frustrating to see skaters in pain, off the ice and spending money on medical care for something that could've been prevented.

Stiffness: Boots become too stiff over time. In the future, you will see more flexible boots. Some will have mobile ankle joints, while others might have lighter materials with better capacity to bend. If your ankles are strong and flexible, skating and jumping in these boots will be similar to jumping on land.

Those dependent on boot stiffness to compensate for weak ankles are likely to have the greatest challenge with the new boots. Plan ahead and begin an ankle strengthening and calf flexibility program now! Try the exercises shown on the next page.

Proper Boot Selection

Brand: Regardless of changes made in the industry, it is important for skaters to select the best boot for them. No brand is the best brand for everyone. Since many shops represent only a few manufacturers, don't hesitate to try another store and test different products.

Stock Versus Custom: Whenever possible, purchase stock boots. The advantage is that you can try a number of pairs in the same size and select the pair that is defect-free and the best fit. If it isn't possible to wear stock boots, make sure the width and length of your feet are properly measured for semi-custom or custom skates. If you have significant lumps and bumps on your feet, custom boots are the only option.

Make sure your heel fits snugly in the back of the boot so that you don't get pump bumps or hammer toes. If you place your heel all the way back in the boot before lacing, you shouldn't be able to move your heel in the boot.

Orthotics: Custom foot orthotics are recommended if you have difficulty getting to an outside edge or have bunions, bursitis on the ankle bones, or navicular (Bone in the arch) enlargement as these findings correlate with uncorrected pronation (flat feet). Orthotics easily fit into custom or stock boots if you work with someone who is accustomed to making low-volume, narrow-cut, intrinsically posed orthotics.

To eliminate rocking in the skate, I recommend subortholene orthotics that allow accommodation to the pitch of the skates. If you need orthotics, work only with medical professionals who have experience fitting skating orthotics. Some may advocate hard orthotics, but I find something with more flexibility and shock absorption is better with managing the harsh and repetitive impact encountered in figure skating.

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

Stiffness: Take your bendability score (see Part One, SKATING May 2004) into consideration before selecting your boots. If you have worn your current skates for six to 12 months and still have poor to fair bendability (0–6 cm knee over toe) in skates, order
your next pair of boots with less stiffness and strength.

Don't buy a certain stiffness based on your jumps. It is better to use your bendability score as an indication of the appropriate boot stiffness. If you are overbooted, most manufacturers will remove up to 20 percent of the boot strength to increase the bendability of your current skates.

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 means 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. Take care of pressure spots until they are resolved!

**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 one leg straight and one bent (photos 1 and 2). If you feel pressure in the front of your ankle, consult a doctor or physical therapist who will loosen the joint restriction that prevents the muscle from stretching.

**Strengthening:** With the new books it will be important to strengthen through a greater range of motion. Start with heel raises on one foot. Watch your alignment in the mirror — make sure the heel rises 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 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. Change the angle of the band so that the band pulls from all directions like on the face of a clock (see photos 3 and 4). With smooth, controlled motion, try two to four repetitions in each of the 12 different directions.

**Foot articulation:** The stiffness of skating boots causes muscle atrophy and joint stiffness similar to wearing a cast. But foot articulation is necessary for proper shock absorption to prevent injury and to create a powerful push-off and increased vertical jump height. Try this pilates footwork series.

Stand with your heels together and toes about three to four inches apart (photo 5). Pressing your heels together, lift them off the ground as high as possible (photo 6). With the heels fully raised, bend your knees while keeping the spine and pelvis up tall (photo 7). Keep the knees bent and proceed to press your heels down to the floor (photo 8). Finish the sequence by straightening the legs back to the standing position. Repeat 10 times this direction and then reverse.

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**

Figure skating is about to undergo the most significant equipment change it's seen in decades, which we hope will reduce injuries and enhance performance. There will be challenges, but these recommendations should help prepare your for the change and ease your transition into a new exciting era of skating.

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