Ankle injuries, especially lateral ligament sprains, are common in sports and result in more time loss than any other single injury (Garrick, 1987). The high intensity nature of sports requires optimal neuromuscular development and control of the lower extremity. Basketball, volleyball, soccer, and football have the highest incidence of inversion sprains.

Prevention and treatment programs for ankle injuries can be time consuming and costly. Ankle bracing has been part of the treatment and rehabilitation of ankle sprains for years. It is important that athletic therapists have a knowledge and understanding of the various types of ankle braces available today.

The majority of ankle sprains involve the lateral ligamentous structures, primarily the anterior talofibular and calcaneofibular ligaments. Most sprains occur with the foot inverted and the ankle plantar flexed. The dynamic stabilization offered by concentric contraction of the peroneals and eccentric action of the invertors is overcome, thus disrupting the ligamentous constraints to this movement. As the physiologic range of motion is exceeded, injury occurs.

A common objective of many athletic therapists is to prevent this occurrence via external support (taping or bracing). The ultimate goal is to prevent injury or reinjury.

The rationale for ankle bracing is based on the assumption that by reinforcing the ligamentous structures of the ankle joint and restricting motion, especially subtalar joint motion, ankle stability will be increased (Miller & Hergenroeder, 1990). The goal is to prevent the talus from exceeding its physiologic range of motion within the ankle mortise. These ankle braces act as external ligaments helping to reduce the amount of anatomical motion in the subtalar joint, especially inversion.

A number of studies have reported on the effects of ankle bracing on range-of-motion and performance parameters, but few have examined their effectiveness in preventing ankle injury. Given the multitude of choices and styles available, it is important that the athletic therapist understand which features are most important.

### Classification of Ankle Braces

Ankle braces have several advantages over tape in that they can be self-applied without needing the expertise of qualified personnel; they are easy to apply and remove and are reusable, adjustable, and washable. Qualities to look for in the ideal ankle brace include:

**Key Points**

- Ankle braces have several advantages over tape including ease of application, reusability, and comfort.
- There are two main categories of ankle braces: non-rigid stabilizers and semi-rigid orthoses.
- Athletic therapists need an understanding of the various types of ankle braces so they can pick the right one for their treatment objectives.
the following (Miller & Hergenroeder, 1990):

1. Ease of application;
2. Ability to retain a continuous degree of support throughout an exercise period;
3. Ability to provide an equivalent degree of support with each application;
4. Ability to limit the extremes of subtalar joint inversion and eversion while permitting talocrural joint dorsiflexion and plantar flexion;
5. Affordability.

Non-Rigid Stabilizers

Although ready-made elastic pull-on and neoprene ankle supports are part of this category, by far the majority of these types of stabilizers are the reusable lace-up ankle braces. These braces generally can be made more rigid by inserting plastic stays into the side pockets of the brace shell. These are designed to provide additional stability to the ankle.

A number of off-the-shelf ankle braces are available today. Some of the more common brands include: McDavid® lightweight ankle support (McDavid Sports Medical Products, Chicago); Swede-O® Ankle Lok ankle brace (Swede-O, Inc., North Branch, MN); Cramer® ankle stabilizer (Cramer Products, Inc., Gardner, KS); and Mueller® Bi-Lateral ankle brace (Mueller Sports Medicine, Inc., Prairie Du Sac, WI).

Although these ankle braces are marketed with a variety of advertising claims, they all have similar features: (a) bilateral supports made of materials sewn together allowing for an opening at the heel; (b) elasticized heel counter to prevent irritation of the Achilles tendon; (c) padded, elastic tongues beneath the laces; and (d) built-in stays or side-pockets in which plastic stays can be inserted freely.

The effectiveness of these ankle braces has often been compared to that of tape. Initially these braces provide less support than properly applied tape (Bunch et al., 1985). However, as activity continues, tape tends to slacken whereas ankle braces can be retightened to provide continuous support and stability.

A retrospective study examining ankle injuries in football players concluded that ankle braces were more effective than tape in preventing ankle injuries (Rovere et al., 1988). Lace-up stabilizers tend to maintain range-of-motion restrictions better than tape because of the retightening capabilities.

Semi-Rigid Stabilizers

Another popular class of ankle braces include the semi-rigid orthoses. First mentioned in the medical literature in 1979 (Stover), these devices have been shown to be equally effective when compared with tape for restricting range of motion. They were originally designed for use in early immobilization of acute ankle sprains or stable lower leg and ankle fractures. As technology advanced, the changing design of these braces has enabled them to be used prophylactically.

A variety of semi-rigid ankle braces are available for the athletic therapist to choose from. They are designed to fit into the athlete's shoe and may be worn during activity. These braces contain a prefabricated, thermoplastic materials that are comfortable and easy to slip on and off. Most have lacing features. The semi-rigid braces consist of two bimalleolar struts made of plastic materials connected via elasticized straps.
Table 1  Results of Recent Studies Examining Prophylactic Ankle Bracing

<table>
<thead>
<tr>
<th>Study</th>
<th>Support</th>
<th>Conclusions</th>
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<tbody>
<tr>
<td>Frankney et al. (1993)</td>
<td>Lace-up ankle brace</td>
<td>Hinton-Boswell ankle taping technique better than ankle brace &amp; other taping techniques in restricting NWB-ROM</td>
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<tr>
<td>Greene &amp; Hillman (1990)</td>
<td>DonJoy</td>
<td>Brace better than tape in restricting NWB-ROM</td>
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<td>Greene et al. (1990)</td>
<td>Lace-up vs. semi-rigid orthoses</td>
<td>Semi-rigid orthoses showed no loss in ROM restriction after 20’ of exercise</td>
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<tr>
<td>Gross et al. (1987)</td>
<td>Aircast</td>
<td>Aircast stirrup better than tape at restricting NWB-ROM</td>
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<tr>
<td>Gross et al. (1994)</td>
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<td>No difference between tape &amp; brace in restricting NWB-ROM</td>
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<td>Lindley &amp; Kernozek (1995)</td>
<td>Aircast, Active ankle, DonJoy</td>
<td>DonJoy restricted NWB ROM the most</td>
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<td>MacKean et al. (1995)</td>
<td>Aircast, Swede-O, Active ankle</td>
<td>Least performance impairment with the Active ankle brace</td>
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<tr>
<td>Paris et al. (1995)</td>
<td>Swede-O, subtalar brace</td>
<td>Swede-O better than tape &amp; subtalar brace at restricting NWB-ROM</td>
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<tr>
<td>Rovere et al. (1988)</td>
<td>Lace-up ankle brace</td>
<td>Injury risk reduced by 1/2 using brace vs. taping</td>
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<tr>
<td>Sitler et al. (1994)</td>
<td>Aircast</td>
<td>Aircast reduced the frequency of ankle injury</td>
</tr>
<tr>
<td>Surve et al. (1994)</td>
<td>Aircast</td>
<td>Aircast reduced recurrent ankle injury in those with previous history</td>
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</table>

stirrup or molded plastic sides that fit around the arch of the foot and both malleoli. The stirrups then extend several inches above the malleoli.

Although these types of braces are often referred to as air-stirrups, not all of them use inner inflatable air bag liners. A number of ready-made semi-rigid orthoses use foam padding or neoprene rubber along the inside of the stirrups.

Most braces are secured using Velcro or elastic straps around the lower leg. These braces are designed to allow for ankle plantar flexion and dorsiflexion while limiting inversion and eversion. Like their non-rigid counterparts, they may be tightened if they become loose during physical activity.

A sampling of some of the commercially available semi-rigid ankle braces include: Aircast® Air-Stirrup (Aircast, Inc., Summit, NJ); Active Ankle Training Brace (Active Ankle Systems, Inc., Louisville, KY); DonJoy Ankle Ligament Protector (DonJoy, Inc., Carlsbad, CA); and Atom™ Brace (Swede-O, Inc.).

The majority of research on the efficacy of these semi-rigid ankle braces has involved comparisons to ankle taping (see Table 1). Most semi-rigid braces have been found to restrict inversion and eversion both before and after exercise. These semi-rigid orthoses have an inherent ability to retain their range-restrictive capabilities under the stresses of exercise (Johnson et al., 1994).

Brace wearers often cite comfort and ease of application when choosing ankle bracing over taping. There has been little research evaluating the rate of ankle injuries among athletes wearing semi-rigid ankle braces. When the effect of these semi-rigid ankle braces on performance is examined, the consensus is that these orthoses have little detrimental effect on overall motor performance.

Current Trends in Ankle Bracing

Little has changed with ankle brace design and features through the years. The majority of manufacturers tout the use of lightweight, breathable materials in the construction of their devices. The semi-rigid ankle orthoses are much smaller than their predecessors.

Most manufacturers offer a sport brace with shorter stirrups that can be used during activity, and longer stirrups for greater stability immediately postinjury. The sport braces usually are less bulky and easier to fit into a shoe.
Both the non-rigid and semi-rigid ankle braces offer a cost-effective way to restrict ankle range of motion. Athletic therapists should base their decisions to use ankle bracing on a careful cost-benefit analysis as compared to ankle taping. Ankle bracing offers a nice alternative to taping and has become a popular form of ankle injury prophylaxis. Further study is needed to determine the extent to which braces are used and their efficacy in preventing ankle sprains.

Wrap-up

As the cost of ankle taping has risen through the years, ankle bracing has offered a viable and cost-effective alternative. Athletic therapists need an understanding of the various types of ankle braces available so they can match their injury prevention/treatment objectives with a particular kind of brace.

It is generally agreed that both the non-rigid and semi-rigid forms of ankle bracing are equally if not more effective than tape in helping to restrict ankle range of motion. Furthermore, braces tend to retain these restrictive qualities longer than tape. Since there is not much literature examining the extent to which braces can prevent ankle injury or reinjury, however, one must give careful consideration before deciding to use a brace.

References


