ATHLETIC TRAINING

THE JOURNAL OF THE NATIONAL ATHLETIC TRAINERS ASSOCIATION

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- Psychological Factors in Sports Medicine
- Seizures in Athletics
- Prevention of Neck Injuries

The National Athletic Trainers Association

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ATHLETIC TRAINING

THE JOURNAL OF
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Features

Tips from the Field

Departments

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President's Message

Dear NATA Members:

The 1983 Winter Meeting of the NATA Board of Directors was held in Denver, Colorado on February 27 and 28 at the Denver Hilton Hotel. Several items of interest will be presented to you by your Director at your next district meeting. As you may be aware, I have asked our Board members to direct their attention to the question of how to best regulate athletic trainers working in the private sector. I believe a more precise role clarification must be made in order for the athletic trainer to maintain a credible position as a health care professional. I assure you that our Board of Directors is striving diligently to do what is best for the future of our entire organization.

Steve Antonopulos and Ric Pisarcik have done a great deal of preliminary work regarding the planning and organization of the Annual Meeting and Clinical Symposium of the NATA. They presented a very impressive preview to the Board of Directors and we have prepared an appealing educational and recreational program. I hope that many of you will be able to attend June 12 - 15. The Denver Hilton and the Denver Convention Center will serve as convention headquarters. You should be receiving information regarding registration and housing in the near future.

Please continue to communicate with your national officers as 1983 should be a year of significant growth. Your continuous input is necessary for our Association to function smoothly. I look forward to seeing each of you at one of your 1983 district meetings.

Sincerely,

Bobby

Bobby Barton, ATC
President

ANNUAL MEETING and CLINICAL SYMPOSIUM TRAVEL OFFER

NATA
June 12 - 15, 1983
Denver, Colorado

NATA is pleased to inform you that our travel coordinator, Convention & Group Travel has made arrangements with United Airlines which will offer $5.00 below their normal super saver fare and waive all super saver fare requirements, and with Delta Airlines who will offer us 25% off their coach class level fare for travel to our meeting in Denver, Colorado

DENVER

COLORADO

We encourage you to take advantage of these special discounts. If you live in a city serviced by United Airlines, you simply call United Airlines Meeting Services Desk at 800-521-0810 from anywhere in the continental United States except Michigan. In Michigan, call 800-482-0243. Ask the representative to pull up Profile #2335 which contains all pertinent information on travel to our meeting. For cities serviced by Delta Airlines or other airlines, simply call our travel coordinator at 800-243-3584 (in Connecticut call (203) 377-0770) and they will give you the lowest fares and most convenient flights on airlines that do provide service from your home city. These numbers may be reached Monday thru Friday from 9 A.M. to 5 P.M. EST.

TICKETING INFORMATION:

Fares for tickets written and paid for by credit card stand at that rate at the time you make your reservation. If rates go up, a paid ticket remains at the confirmed rate. Should you choose to be billed and rates increase, you will be billed at the current rate.

MAKE YOUR RESERVATIONS NOW!

The most convenient flights will sell out early. Remember, the only way to receive this special discount is to make your reservations thru either United Airlines or our travel coordinator.

Rates are subject to change between now and the time of the meeting, so we urge you to call and purchase your tickets without delay, using your credit card. This will GUARANTEE THE CURRENT AIR FARE AND PROTECT YOU AGAINST CONTINUING INCREASES.

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Travel to Denver can begin on June 10th with this Special Rate Offer.
Call the National Office if further information is desired.

Letters to the Editor

Ken Wolfert, ATC

To the Editor:

Enclosed find photos of a potentially lethal device possibly being worn by some players.

As you can see there are two dangers:

1. Device can act as a fulcrum to increase lever arm during hyperflexion thereby causing a dislocation of one or more cervical vertebrae.
2. Device has the potential to crush the larynx with resultant airway blockage.

This device has no place in football. I hope you will disseminate this information.

Steve Moore, ATC
Cookeville, Tennessee

To the Editor:

The purpose of any certified athletic trainer is to care for the needs of various athletic team members. Prevention, emergency care and rehabilitation are the three basic principles of our work. However, the level of competition at which a trainer works makes a difference in the philosophy of objectives. At the middle school level of competition, athletic trainers are rarely found. There are several factors involved, among them seemingly low incidence of injury, budget restraints, prestige, and position vacancies.

Most people who decide to enter the field of sports medicine as athletic trainers have the goal of college or professional level competition in mind. At this point in time, the need for competent people certified as athletic trainers is at the high school and middle school level.

In middle school, students are in their formative years. Athletics are a very influential part of their lives. Most middle schools will have from eight to twelve sports including up to two hundred and fifty students. That figure can be doubled when considering the number of students before final cuts are established.

These children play the same intense style of game that is played at any other level. They are against their own age group and any contact or collision between opponents is just as intense to them as that of higher level competition. Injuries do occur; they are serious. They demand immediate and proper attention with usually a part time coach as the only person available for care.

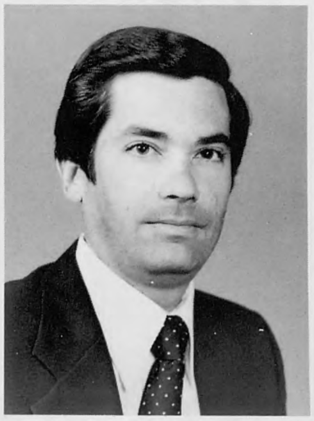
Statistically, this football season alone, I have taken care of three cerebral concussions, two neck injuries, one kidney disorder, five fractures, three dislocations and a number of strains, sprains and contusions. This is not by any means a full docket in comparison with higher level athletics, but the fact remains that potentially serious situations did arise that would place a coach and administrator in a possibly precarious situation.

From the administrative and coaching standpoint, the "monkey" is off their backs and with great relief. From the parental standpoint, their children are going to be cared for by a professional during practice and games.

Administrators, coaches, and parents all feel much better when they know that the student athletes will be cared for in a competent and professional manner. Why should we as trainers and parents wait for the college level to care for our athletes? These young people deserve to be treated just as well as the big boys, and by a professional. Here at Tuckahoe Middle School in Richmond, Virginia, Dr. T.C. Anderson, Jr. understands this and has constructed and supplied a complete training room for the specific care of any child injured while participating in athletics. Sports medicine at the middle school level is a definite challenge that demands patience, understanding, and a good working knowledge of athletic injury care. I sincerely hope that all schools will some day be able to say that they have a certified athletic trainer.

Phillip Pavlidis, ATC
Richmond, Virginia

Calendar of Events



Jeff Fair, ATC, MS
Oklahoma State University

April 1983

16 Fourth Annual Michigan State University Sports Medicine Seminar, East Lansing, MI. Contact Kathleen Heck, Division of Athletic Medicine, Jenison Fieldhouse, Michigan State University, East Lansing, MI 48824.

21-24 Sports Medicine and the Young Athlete, Houston, TX. Contact Thomas Nelson, American Orthopaedic Society for Sports Medicine, 70 W. Hubbard, Suite 202, Chicago, IL 60610.

21-23 Annual Cherry Blossom Seminar: Arthroscopy and Arthroscopic Surgery — Step by Step, Washington, DC. Contact Mehrdad M. Malek, MD, National Knee Institute, 6192 Oxon Hill Road, Suite 510, Oxon Hill, MD 20745.

22-23 How to Implement and Manage A Sports Medicine Program, Chicago, IL. Contact Ronald G. Peyton, Director, The Sports Medicine Education Institute, 993 Johnson Ferry Road N.E., Suite 450-D, Atlanta, GA 30342.

23-24 Prevention and Treatment of Athletic Injuries Workshop, Los Angeles, CA. Contact Vickie D. Zomar, National Athletic Health Institute, 575 E. Hardy Street, Suite 104, Inglewood, CA 90301.

28-May 2 International Society of the Knee Congress, Perth, Scotland. Contact International Society of the Knee, 70 W. Hubbard Street, Suite 202, Chicago, IL 60610.

May 1983

5-7 Orange County Trauma Society Symposium, Costa Mesa, CA. Contact OCTS, 321 N. Rampart, Suite 225, Orange, CA 92668.

14 Athletic Injuries of the Lower Extremity, Waltham, MA. Contact Department of Continuing Education, Boston University School of Medicine, 80 E. Concord St., Boston, MA 02118.

18-21 American College of Sports Medicine Conference, Montreal, Canada. Contact American College of Sports Medicine, 1440 Monroe Street, Madison, WI 53791.

21-22 The Third Annual Sports Medicine Symposium of the New York State Athletic Trainers' Association, Rochester, NY. Contact Abby Herzog, Dept. of Physical Education, Barnard College, Columbia University, New York, NY 10027.

June 1983

9-10 The Medical, Physiological and Psychological Aspects of Marathon Running, Duluth, MN. Contact Lynn Devlin, UMD School of Medicine, 2400 Oakland Avenue, Duluth, MN 55812.

12-15 NATA Annual National Symposium, Denver, CO. Contact NATA, P.O. Box 1865, Greenville, NC 27834.

25 Cybex/Isokinetic Clinical Workshop, La Crosse, WI. Contact George J. Davies, Orthopaedic and Sports Physical Therapy, S.C., 2501 Shelby Road, La Crosse, WI 54601.

Athletic Training will be happy to list events of interest to persons involved in sports medicine, providing we receive the information at least two months in advance of publication. Please include all pertinent information and the name and address of the person to contact for further information. This information should be sent to: Jeff Fair, Head Athletic Trainer, Athletic Department, Oklahoma State University, Stillwater, OK 74078. +

Abstracts

John Wells, ATC, PT, PhD
Mars Hill College

"Clinical Uses of TENS: A Survey of Physical Therapists," Paxton, Susan L. *Physical Therapy: The Journal of the American Physical Therapy Association*, 60: 38-44, January, 1980.

At the present time, the mechanism by which electrical neuromodulation produces relief of pain is not completely understood. However, numerous experimental studies have shown that transcutaneous electrical nerve stimulation (TENS) can reduce both acute and chronic pain from a variety of causes. Because TENS is a nonhazardous, nonpharmacological technique of pain control and has proved to be effective for some patients for whom other conventional forms of therapy have failed, TENS has become widely used for pain management, especially by physical therapists. The results of a nationwide survey of physical therapy departments showed that the majority of respondents use TENS to relieve chronic and acute pain from a variety of disorders. Use of the modality is new, with most respondents having obtained stimulator equipment within the last two years. Of the respondents who do not currently use TENS, one-third reported plans to obtain stimulator units. The most common treatment techniques used in conjunction with TENS were heat modalities, exercise, and massage or acupressure. The most frequently seen side effect of stimulation was skin irritation. The majority of therapists evaluated the effectiveness of pain relief from use of TENS by the patient's subjective estimation of relief, as well as by observation of changes in the patient's activity level, mobility, and drug intake. Most therapists did not consistently perform follow-up evaluation of patients who continued to use TENS after discharge from physical therapy. The majority of TENS users were satisfied with the effectiveness of TENS in relieving acute, chronic, and psychogenic pain. The effectiveness of pain relief with short-term use of TENS was more satisfactory than with long-term use. The overall finding of this study confirms that TENS is an effective modality that is finding widespread clinical application in management of acute and chronic pain.

Lois Howard

* * *

"Blues and Depression," Neshama Franklin, *Medical Self-Care:* 10-16, Spring, 1982.

Depression is surprisingly common. About one in five Americans has significant symptoms, more than 1.5 million are being treated today, and 30 million people around the country can expect to suffer this illness at some point in their lives. Depression is so widespread, it has been called "the common cold of mental disorders." Some of the symptoms of clinical depression include: anxiety, irritability, guilt, self hate, feeling worthless, loss of energy, extreme fatigue, and difficulty concentrating and making decisions. Frequently, depression involves changes in sleeping and eating patterns. Depression may also cause headaches, backaches, digestive upsets, loss of interest in sex or other physical symptoms. It's twice as prevalent in women as in men. One woman in six develops depression at sometime in life compared with one man in 12. Often traumatic events of loss of life change: relationship problems, job stress, relocation, death of loved one, or changes associated with adolesence, middle age or old age. No one is immune to feeling down from time to time. The suggestions may help those who tend to get stuck in the blues. Usually, the passage of time helps alleviate these low periods; but the techniques that follow may help deal with them more effectively and faster. One strategy is to combine activities you ordinarily enjoy with little tasks that need doing. Planning and adhering to a course of action often helps lift the spirits. Exercise is a safe healing release for the anger that often underlies a depressed state of mind, the more vigorous, the better. Jogging, bicycling, swimming or chopping wood are some of the many possibilities. Friends can be a crucial resource when you're feeling down. Complaining can be a safe emotional release and it can help pinpoint problem areas in your life. By learning to identify negative thought processes, then applying relatively simple, common sense eventium techniques, depression can be ameliorated. Most blue periods, which result from life's normal ups and downs, resolve themselves on their own in a few days to a week. But if your misery lasts more than a week or two and interferes with your life, it is probably time to explore some of the available treatment options.

George Jarrett, III

* * *

"The Injury Rate in Professional Basketball," Henry, Jack H., Lareau, Bernie, and Neigut, Deborah, *The American Journal of Sports Medicine*, 10: 16-18, 1982.

A restrospective study was carried out on all team players from the beginning of the 1973 basketball season through the 1980 season. During these seven years of playing experience, 576 injuries occurred in 49 of 71 players. This means that 69% of the players were injured during this period. Further calculations showed that a player could be expected to miss a ballgame 7.6% of the time due to injuries received. The greatest number of injuries occurred during games, followed by practice sessions, warmups, and scrimmages. The position played had little bearing on the incidence of injury. During the seven years, forwards averaged 9.8 injuries per player; guards, 8.3; and centers, 7.8. The type of injury was related to the position played. Guards suffered a greater number of lower extremity injuries, whereas forwards suffered mostly upper body injuries, and centers tended to have a combination of both. Head and face injuries, N=69, represented 12% of all injuries. Shoulder girdle injuries, N=19, accounted for 3% of all injuries. Elbow, wrist and hand injuries accounted for 2% each. Finger injuries accounted for 11%. Back and hip injuries represented 11.5% of all injuries. Groin strains and contusions to the genitalia comprised 1.4% of the injuries. Chest and abdominal injuries made up only .9% of injuries. Injuries to the lower extremities, N=79, represented 14% of all injuries. The lower extremity joints, aside from the hip, received the most significant injuries and accounted for 94% of all games missed. The ankle was the most-injured joint, N = 105, 18.2% of all injuries. The average time loss from basketball was amazingly consistent for each injury. Rehabilitation varied from three days to two years. Surgery was performed on two ankles and two knees. The data presented strongly suggests that professional basketball can no longer be considered a noncontact sport.

Tim Garl

* * *

"Dubious Drugs For Coughs and Colds," Neshama Franklin, *Medical Self-Care Magazine*, 38-41, Summer, 1982.

When you're suffering the symptoms of a cold, the prospect of instant relief looks very attractive. Why should you have to bear the indignities of a nose either stuffed or streaming, a throat so sore it makes you flinch to swallow, a hacking cough, and so many aches you feel battered? Oral cough and cold products are big sellers; North American consumers spent more than $1 billion on them in 1980. But what do you get for your money? In most cases, these supposed panaceas contain at least one effective, well-proven ingredient to combat one specific symptom. If the manufacturers stopped there, you'd get something useful. But then they wouldn't be able to offer you a "cure-all." So they concoct mixtures that include some ingredients that have not been proven effective and offer some combinations that may interact to inhibit effectiveness and increase toxicity. It may be worth taking a drug if it helped the cold go away faster. But ironically, many drugs that promise rapid respite may actually interfere with natural healing processes. In order to evaluate cold drugs, you have to look at what they promise, what they contain, and how effective each ingredient is. The multidrug might contain ingredients you don't need, and it's impossible to tailor multidrugs to individual needs, body weights and metabolisms. Over-the-counter combination drugs may contain effective ingredients that come in less than therapeutic doses, and produce little or no benefit. The question of what constitutes an effective drug is controversial. In his book *Pills That Don't Work*, Dr. Sidney Wolfe, MD, Director of Ralph Nader's Health Research Group, takes a hard line. If the ingredient does not appear on the Food and Drug Administration's (FDA) list of drugs proven effective in well controlled double-blind studies, he doesn't consider it effective, period. Some of Wolfe's pronouncements may be reversed in the future, but it's useful to know what the best-selling cough and cold remedies contain, and how they work — or don't work.

Debbie Suggs

* * *

"The Pupil Check," Susan Norman, *American Journal of Nursing:* 588-591, April, 1982.

The pupil check — assessment of the pupillary light reflex (PLR) — tests the response of the pupils to light and is an important aspect of the neurophthalmic examination. The PLR can indicate second or third cranial nerve involvement and, possibly, brain stem damage. There are many other possible causes of PLR abnormalities, including eye trauma, congenital defects, and drug effects. Under normal conditions, a light shone directly onto the retina of one eye stimulates the parasympathetic nerves, causing brisk constriction of that pupil — the direct light reflex. Begin the exam by inspecting the pupils in normal light. Since most pupillary reactions are exaggerated in the dark, the exam room should be dim enough to exaggerate the pupillary reaction, but bright enough for inspection. Note and record the size, shape, and equality of the pupils. Normal pupils measure 2 to 5 mm in diameter. The size of the pupils changes with age. Record any inequality in size. Slight anisccoria is normal variation, occurring in about 15 percent of the population. Pupils are normally round with a smooth border, and are in the midline position when the patient is asked to look straight ahead. To determine the reaction of the pupils to light, use a small bright penlight. A patient who is blind in one eye will have a direct and a consensual light reflex when the normal eye is illuminated, but there will be no response in either eye when the light is shone into the blind eye. If the patient has a prosthetic eye there will be no pupillary reaction. Accommodation reaction is the process where a clear visual image is maintained as the gaze is shifted from a distant to a near point. The accommodation reaction includes convergence of the eye, constriction of the pupils, and thickening of the lens through contraction of the ciliary muscle. A normal pupillary response is recorded as PNERLA — Pupils Normal (in shape and size), Equal and Reactive to Light and Accommodation.

George Jarrett, III

* * *

"Electromyography of the Quadriceps Femoris Muscles in Subjects with Normal Knees and Acutely Effused Knees," Paul Stratford, *Physical Therapy: The Journal of the American Physical Therapy Association*, 279-282, March, 1981.

For many years the phenomenon known as quadriceps lag has been of interest to rehabilitation specialists. For the purpose of this paper, quadriceps lag is defined as the inability of an individual to complete actively full extension of the knee even though passive terminal extension of the knee is possible. Two groups of subjects were identified based on whether they demonstrated knee joint effusion. A normal group (n = 8) was matched by sex and age (within four years) to an effused group (n = 8). The normal group's knees were uneffused and had full range of motion; there was no history of trauma to their knees in the past year. The effused group had been selected consecutively upon admission and had a midpattelar circumference measurement increase of 5 percent or more (this was demonstrated to be greater than normal variation in a pilot study) compared with the same measurement on the unaffected side. All subjects in this group demonstrated a quadriceps lag on the side of the effusion. Electromyographic recordings were taken at knee flexion of 30 degrees and of 0 degrees for maximum quadriceps femoris muscle contraction. These recordings were taken on both the effused knee and uneffused knee in the effused group and on the knee on the same side as the effusion in the normal group. Each subject was then instructed to extend his knee to try to break the resistance offered by the distal belt. The contraction was held for six seconds and was followed by a six-second interval. Each subject was allowed three practice contractions in both positions before recordings were taken. After each set of three repetitions, a rest interval of two minutes was allowed. The data obtained were full-wave rectified, averaged by amplitude, EMG recordings. The data were displayed on a Visi-Corder. The results of this descriptive study demonstrate a decrease in EMG activity at 0 degrees knee flexion compared to 30 degrees knee flexion in individuals with acute, severely effused knees (the admission criteria of the study) when compared to normal knees.

Debbie Suggs +

MEMORANDUM

TO: Athletic Training Educators
Head Athletic Trainers
Students of the Profession

FROM: Paul Grace, Chairperson
Board of Certification

REFERENCE: Role Delineation Study Sale

I am pleased to announce that the 1982 Role Delineation Study is now available for purchase. This sixty-one page booklet can be utilized by those interested in assuring themselves and/or their students of a better understanding and appreciation of athletic training. The study identifies the major domains of athletic training and tasks associated with each domain. The study consists of the following phases:

(1) Domain development with tasks, knowledges and skills identified in each domain.

(2) Ratings and determination of percentage of each domain within the profession.

(3) Validation of test specifications by a national sample of NATA Certified Athletic Trainers.

The study identifies those knowledges that are needed by the entry-level athletic trainer commencing in the profession as measured by the NATA Certification Examination.

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Please send check or money order to: **NATA ROLE DELINEATION STUDY**
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Certificate and Plaque Order Form For NATA Certified Athletic Trainers

The Board of Certification is offering a new graphically designed certificate printed in Old English Script with gold embossed NATA logo and seal of certification. Each certificate is professionally personalized with the athletic trainer's name, certification number, and date of certification. The certificate may be purchased on a 12" x 16" hardwood plaque protected by plexiglass, or ordered as the certificate of Certification only.

Please indicate below which of these two alternatives would better suit you:

_______ I wish to order the plaque mounted certificate for the price of $30.00 each.

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Use a permanent street mailing address. No post office boxes please. Delivery will be by United Parcel Service.

NAME ______________
(as you wish it to appear on the certificate)

ADDRESS ______________

CITY ______________ STATE ______________ ZIP ______________

Certification Number ______________

Certification Date ______________

Potpourri

Dennis Aten, ATC, RPT, MS
Eastern Illinois University

Sad News for Dieters

Good Health Digest, July, 1982

As body weight falls from dieting, so does the body's caloric requirements. The more weight one loses, the more calories must be shaved off the daily diet to reduce. For example, a moderately active female weighing 135 pounds can lose about a pound per week on a 1500 calorie diet. Once down to 125 pounds, however, she must consume no more than 1200 calories a day to maintain the same rate of loss.

Which TENS?

Progress Report, April, 1982

A comparative evaluation of 18 battery-powered transcutaneous electrical nerve stimulators (TENS) has been completed by the Department of Medical Physics and Clinical Engineering, Royal Hallamshire Hospital, Sheffield, England. The stimulators evaluated were those primarily intended to be worn by patients to provide pain relief, although other applications, such as acupuncture techniques, have also been noted in the study. The models included in the study were those which were readily available in the United Kingdom during 1980-81. The 85-page report contains detailed information on the characteristics of each stimulator, the results of clinical trials, and a technical assessment of each taking into consideration safety standards. Copies are available at a cost of six pounds including postage. Make checks payable to the University of Sheffield and mail to J.M. Stamp, Senior Physicist, Department of Medical Physics and Clinical Engineering, Floor I, Royal Hallamshire Hospital, Glossop Road, Sheffield S10 2JF England.

Biofeedback

Progress Report, April, 1982

A clinical Biofeedback Self-Learning Review Course is now available on ten one-hour cassettes. Also included is a syllabus, lesson review, and final exam. The course has been set up under the co-sponsorship of the University of California at Los Angeles, Extension Division. Cost is $210 for credit and $185 without credit. For further information contact Eveline Ginzburg, Biofeedback Review Seminars, 2049 Century Park East, Suite 2590, Los Angeles, California 90067.

Zapping Chapped Lips

Family Weekly, January 17, 1982

The best way to prevent winter's chapped lips may simply be to drink more water. Chapped lips are primarily caused by internal dehydration, explains Dr. Bernard Kirshbaum, clinical professor of dermatology at The Medical College of Pennsylvania. We don't feel as thirsty in cold weather as in hot and so don't drink enough. And when we lick our lips, the cold air evaporates the moisture, causing further irritation.

Consuming just any liquids won't do. Coffee, tea and colas contain diurectics, says Kirshbaum, and drinking them draws off more fluid than you take in. He advises water or juices — 4 to 8 glasses a day.

Chymopapain

AAOS Bulletin, July, 1982

Since Chymopapain is still a controversial subject the American Academy of Orthopaedic Surgeons is hoping to meet the expected release of the drug with appropriate education. The following is an excerpt from the President of the AAOS, David Murray:

"Chymopapain is surfacing again. At this point it appears that the lengthy trials, including double and triple blind studies, may be reaching a point where eventual release of the drug can be expected. In anticipation of this, a joint committee has been formed under the chairmanship of Eugene J. Nordby, MD, with representatives from the Academy and the American Association of Neurological Surgeons. The committee on Intradiscal Therapy, as it has been named, is in the process of planning courses on the use of this material with particular emphasis on indications, contraindications and technique. No courses will be given until the drug has been officially released."

Sports Medicine Fellowship Available

AAOS Bulletin, December, 1981

Applications are now being accepted for the Knee and Sports Medicine Fellowship at Memorial Hospital Medical Center of Long Beach, California.

The positions begin in July 1983 and January 1984 and information concerning the program may be obtained by writing Douglas W. Jackson, MD, 2888 Long Beach Boulevard, Suite 400, Long Beach, California 90806.

Motion That Heals

Health, February, 1982

Barbara Ribakove shared some concepts in her article regarding the continuous passive motion philosophy attributed to Dr. Salter.

For centuries, physicians have assumed injured joints must be immobilized while they heal. Not so, says Robert B. Salter, MD, head of orthopedic surgery at the University of Toronto, who maintains that injured joints should be put into motion immediately after surgical repair. In the past, Dr. Salter hooked up ten patients — all described as "orthopedic disasters" — to a continuous passive motion (CPM) device while they were still in the operating room and kept them on it, day and night, for up to two weeks. The device — a battery-operated machine that supports the injured knee, hand or elbow — gently

Continued on page 65

Current Literature

Ed Christman, ATC, MEd
Knoxville, Tennessee

"Achilles Tendon Injuries and Disabling Conditions," Shields, C. *The Physician and Sportsmedicine*, 4530 W. 77th St., Minneapolis, MN 55435. 10(12): 77, December, 1982.

"Acute Anterior Cruciate Ligament Injury and Repair Reinforced with a Biodegradable Intraarticular Ligament, Experimental Studies," Cabaud, H., Feagin, J., and Rodkey, W. *The American Journal of Sports Medicine*, 428 E. Preston St., Baltimore, MD 21202. 10(5): 259, September-October, 1982.

"Catastrophic Eye Injury in a Football Player: A Case Report," Heinrichs, E. *The Physician and Sportsmedicine*. 10(10): 71, October, 1982.

"Coaches and the War on Drugs," Purcell, J. *Texas Coach*, P.O. Drawer 14627, Austin, TX 78761. 26(4): 22, November, 1982.

"Concussion in Athletes," A Round Table Discussion. *The Physician and Sportsmedicine*. 10(10): 95, October, 1982.

"Cryotherapy in Ankle Sprains," Hocutt, J., Jaffe, R., Rylander, R., and Beek, J. *The American Journal of Sports Medicine*. 10(5): 316, September-October, 1982.

"Football Fatalities and Catastrophic Injuries," Zuellar, F. *The Physician and Sportsmedicine*. 10(10): 135, October, 1982.

"Heat or Ice," Harland, M. *Texas Coach*. 26(3): 52, October, 1982.

"Injury Management Pyramid," Marshall, S. *Texas Coach*. 26(2): 48, August, 1982.

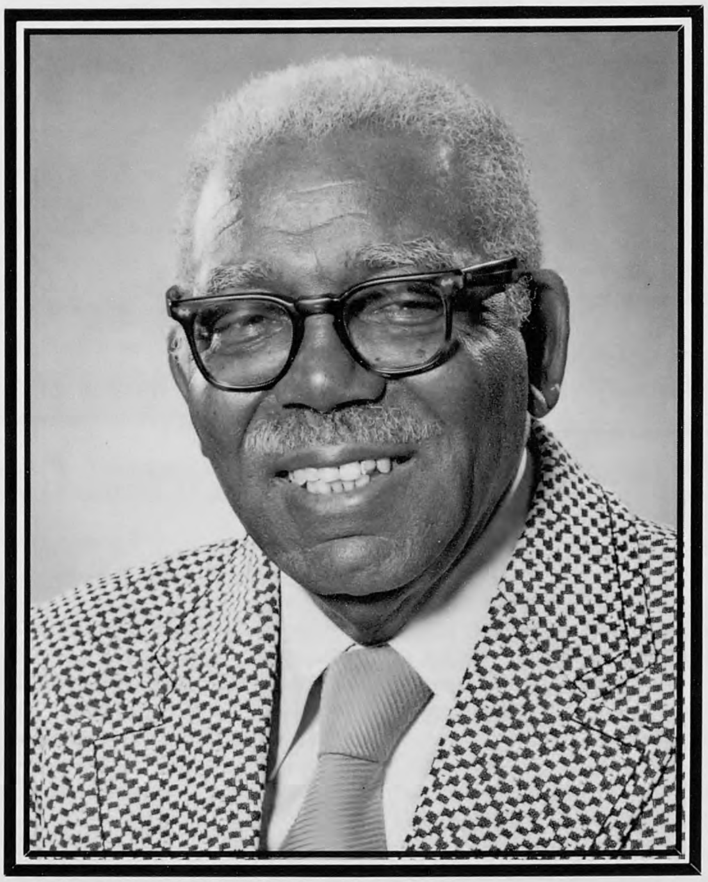
"Low Back Pain in Young Athletes," Stanitski, C. *The Physician and Sportsmedicine*. 10(10): 77, October, 1982.

"Management of Ankle Sprains," Hart, D. *Texas Coach*. 26(4): 22, November, 1982.

"Meniscectomy: Arthrotomy Versus Arthroscopy," Pettrone, F. *The American Journal of Sports Medicine*. 10(6): 355, November-December, 1982.

Continued on page 65

In Memorium



Chester A. Grant

March 19, 1906 – September 11, 1982

The National Athletic Trainers Association and North Carolina State University lost a close friend when longtime assistant trainer Chester Grant succumbed to a year long bout with cancer. Grant, 76, a native of Raleigh, N.C., served N.C. State as a trainer for more than three decades.

Chester attended North Carolina A & T University in Greensboro, N.C., and served his country in The Armed Forces during World War II. In 1945 Chester Grant was honorably discharged from The Army.

He began a 34 year association with N.C. State in 1948. He served under four different head trainers and worked with thousands of athletes. He soothed their pains, wrapped their ankles, healed their wounds, listened patiently to their problems, and offered his encouragement. Most important, he became their friend.

In 1970 Grant was honored by North Carolina State for his years of dedication. He was given a car, plaques and tributes from former Wolfpack athletes and staff in a special ceremony at halftime of a football game at Carter-Finley Stadium.

He continued working past retirement age until illness forced him to quit in the Spring of 1982.

Always an asset to his community and his university, Grant personified loyalty and dedication. In an age of leisure and permissiveness, his characteristics were hard work and discipline.

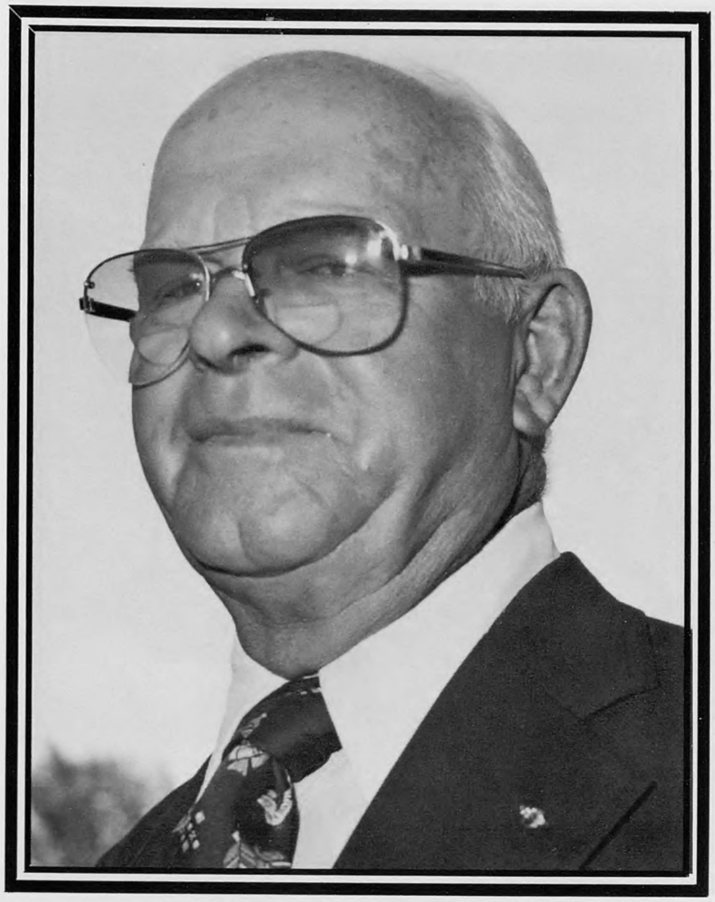
Grant is survived by his wife, Lessie M. Grant, a stepson, Robert E. Hill of Woodbridge, VA, a foster son, Lt. Andrew W. Jenkins of Wilmington, NC, and two grandchildren.

The special relationship Grant shared with North Carolina State's athletes is described in the words of NSCU Associate Director of Athletics, Frank Weedon, who knew the deceased for more than twenty years:

> "Chester did not have any children of his own," said Weedon, "but he sure had many of them here at North Carolina State."

Honoring Grant with a permanent, yet living, memorial, the NCSU Athletic Council adopted a resolution naming the training facility in State's legendary Reynolds Coliseum as The Chester A. Grant Training Room.

In Memorium



Albert C. "Whitey" Gwynne

June 4, 1910 — October 28, 1982

On October 28, 1982, Albert C. "Whitey" Gwynne died. Whitey had achieved international prominence as the athletic trainer at West Virginia University.

Upon receiving his bachelors degree in 1934, Gwynne coached the West Virginia University wrestling teams. He was awarded his masters degree in 1938. Whitey served as assistant trainer to the late Art Smith until 1942 when he joined the Navy for duty in World War II. He retired with the rank of Lieutenant Commander in The Naval Reserve.

Whitey was appointed Head Trainer of all sports upon his return to WVU in 1946. He gave up football training duties in 1966 for health reasons, but remained basketball and baseball trainer until his retirement on June 30, 1975.

Widely known for his work with West Virginia's athletic teams, he achieved his greatest fame as trainer of U.S. basketball teams for the Olympic Games, Pan American Games, and World Championships.

He served as trainer of the 1968 gold medal team at Mexico City. He filled the same role for the 1972 team that was upset by Russia in the finals at Munich.

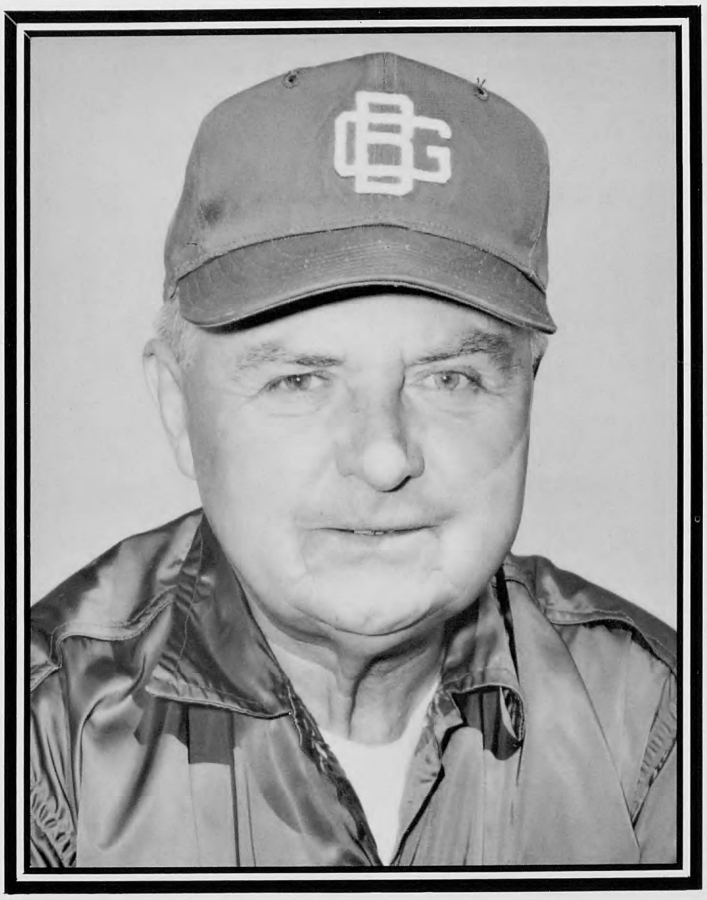
Whitey also trained U.S. basketball teams in the 1963 Pan American Games at Sao Paulo, Brazil, and the 1963 World Championships at Rio de Janeiro. In 1964 he toured Poland, Czechoslovakia and France with a State Department sponsored basketball team.

Whitey was also very active in the early formation of the NATA. He was a member of the Helms Hall of Fame and a charter member, past president and director of the National Athletic Trainers Association which he helped organize in 1949.

The family requests that any donations be made to the Whitey Gwynne Memorial Fund which will be used for athletic training education. Donations should be sent to:

John Spiker
148 Coliseum
West Virginia University
Morgantown, West Virginia 26506

In Memorium



Carl "Bud" Jorgenson

December 5, 1904 – December 18, 1982

Carl "Bud" Jorgenson died on December 18, 1982 of a heart attack. The 78 year old Jorgenson has been the long time trainer for the Green Bay Packers Football Club.

Bud began his career in the training profession in 1924 as the equipment manager and assistant trainer for the Packers. This began a forty-seven year stint with Green Bay.

In 1940 Bud Jorgenson became head trainer for the Packers. He held that position until 1969. During his tenure as a trainer with Green Bay, Bud worked for the two winningest coaches in Packer history, Curly Lambeau and Vince Lombardi. Bud was greatly loved and admired by the players throughout his career. He often referred to the players as "my kids."

In 1970 Bud again became an assistant trainer for the Packers while working with head trainer Dominic Gentile. He retired later that year.

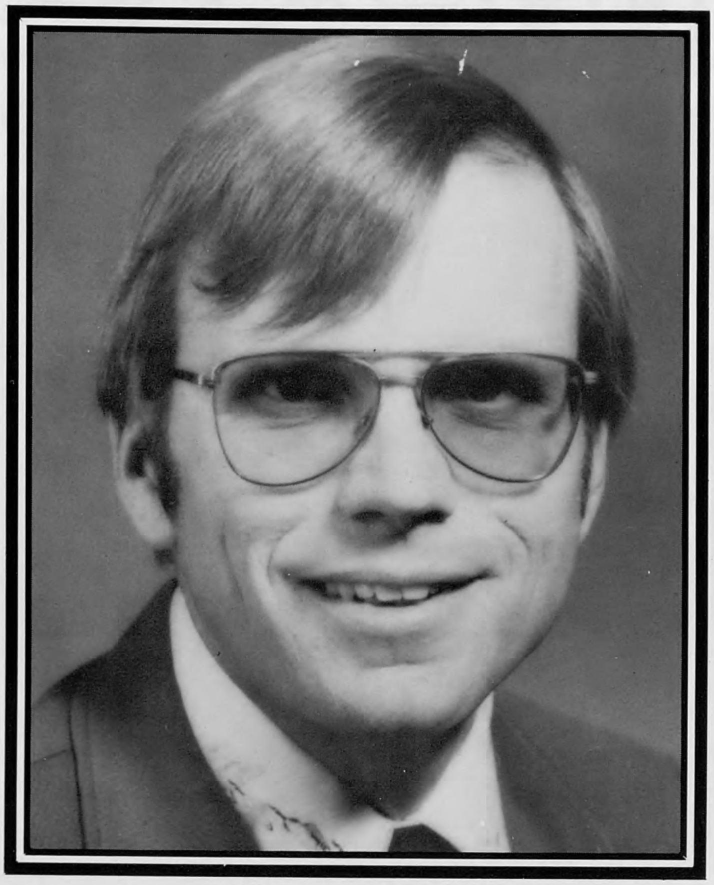
Following his retirement from the Packers, Bud still remained active. He worked for a number of years as a trainer for the University of Wisconsin Green Bay Basketball program.

In 1967 Carl Jorgenson was inducted into the Helms Hall of Fame and in 1975 he was inducted into the Green Bay Hall of Fame.

Bud is survived by his daughters Ruth, who lives at home, and Judy Kuckkahn of Manitowoc, Wisconsin. He has two grandchildren. His daughter-in-law Gloria Jorgenson lives in Green Bay.

For many years Bud was a part of the Green Bay Packer organization. He will be missed by all who knew him but will live on as another of the Packer Legends.

In Memorium



Warren H. Lee

January 20, 1941 – December 13, 1982

Warren H. Lee died on December 13, 1982 at the age of 41 after a prolonged illness. For the past 15 years, he had been the Head Athletic Trainer and an Instructor in Health, Physical Education, and Recreation at the University of Arizona. Warren graduated from Pacific Lutheran University with a Bachelor of Arts in Education in 1964; it was here that his interest in athletic training was developed as a member of the football and track teams until his sophomore year. He completed his Master of Education at the University of Arizona in 1966.

Prior to his position at the University, Warren was the Head Athletic Trainer at Pueblo High School in Tucson, and an Assistant Athletic Trainer at the University of New Mexico. His concern for the proper care for high school athletes was evident early in his career and he was quite involved in the recruitment, supervision and in-service training of athletic trainers at the local high schools for over a decade. His academic assignment kept him actively involved in the teaching and development of many Certified Athletic Trainers through the University's athletic training curriculum.

Warren was very involved in the athletic training profession. He was Director of the Rocky Mountain Athletic Trainers Association from 1974-77 and thus was District 7 representative on the NATA Board of Directors for that same period of time. He also served terms on the Joint Commission on Competitive Safeguards and Medical Aspects of Sports, as well as the NATA Membership Committee and Ad Hoc Committee for Selection of International Games Trainers. As a scholar of the profession, he had many presentations in a variety of settings, including a lecture at the 1970 NATA Annual Symposium. Warren's efforts were recognized in 1979 when he was the initial recipient of the Arizona Athletic Trainer of the Year as selected by the Arizona Medical Association.

Warren will be remembered as a dedicated, religious family man and community member. He was quite active in little league baseball and was President of the Sahuaro Little League, a position he dedicated himself to and loved as much as his professional vocation. He was a tireless, hard worker, on the go at all times and made sure that things were always completed. His concern for the injured athlete was sincere and he was considered a friend to the athlete, community members, and fellow trainers.

Warren is survived by his wife, Andrea, and his children, Erik and Alison. The NATA deeply shares in their loss.

The Use of Ice, Airsplints, and High Voltage Galvanic Stimulation in Effusion Reduction

Patrick Lamboni, ATC, MEd and Bill Harris, BA

The practice of combining ice, compression, and elevation has long been an accepted mode of treating athletic injuries. The use of these modalities aids in decreasing effusion, which in turn decreases pain. There have been many advancements in the area of cryotherapy, and the introduction of cold compression units has made great strides in reducing time lost due to effusion. However, not many training room budgets have the luxury of purchasing the compression units.

By combining equipment available in most training rooms, you can apply compression and cold therapy by using air splints and ice. Simply conform an ice bag to the injury site, apply the appropriate air splint, and elevate (Figure 1). This effectively supplies your athlete with the three necessary components of effusion reduction — ice, compression, and elevation (I.C.E.). The duration of the treatment should be in conjunction with your normal protocol, however you must monitor the extremities to insure that complete constriction has not taken place. The airsplint must be filled with enough air so as to be "snug," but not too tight for this may cause more damage than good. The use of these modalities is not new, but is an effective tool for your use.

To make this system even more efficient, the addition of high voltage galvanic stimulation (H.V.G.S.) can increase the effects of I.C.E. H.V.G.S. aids in effusion reduction in two ways. First, it causes muscular contractions which "milks" the exudate from the area, increasing lymphatic drainage. Second, it stimulates the body to manufacture and secrete enkephlins, which is the body's natural anti-inflammatory agent. Using H.V.G.S. in conjunction with I.C.E. is a good method of eliminating effusion and pain.

Our mode of H.V.G.S. is the Microdyne I (Figure 2). The placement of pads is the same as your normal protocol for H.V.G.S. We use a low pulse rate (5 to 30 pulses per second), stimulating for 30 seconds at as many volts as is tolerable, and no stimulation for 15 seconds. Like all systems, this procedure does have a few drawbacks. It is bulky, sometimes difficult to apply, and someone must sit at the control of your voltage regulator. However, we have found that the results far outweigh the drawbacks.

The H.V.G.S. is a modality that is appearing in more and more training rooms. The method we have described has been an efficient method of reducing effusion which decreases rehabilitation time. +

Figure 1

Figure 2

Mr. Lamboni is the Head Athletic Trainer at Salisbury State College in Salisbury, MD 21801. Mr. Harris is a Graduate Assistant Athletic Trainer at Salisbury State College.

Editor's Note: Anyone wishing to have an idea, technique, etc. considered for this section should send one copy to **Dave Burton, Duncanville High School, Duncanville, TX 75116.** *Copy should be typewritten, brief, and concise, using high quality illustrations and/or black and white glossy prints.*

Association Activities

David G. Yeo, DPE, ATC
Montgomery County
Community College

One of the purposes of the "Association Activities" column is to report on member accomplishments and individual honors. In each Fall issue of the *Journal*, the NATA members and other individuals earning awards, honors, and scholarships in 23 various categories are identified. In an attempt to put these awards in some perspective, some further description must be provided concerning the highest and most prestigious award that can be bestowed upon an athletic trainer, the Distinguished Service Award. In addition, a brief biographical sketch of the two past recipients is also fully warranted to give just recognition of their contributions to the profession.

The Distinguished Service Award is sponsored by the American Orthopaedic Society for Sports Medicine, a professional organization of approximately 700 orthopaedists. Each NATA District nominates one name to the Selection Committee of the AOSSM, presently served by Fred Allman, MD, Atlanta; James Andrews, MD, Columbus; Joe Gieck, University of Virginia; Kenny Howard, Auburn University; and Frank McCue, MD, University of Virginia. The recipient of the Distinguished Service Award must be a member of the NATA Hall of Fame. The AOSSM presents a $2,000 donation in the recipient's name to the NATA Scholarship Fund.

It is a privilege to relate some of the biographical information of the first two recipients of the Distinguished Service Award, William "Pinky" Newell (1981), and Otho Davis (1982).

William E. "Pinky" Newell received his Bachelor's of Physical Education degree from Purdue University in 1947, and his Certificate of Physical Therapy from Stanford University in 1948. After teaching and serving as Head Athletic Trainer at Washington State College (Pullman) from 1948-49, Pinky began teaching in the Department of Physical Education and Recreational Studies at Purdue University in 1949, where he is currently an assistant professor. Pinky was Head Athletic Trainer at Purdue from 1949-1977, and since 1960 he has served as Chief Physical Therapist at Purdue Student Hospital.

Pinky Newell was one of the key individuals responsible for organizing athletic trainers on a national basis, and has been described as the "Father of the Modern Era of Athletic Training". He was the National Secretary of the NATA from 1955-1970, a period of tremendous growth and development for the athletic training profession. Pinky has served as Chairman of the NATA Professional Advancement Division, and currently is Chairman of the NATA Grants and Scholarships Committee. He is a member of the Indiana Football Hall of Fame, and has served as an athletic trainer for college All-Star games (1953, 1954, 1957), the 1963 Pan American Games, the 1976 US Olympic Team and the 1980 US Olympic Winter Games.

Pinky has been a key force in obtaining several rule changes in football as well as significant improvements in equipment and training techniques. He perhaps has accomplished more than any other individual in upgrading the educational and professional standards of athletic trainers over the last 25 years.

Otho L. Davis received his Bachelor's degree in Physical Education from Lamar University, and his M.A. degree in Physical Education from Kent State. He began his athletic training career by treating military service teams while serving in the U.S. Army Medical Corps, 1954-56. Otho served as an athletic trainer at Lamar University, Kent State, and Duke University before becoming the Head Trainer for the Baltimore Colts Football Club, 1971-73. Since 1973, he has been the Head Trainer for the Philadelphia Eagles Football Club.

Otho's service to the NATA began in 1963 when he was elected to a two-year term as Secretary-Treasurer of District 4. He was Secretary-Treasurer of District 3 from 1969-71. From 1976 to the present he has been President of the Pennsylvania Athletic Trainer's Society. Of most significance, Otho was named the first Executive Director of the NATA in 1971, and has held that office ever since.

Among Otho's numerous professional contributions are several published articles and professional exhibits, three grants for research in athletic training, three patents for various devices used in treating athletic injuries, and a gold medal award in the 1977 International film and TV festival for his film, "What Is Conditioning". The Drackett Company named Otho the Trainer of the Year in the Professional Division in 1977, 78, 80, and 81. Otho was listed in "Who's Who In the East" (1976), and is currently working on a text in athletic training.

The Distinguished Service Award is the ultimate honor an athletic trainer can receive from his profession and his colleagues. The NATA is very privileged once again to recognize Pinky and Otho, two "giants" of dedication, leadership, competence, and humility. We are, indeed, fortunate that these respected and admired leaders continue to serve the profession and the Association.

District News

Districts 1 and 2 have initiated plans for a Scholarship Fund for two students, one from each District. The Districts are also establishing the Joseph Abraham Scholarship Fund.

Phillip Donley, PT, ATC, of West Chester State College served on the faculty of an American College of Sports Medicine colloquy on guidelines for establishing sports medicine clinics. Also active in the area of educating physicians, physical therapists, and hospital/clinic administrators in how to start and manage sports medicine programs is Ron Peyton, PT, ATC, Atlanta. The comments and guidelines of these trainers and other experts were reported in the October 1982 issue of *The Physician and Sportsmedicine*.

District 3 — Martha Godfrey, a graduate student in athletic training at Old Dominion University, Virginia, successfully evaluated and treated a critically injured O.D.U. rugby player this fall. The player sustained a fractured cervical vertebrae with spinal cord pathology, but after proper emergency procedures and two operations is expected to make a good recovery.

District 4 — Al Rector, athletic trainer at Ohio Wesleyan University from 1951-78, has been inducted into the O.W.U. Athletic Hall of Fame. Rector was dean of the Ohio Athletic Conference trainers with 27 years of service to O.W.U.

Dr. Robert Behnke has been elected Vice President of the NATA. Bob is a member of the Board of Directors, Chairman of the Licensure Committee, and head trainer at Indiana State University.

District 7 — Troy L. Young from Arizona State (Tempe) has been appointed the liaison from NATA to the U.S. Olympic Committee.

Trainer of the Year. The recipients of the 1982 Trainer of the Year Awards, as sponsored by the Drackett Company are:

High School — Glen Snow, Floyd Central High School, Indiana
Junior College — Bill Chambers, Fullerton Junior College, California
College — Chris Patrick, University of Florida, Gainesville
Professional — Jerry Rhea, Atlanta Falcons Football Club, Georgia

NATA members featured in this year's segment of "They Keep 'Em Playing", as televised during the Tangerine Bowl, were Fred Hoover, Clemson University, and Glen Snow, Floyd Central High School.

Notice: One of the most significant meetings of the NATA Annual Meeting and Clinical Symposium is the Student Athletic Trainers Awards Banquet. In the 1983 convention, this meeting will be held on Sunday, June 12, at 12:00 noon, and is an ideal opportunity for all trainers at the convention to give support to student trainers who are beginning their professional career. The S.A.T. Banquet is coordinated by Dean Weber, University of Arkansas.

Historical Flashback

Mike O'Shea, MA, ATC
University of Miami

ATHLETIC TRAINING, The Journal of the National Athletic Trainers Association.

When was the Journal founded?

It was decided at the 1956 NATA National Convention in Boston, Massachusetts to begin publication of a journal for the Association. The new publication would be entitled, *The Journal of the National Athletic Trainers Association.* Today the publication is known as *Athletic Training, The Journal of the National Athletic Trainers Association.*

Who was the first editor?

Arthur Dickenson, Arizona State College

Why the Journal?

As stated by Arthur Dickenson in the 1956 Journal, there were three reasons why there was a need for a Journal:

1) There is a need for an exchange of ideas and techniques.
2) The Journal will be able to disseminate information of professional interest to the athletic trainer.
3) The professional stature of the organization can be raised.

A survey taken in the first NATA Journal.

An interesting article in the first Journal was titled "How They Answered" by Eugene Christman. It was a survey taken of athletic trainers.

One important fact in the survey was that out of 61 athletic trainers, the highest yearly salary was $8,655.00 for a trainer 52 years old who had 28 years experience.

The lowest salary was $4,300.00 for a trainer 62 years old who had 38 years experience.

Name These Trainers . . .

Answers: Army Football Coaching Staff — 1945

Left to right:

Rollie Beven — Head Athletic Trainer
Herman Hickman — Line Coach
Earl (Red) Blaik — Head Coach
Andy Gustafson — Backfield Coach

The University of Kentucky "Family Tree"

(Thanks to Al Green, Head Trainer at the University of Kentucky)

NAME	DATES	WHERE THEY ARE
Frank "Skipper" Mann	1924-1945	Much is written
Phil Hudson	1945-1947	Records lost in a flood
W.E. "Bud" Burger	1948-1950	Records lost in a flood
Charles "Smokey" Harper	1950-1953	Followed "The Bear" to Texas A&M and Alabama
John "Rusty" Payne	1954-1964	Director, Student Teaching, Morehead State University
Ralph Berlin	1968-1974	Head Trainer, Pittsburgh Steelers
Chris Patrick	1968-1970	Head Trainer, University of Florida
Roy Don Wilson	1970-1978	Southwest Louisiana Univ. Now Sports Medicine Clinic
Mike Ritz	1978-1979	Private business
Al Green	1978-	

Please send your "Family Tree" to me if at all possible.

Michael O'Shea, ATC
University of Miami
P.O. Box 248167
Coral Gables, Florida 33123

TRAINER OF THE YEAR AWARD

Four NATA members were honored at the seventh annual Trainer of the Year Award ceremony, held December 14 at the College Football Hall of Fame near Cincinnati, Ohio. The presentation was videotaped and broadcast New Year's Eve on the Bluebonnet Bowl.

Ballots for the awards were sent to all certified members of the NATA by The Drackett Company, which sponsored the awards for their product Nutrament.

Winners in this year's balloting were high school trainer Glen Snow, junior college trainer Bill Chambers, university trainer Chris Patrick and NFL trainer Jerry Rhea.

Glen Snow, trainer at Floyd Central (IN) High School, is Vice-President of District IV, serves on the Professional Education Committee and represents NATA in the Joint Commission on Competitive Safeguards in Sports.

Bill Chambers has spent his entire career at Fullerton (CA) Junior College. Bill is immediate past President of the NATA and has held a number of executive positions within the Association. Additionally, he is an advisor to the National Athletic Health Institute.

Chris Patrick, University of Florida, has also been active in NATA for many years, and has served on the Board of Directors. Currently, he is Chairperson of the Code of Ethics Committee and acts as NATA liaison to the American College Health Association.

Jerry Rhea, of the NFL Atlanta Falcons, is president of District IX and President of the Professional Football Athletic Trainers Society. He is also a member of the Georgia Board of Athletic Trainers.

Winners of the 1982 Trainer of the Year Awards prepare to go before the television camera. Receiving the attention of a make-up artist is Glen Snow. Next to Glen are Bill Chambers; John Courter, The Drackett Company; NATA President Bobby Barton, who accepted the award for Jerry Rhea, and Chris Patrick.

NATA Around the World

In the Winter 1982 issue, the *Journal* listed the names and addresses of the NATA International Affiliate members. To further promote communication and unity within our profession, it is also a pleasure to identify our current NATA certified members who are working outside of the United States.

Roy Sandy Archer
142 McCarthy Blvd. N
Regina, Saskatchewan, Canada

C.W. Badcock
14 Wurksworth Way
Winnipeg, MAN R3K0J9

Sheldon E. Balberman
1968 Main St. #606
Hamilton, Ontario, Canada

Dale Butterwick
Bishops University
Lennoxville, QUE J1M 177

Kenneth Carson
Toronto Blue Jays Baseball Club
Toronto, ONT, Canada

G. Patrick Connors
P.O. Box 5747
Manama, Bahrain, Arabian Gulf

Karl Elieff
Box 37 Commerce Court E
Toronto, ONT, Canada

A. Kerry Frey
CMCH Vellore 632004
Tamil, Nadu, India

Sheila Rae Iversen
524-40 Ave. NW
Calgary, ALTA, Canada

Gordon Mackie
University of Manitoba
School of Physical Education
Winnipeg, Canada

James E. Mac Leod
School of Rec. and Phys. Ed.
Acadia University
Wolfville, Canada NS B0P 1X0

Donald F. Mattern
#8 Ruselawn Place
Calgary, Alberta, Canada

Dexter S. Nelson
5240 Varsity Dr. NW
Calgary 49, ALTA, Canada

Edgar R. Nowalkoski
York University
4700 Keele Street
Downsview 463, ONT, Canada

Dan J. Ulesewich
RR #2
Harrow, Ontario, N0R 1G0

David L. Paris
Phy. Ed. Univ. of New Brunswick
Fredericton NB
Canada E3B 5A3

Stanley Schwartz
2735 Lionel Cres SW
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Canada

Jiro Shikakura
3-21-12- Kotobuki
Taito-Ku
Tokyo 111 Japan

Vincent S. Smyth
c/o Athletic Department
Mount Allison University
Sackviele, NB CAN E0A 3C0

Brian D. Townsend
3071 Gambin CT Mississauga
Ontario, Canada L5A 376

Joseph N. Twardowski
1056 Woodside Drive
Dollard Des Ormeaux
Quebec H9V, 1P9, Canada

David Yick Leung Wong
LAI Sing Court 13 TAI Hang RD
12 FL Flat B
Hong Kong

Announcements

Schedule of Future Sites and Dates NATA Certification Examination

All regional sites subject to a **minimum** of six candidates per site and limited to a **maximum** of 30 candidates. Applications are accepted and scheduled for sites in order of remittance.

NOTE: All sites are subject to change within the region.

January 9, 1983 — Deadline for returning applications is 11-27-82

New Britain, CT
Philadelphia, PA
Raleigh, NC
Chicago, IL
Dayton, OH
Fort Worth, TX
Denver, CO
Sacramento, CA
Portland, OR

March 20, 1983 — Deadline for returning applications is 2-5-83

Boston, MA
Pittsburgh, PA
Lincoln, NE (3-18-83)
Tucson, AZ
Costa Mesa, CA
Richmond, KY
Boise, ID
Anderson, IN
Fort Worth, TX
Springfield, VA

June 26, 1983 — Deadline for returning applications is 5-21-83

New Britain, CT
Philadelphia, PA
Raleigh, NC
**Chicago, IL
Lawrence, KS
*Denver, CO
Sacramento, CA
Richmond, KY
Portland, OR

July 31, 1983 — Deadline for returning applications is 6-18-83

Boston, MA
Philadelphia, PA
**Chicago, IL
Cedar Falls, IA
Costa Mesa, CA (7-29-83)
Chattanooga, TN
Seattle, WA
Raleigh, NC

WHEN REQUESTING AN APPLICATION: It must be in written form, it must state the date to be examined and what section you will be applying under. Application forms are available from:

NATA Board of Certification
P.O. Drawer 1865
Greenville, NC 27834

NOTE: The 1984 examination dates will approximate the 1983 dates on a regional basis.

All items must be received by the NATA Board of Certification Office by the specified deadline for the date you have chosen; however, all applications are accepted and scheduled in order of remittance.

*Test site not at National Meeting
**Change from previous listing

NATA Audio-Visual Aids Committee

The NATA Audio-Visual Aids Committee will revise the bibliography of media items available to our membership this year. Please inform your district committee member if you are aware of or use a media item in your program that may benefit other members of our profession.

Committee Members

Michael Rule (Dist. I)
Keaney Gymnasium
Univ. of Rhode Island
Kingston, RI 02881

G. Patrick Connors (Dist. II)
Program Director
The Institute for Medicine in Sports
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Robert S. Gray, Jr. (Dist. IV)
3187 West 21st Street
Lorain, OH 44052

Jerry Nowesnick (Dist. IV)
College of Du Page
22nd St. & Lambert Rd.
Glen Ellyn, IL 60137

Jerry Weber (Dist. V)
Dept. of Athletics
Stadium Office Building
University of Nebraska
Lincoln, NE 68588

Allen Eggert (Dist. VI)
Rice University
Houston, TX 77002

Thomas E. Abdenour (Dist. VII)
Head Athletic Trainer
Weber State College
Ogden, UT 84408

Robert E. Smetanka (Dist. VIII)
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Apt. #3
San Francisco, CA 94122

James A. Madaleno (Dist. IX)
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Athletic Dept.
Valdosta, GA 31698

Dennis T. Murphy
University of Montana
Field House 208
Missoula, MT 59801

John Streif
University of Iowa
FH Training Room
Iowa City, IA 52242

SEIZURES IN ATHLETICS

Steve Marti, ATC

Imagine yourself working a routine practice, when suddenly an athlete falls to the ground. All the body musculature stiffens, the eyes turn up or to one side, the jaws close tight, saliva and bloody froth form at the lips, and the athlete becomes cyanotic. He or she does not respond to calls of "Are you okay?". What is wrong with this athlete? What would you do to help?

The athlete is having a seizure, and even though it may be caused by a number of reasons, in the field of athletics it is probably from a head injury or the athlete is an epileptic. Now, how are you going to handle this frightening situation? Do you carry an oral screw and tongue forceps for such situations? (Figure 1) Are they needed during a seizure to pry open the jaws (oral screw)? Does the tongue need to be pinched and pulled forward to prevent an obstructed airway (tongue forceps)?

This article will familiarize the reader with the etiology, pathophysiology, and current emergency treatment of seizures. A short survey is included to show how fifty certified athletic trainers feel about carrying an oral screw and tongue forceps and whether they have ever used either device.

Etiology

In athletics, an athletic trainer or coach may encounter an athlete having a seizure because he or she is an epileptic. Nolen (5) estimated that there are about two million epileptics in the United States. All forms of epilepsy are caused by a malfunction of the neurons, the cells of the brain. Epileptic seizures occur when one or more nerve cells fail to return to a resting state and instead continue to produce a stream of electrochemical impulses. Acquired epilepsy can be caused by a number of reasons, one of which is injury to the brain from trauma. Nolen (5) also estimated that every year 190,000 seizure producing head injuries are caused by automobile accidents. In fact, two or three years may elapse after a head injury from an auto accident, a football game, or simply a fall before epilepsy develops. This is because it may take that long for brain scar tissue (which sets off the seizure) to develop.

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Head trauma is one of the most common causes of epilepsy in the young adult. In about 5 percent of the patients with severe closed head injuries, epilepsy occurs within two years. This incidence rises to 30-50 percent in patients with open head injuries that penetrate the skull and dura. Seizures are most likely to occur within the first year of the injury; 90 percent of the risk of having post-traumatic epilepsy is over by the end of the second year. Seizures that develop during the first week after head trauma imply a less serious prognosis than those that appear after a long interval. (7)

Figure 1

Pathophysiology

Most seizures athletic trainers and coaches will be concerned with are of the Grand Mal type. An aura can be present just prior to the onset of the seizure. This can warn the person of an impending seizure. This aura occurs in the form of unusual colors, smells or sounds, numbness, tingling, or other disturbances. Some persons will utter a sharp cry just prior to the attack. (2, 5, 6, 7)

During the seizure, all of the body musculature, including the diaphragm, stiffen or become rigid. The diaphragm, in fact, is locked in the down position and is called diaphragmatic spasm. There is no respiratory activity for up to 75 seconds, the eyes turn up or to one side, and the jaws tighten and lock shut with the victim possibly biting the tongue in the process. This spasm of the respiratory muscles prevents breathing, and the victim becomes cyanotic. (7) This is called the Tonic Phase of a seizure (Figure 2). It should be noted that the tongue blocking the airway has not caused the cyanosis or apnea but rather the rigid contraction of all the respiratory muscles. Therefore, efforts to pry the jaws open and pull the tongue forward will be futile and could easily cause more harm to the victim by breaking teeth or damaging the gums. Further complications may result if fragments of broken teeth are aspirated into the airway passages during a deep breath before regaining consciousness.

The next phase of the seizure is called the Clonic Phase (Figure 3) and normally lasts from two to four minutes. It is during this phase that the victim will experience alternating contracting and relaxing of the muscles. This causes the jaws to open and close many times. Saliva or bloody froth may form on the lips, and the victim may lose sphincter control. During this Clonic Phase, the victim could again bite or even chew the tongue causing aspiration of blood or pieces of tongue tissue.

Warner (8) stated that as the seizure continues, the patient tends to injure the flailing extremities, lacerate the tongue between clenched teeth, and become more and more cyanotic. He further explains that it is this increasing cyanosis that finally makes the brain hypoxic; and because of a lack of adequate oxygen, the brain cells stop firing. This explains why most generalized seizures cease spontaneously after a few minutes.

After the Clonic Phase, the victim relaxes and sleeps deeply. Most Grand Mal seizures last two to four minutes; and the immediate sequelae includes confusion, memory loss, irritability, abnormal behavior, fatigue, muscle weakness, and headache. These symptoms occur in the part of the seizure called the Post-ictal Phase. (6, 7)

In rare cases, the victim may have recurrent, major, generalized seizures between which there is no resumption of consciousness. This is known as Status Epilepticus, and it may last for several hours. It is a medical emergency, and the victim could die from the disorder. Obviously, prompt medical attention is needed in such rare instances.

Figure 2

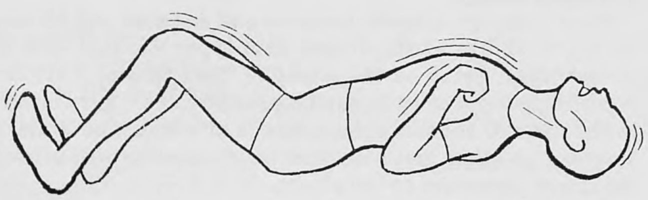
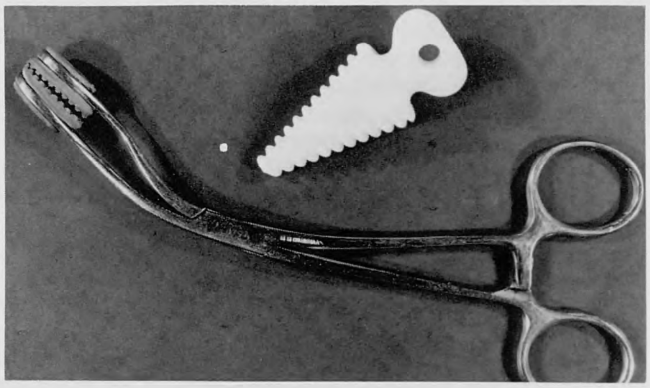


Figure 3

Treatment

One of the biggest problems in the treatment of a seizure is the witness injuring the victim having the seizure. Broken teeth, injured gums, strained muscles, and sprained ligaments may all result from the bystander trying to help the victim. The main concern then is with the person biting and even chewing the tongue. The prevention of this should be one of the trainer's or coach's main concerns. It is important that the observer remains calm. The seizure cannot be arrested; the intense contractions do not produce pain, as the victim is usually completely unconscious. Clear the area around the victim of hard objects. Place something soft, i.e., a pillow or towel under the head. If possible, turn him on his side to allow drainage of any vomitus or blood. Do not force anything between the jaws if they have already closed tight, which will be the case if the tonic phase has started. (1, 2, 4, 6, 8) Warner (8) stated that prying open the mouth by itself does not assist respirations. They are inadequate because of diaphragmatic spasm, not an airway obstruction. In first aid for seizures, Boshes and Gibbs (1) stated, "Do not force open the clenched jaws. Do not force anything between the patient's teeth." If possible, before the jaws close or during the clonic phase when the jaws open and close, place a stat stik (Figure 4) or an oralpharyngeal airway in the side of the mouth to prevent the victim from biting the tongue. Carefully observe the details of the attack for a medical report later. When the seizure is over (Post-ictal Phase), allow the victim to rest and sleep if he wishes. Also, turn him on his side to prevent airway obstruction due to excessive secretions or a relaxed tongue. This is extremely important, as during this phase the person is extremely confused and usually unable to control his own airway. Finally, the victim should be evaluated by a doctor to determine the exact cause of the seizure since most epileptics should be on medication for control of seizures.

Figure 4



Results of Survey

A survey (Figure 5) was sent to fifty certified athletic trainers to obtain a rough estimate as to whether an oral screw and tongue forceps should be or are carried. As to if or when the oral screw or tongue forceps were used, the 32 percent who responded "yes" to the use of the oral screw did so only to keep the jaws open. A few trainers stated the tongue forceps were used to retrieve a foreign body lodged in the throat, but they were not used to pull the tongue forward while the athlete's jaws were opening and closing in a seizure.

Summary

A seizure, no matter what the cause, can be a frightening experience for an unsuspecting witness. Knowing how to properly treat an athlete having a seizure is the responsibility of all trainers and coaches.

The most common type of seizure is the Grand Mal, and it normally has two phases: (1) the tonic, when the jaws close tight and all of the body musculature, including the diaphragm are in spasm, causing no respiratory activity, and (2) the clonic, when the jaws open and close along with jerking movements of the extremities. These can be very alarming for a coach or trainer who is unfamiliar with seizures.

Figure 5. Form used to survey 50 Certified Athletic Trainers.

NAME: ____________________

POSITION: ____________________

SCHOOL: ____________________

1. Do you feel these devices (oral screw and tongue forceps) should be carried?

   Yes 80% No 20%

   If so, by whom?

   54% a) all trainers
   16% b) only those certified
   14% c) head and/or assistant
   0% d) trainers who are EMT's

2. Do you carry an oral screw?

   14% a) never
   60% b) just for practice and games
   26% c) keep one in the kit

3. Do you carry a tongue forceps?

   14% a) never
   70% b) for practice and games
   20% c) keep one in the kit

4. Have you ever used an oral screw or tongue forceps?

   Yes 32% No 68%

   If so, what was the situation; how effective was it? (Describe briefly.)

It is, therefore, important to know how to treat the athlete in such a situation so as not to inflict any unnecessary harm to him or her. Remaining calm, protecting the athlete from hurting himself by removing nearby objects, placing a pad under the head, and inserting a jaw block, if possible, are important steps to remember in the immediate care of the seizure. All trainers and coaches hope they are never confronted with anyone having a seizure, but if so, it is reassuring to know what to do in such a situation.

References

1. Boshes LD and Gibbs FA: *Epilepsy Handbook*, Springfield, Illinois, 2nd edition, 1972.
2. Caroline N: *Emergency Care in the Streets*, Little, Brown & Co., Inc., Boston, Massachusetts.
3. Gastaut G and Broughton R: *Epileptic Seizures, Clinical and Electrographic Features, Diagnosis and Treatment*, Charles C. Thomas, Publisher, Springfield, Illinois, 1979.
4. Hafen BQ: *First Aid for Health Emergencies*, West Publishing Co., St. Paul, Minnesota, 1981.
5. Nolan WA: The Truth About a Misunderstood Sickness, *McCalls*, November, 1978, pp. 82-84.
6. Sands H and Winters C: *The Epilepsy Fact Book*, Charles Scribner's Sons, New York, New York, 1979.
7. Solomon GE and Plum F: *Clinical Management of Seizures*, W.B. Saunders Co., Philadelphia, Pennsylvania, 1970.
8. Warner CB: *Emergency Care, Assessment and Intervention*, The C.V. Mosby Co., St. Louis, Missouri, 1978. +

Psychological Factors in Sports Medicine

Ron Dunn, ATC, MEd

Introduction

Are athletic trainers treating the body or the mind? This question may appear extremely simple at first glance. Training rooms are filled with thousands of dollars worth of various modalities designed to treat almost any physical ailment an athlete might receive. Trainers have access to the most sophisticated rehabilitation equipment science can produce. Orthopedic surgeons and other specialists are readily available for expert diagnosis and care. Despite all these resources designed to cure the injured athlete, most trainers would agree that correcting the physical malfunction is only half the battle. A leading text in Athletic Training states "psychological conditioning is as important and as much the responsibility of the trainer as physical conditioning or reconditioning." (7) An athlete must also realize that his recovery depends on the proper attitude as well as on the physiological processes involved. It is the purpose of this paper to examine ways the trainer can establish a favorable climate in which the body and mind can work together to overcome an athletic injury or illness.

Dr. Paul Conn, psychologist, writes "As more is learned about the human body and the way it works, it is increasingly apparent that what was once thought to be a clear-cut division between the body and the mind is not so clear after all." (1) Numerous examples have been documented where individuals have betrayed the laws of medical science and conquered serious injuries or illness. Norman Cousins, in his book *Anatomy of Illness*, describes how he used laughter and positive thinking, along with guidance from his physician, to cure a blood disease which most physicians described as incurable. (1) John D. Rockefeller, after his retirement at the age of fifty-seven, hired his own physician Dr. Bigger to keep him well, happy and alive. Dr. Bigger achieved this goal through motivating his patient to develop a cheerful, happy attitude and his patient lived to be ninety-seven years old. (6)

Attitude

There is overwhelming evidence that disease or illness sometimes begins in the form of a negative thought impulse which may be passed from one mind to another by suggestion or created by an individual in his own mind. (5) Trainers and coaches may be guilty of initiating these thought impulses. Complaining of a large amount of injuries or using injuries as an excuse for lack of success will only predispose more injuries. It is a well known fact that one comes finally to believe whatever one repeats to himself or hears from others. (5) If every man is what he is because of the dominating thoughts which occupy his mind, it is important to fill the mind with positive thoughts. The trainer should concentrate on the positive aspects of the health of his team and take constructive action to correct any health problem which may presently exist. The old cliche of "what you say is what you get" is probably not too far from the truth. Dr. Schwartz, in his book *The Magic of Thinking Big*, lists four things a person can do to correct negative health thinking. 1) Refuse to talk negatively about health. A person may receive a little sympathy but will never get respect or loyalty by complaining. This is particularly true in athletics. 2) Refuse to worry about poor health. Worry is a negative emotion and fear of ill health or injury in athletics often results in injury or illness due to unconscious adjustment in activity. 3) Be genuinely grateful of good health. This will help keep a person's thoughts focused on the positive aspects of their health. 4) Finally, a person should understand that the body responds to its own needs. Very gradual exercise, not in excess, is an important tool in rehabilitation. (11) What one says and how he reacts to injury plays a major role in determining the magnitude of the condition.

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Communication

A situation the trainer may be confronted with is the athlete who is in the habit of feigning illness to cover plain laziness or lack of ambition. The trainer, for his own protection as well as the athlete's, must respect the athlete's complaint and treat each illness or injury as a legitimate problem. Athletes tend to feel indignant or insulted if the trainer can find no physical cause for the pain. They tend to interpret the term "psychogenic" to mean that they are complaining of non-existent symptoms. (2) The athlete doesn't realize that pain can be caused by other factors like worry and stress. (5) If this is the case, it is imperative that the trainer identify and cope with the real source of pain. An honest, open relationship must be established. This kind of relationship is fostered best when the athlete places trust and confidence in the trainer. The trainer, on the other hand, must be capable of understanding and respecting the player and his feelings.

Self Esteem

Another example would be the athlete who is extremely obstinate and negative toward the training room. This athlete, if analyzed, would probably be suffering from lack of self-love. Self-love comes through self discipline, self forgiveness and self acceptance. An athlete with self-love will exhibit self reliance, self confidence and inner security. (9) Athletes without this feeling about themselves would naturally be discouraged, depressed and lacking enthusiasm which translates into a negative attitude wherever the setting may be. Les Giblen, in his book *How to Have Confidence and Power in Dealing with People*, states that the only effective way to deal with trouble-makers is to help the other fellow like himself better. Feed his ego and the person will not have to put on a false front. The arrogant person who attempts to put another person in their place or make another feel inferior is really suffering of low opinion of himself. A trainer can better understand this behavior if he understands two things: first, this type of athlete needs to increase his own self importance and second, he is afraid. When self esteem gets low enough almost anything can be a threat. (4) The trainer should approach this athlete with a sincere, friendly smile. It makes the person he is smiling at feel self deserving. Then let the athlete express himself in a positive manner. The trainer will find that the athlete, like everyone else, wants as one of his primary goals awareness that he is a worthy person. (9)

Motivation

Besides negative attitude and low self image, the trainer may also have to deal with the athlete with low motivation. Weak desires bring about weak results. (5) Successful coaches and people in all walks of life are using motivation as a method to gain the edge on their opponents. Motivation in athletic training should not be confused with forcing athletes to compete when they are physically incapable or where they run the risk of serious injury. The trainer can motivate by using positive talk to create a positive imagery of what the athlete will experience when he is healthy. Napolean Hill explains how he created this desire in his son who was deaf so he would want to hear. This desire was translated into action and persistent effort so that eventually his son found a hearing device that would make him hear. (5) The athlete must develop this same attitude that he can win despite the handicap. Dr. Robert Schuller describes four qualities of a winner and they apply readily to an injured athlete. 1) Imagination. The self confident person imagines himself being the person he wants to become. This is why it is vital that the trainer help the athlete to focus on what he will be able to do when he is healthy again. Cultivate the desire through vivid imagination of positive thought. 2) Commitment. So strong is the desire to achieve his dream that the self confident person totally commits himself to his goals. Athletes should be encouraged not to sell themselves short and do what it takes to obtain the desired results. 3) Affirmation. The athlete should start affirming that he will succeed. His subconscious mind cannot distinguish between fact and fiction, only what it is programmed to believe with emotion. It will turn this belief into its physical equivalent. 4) Persistence. Patience and persistence are the crowning qualities of self confident champions. (10) Start building the athlete's confidence with small tasks and gradually increase the difficulty. The trainer should allow the athlete the right to fail and do not discourage him if he does. (3)

Environment

Solutions to a negative attitude, poor self image and lack of motivation may lie in the environment the trainer creates in the training room. The trainer should spend his energy working on the positive aspects of players rather than belaboring their negative points. For example, excessive teasing or kidding is aimed at the self esteem of the other person and anything that threatens the self esteem is dangerous business, even if it is done in fun. It is far more beneficial to build the athlete up and make him feel important. Norman Cousins explains that the principal contribution made by his doctor to the taming and conquering of his illness was that the doctor encouraged his patient to become a respected partner with him in the undertaking. (2) Let the athlete understand his role in the rehabilitation process and that his feelings matter. There is one sure way to convince the athlete that the trainer is one of the wisest, most intelligent persons he has ever met, and that is by the trainer listening and paying attention to what the athlete has to say. (4) Frequently, the athlete will convey to the trainer the real essence of the problem if the trainer will only listen.

Finally, a healthy environment includes an element of faith; faith in oneself as an athlete or as a trainer, and faith in the entire program. Above all one must possess faith that there is something greater governing the events of daily living. Faith will help eliminate the negative emotion of fear. (10) It is that inner strength that gives the athlete peace when everything around him seems to falter. Og Mandino, in his classic novel *The Greatest Salesman in the World*, illustrates this feeling of faith by writing "Is it not incomprehensible in a world governed by nature's law to give a lamb, or a mule, or a bird, or man the instinct to cry out for help lest some great mind has also provided that the cry should be heard by some superior power having the ability to hear and answer our cry." (8)

Conclusion

It would appear obvious that a successful trainer directs his efforts to treating both the body and the mind. He recognizes the important role the mind plays in overcoming an injury or illness. By maintaining a positive attitude, improving the athlete's self-esteem and using positive encouragement, the trainer acquires an edge in the battle against athletic injuries. This, combined with sound physiological treatment techniques, is a winning combination in developing a healthier, more successful team. Neil Eskelin sums it up by saying "The real miracle of positive living is that it affects everything you do. In fact, it even changes the atmosphere. You can walk into a room and people will instantly notice there is something special about you." (3) It is this special something that, when all else is equal, will help the positive athlete and trainer come out on top.

References

1. Conn P: *Making It Happen*, Old Tappan, New Jersey, Fleming H. Revell Co., 1981, p. 60.
2. Cousins N: *Anatomy of an Illness*, New York, Bantam Books, 1979, pp. 48 & 91.
3. Eskelin N: *Yes Yes Living in a No No World*, Plainfield, New Jersey, Logos International, 1980, pp. 2 & 21.
4. Giblen L: *How to Have Confidence and Power in Dealing with People*, New York, Benjamin Co., Inc., 1956, pp. 16, 17, 74 & 95.
5. Hill N: *Think and Grow Rich*, New York, Fawcett Crest Books, 1960, pp. 44, 53, 152 & 233.
6. Hill N, Stone WC: *Success Through a Positive Mental Attitude*, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1960, pp. 186 & 193.
7. Klafs CE, Arnheim DD: *Modern Principles of Athletic Training*, 5th ed. St. Louis, CV Mosby Co., 1981, pp. 168 & 177.
8. Mandino O: *The Greatest Salesman in the World*, New York, Bantam Books, 1968, p. 99.
9. Schuller R: *Self-Love*, Old Tappan, New Jersey, Spire Books, 1969, pp. 18 & 27.
10. Schuller R: *You Can Become the Person You Want to Be*, New York, Hawthorne Publishing, 1973, pp. 50, 51 & 75.
11. Schwartz D: *The Magic of Thinking Big*, New York, Prentice-Hall, Inc., 1978, p. 27. +

Flexibility Exercise Re-Examined

Paul R. Surburg, PhD

For many years the property or physical characteristic of flexibility was regarded in terms of stretching exercises for certain athletes. The stereotype stretching exercise was performed by the hurdler working on adductor and hamstring muscles by bobbing and reaching for his toes. Over the last decade numerous changes have occurred in developing and utilizing flexibility.

Articles by sports medicine personnel such as Nicholas (22) have had an impact upon the sports scene. While not all sports medicine personnel agree with Nicholas' (22) screening procedures for determining flexible and tight athletes, his procedure is an attempt to assess flexibility or the lack of this attribute. Certain professional teams such as the Dallas Cowboys, Washington Redskins, and Los Angeles Dodgers have helped to promulgate the value of flexibility exercises concerning prevention of injuries and efficiency of movement.

In light of recent research and current practices in the area of sports medicine, a re-examination of flexibility exercises seems appropriate. This article will delve into the physiological and psychosomatic aspects of flexibility exercises and into the use of these exercises in the sports medicine and athletic settings. Attention will be directed also toward an expanded interpretation of flexibility.

Flexibility may be thought of as a continuum. At one end of this continuum is no flexibility or movement; the condition of ankylosis aptly illustrates the end of the continuum. The other end of the continuum is extreme flexibility or instability; subluxation or dislocation are appropriate terms for conditions at this end.

Between these two extremes lies an optimal level of flexibility that allows efficient execution of movement (6) and a diminution of certain types of injuries. The attainment of this level is usually the goal of a conditioning program.

Following certain injuries, the attainment of normal range of motion (ROM) is the first step toward the development of this optimal level of flexibility. A person could apply the definition of flexibility to ROM; ROM is "able to bend without breaking, not stiff or rigid, easily bent" within a normal arc of movement. Thus, ROM exercises are found on the flexibility continuum between no motion and optimal flexibility. Range of motion exercises on this continuum are used most often in a rehabilitation regimen.

Certain techniques that will be alluded to in this paper may function as ROM exercises or in the narrow sense flexibility exercises. The determinant of function is primarily the current status of the athlete.

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Model of Flexibility Development

In order to attain the desired property of flexibility, an understanding concerning the physiological mechanisms operant in establishing flexibility is appropriate. An interesting model concerning flexibility development has been postulated by Hartley-O'Brien (9). Increase in flexibility and/or ROM may be attained through two approaches: (1) Decreasing resistance of target muscle groups and (2) Increasing strength of opposing muscles. For instance, the target muscle group would be the hamstrings and the opposing muscle group would be the hip flexors.

Decreasing resistance of a target muscle group may be accomplished by lengthening connective tissue or relaxing the myotatic reflex. Hartley-O'Brien (9) contends that the lengthening of connective tissue may be accomplished by contracting target muscles while under stretch or by using a prolonged stretch technique. According to Sapega et al. (26) the lengthening or elongation of connective tissue is the result of the viscoelastic property of collagenous tissue. Viscous property connotes permanent deformation; elastic property signifies an ability to resume an original condition or position.

Part of Hartley-O'Brien's (9) model is the relaxation of the myotatic reflex through the use of reciprocal inhibition, accommodation and fatigue. The use of heat and cold to affect this reflex are other options found in this model.

Inverse stretch response, while not found in the Hartley-O'Brien (9) model, is a mechanism which may affect the target muscle group and the relaxation of the myotatic reflex. Beaulieu (1) postulates that the Golgi tendon organ "prevents overstressing the muscle tissue caused by too much tension from active contraction or overstretching." He contends "when sufficient force is achieved to reach the threshold of the tendon organ, the inverse stretch reflex will inhibit the muscle under stretch in an attempt to relax the muscle tension."

Hartley-O'Brien (9) contends that certain techniques or courses of action are psychological in nature. Courses of action in this model may be more appropriately referred to as psychosomatic techniques. Flexibility techniques that incorporate mind set-gamma and/or spindle bias, facets of relaxation training, and biofeedback training would fall in this category (9, 7, 5).

Spindle bias results from diminution of gamma motorneuron discharge with ultimate decreases in the alpha motorneuron and extrafusal muscle fiber activity of the target muscle group. This bias may be more physiologically oriented than based upon a psychosomatic component. Halkovich (8) noted that light touch initially effects more readily gamma motorneurons than alpha motorneurons; after two seconds the gamma activity decreases below resting rates. No muscle contraction was involved with this decrease in activity which appears to be a neurological adaptation. This type of adaptation may have implications concerning hand contact during ROM exercises and the use of cryostretch (8).

According to the Hartley-O'Brien (9) model, the corollary to decreasing resistance of target muscle groups is increasing strength of opposing or antagonistic muscle groups. Isometric, isokinetic, concentric-isotonic and eccentric-isotonic regimes may be used for strength increments. Facilitation techniques are included in this model for increasing strength of opposing muscle groups.

While certain proprioceptive neuromuscular facilitation (PNF) techniques may produce an increase in strength of opposing muscles, other PNF techniques affect the target muscle groups (14). Work by Markos (17) has indicated a greater sphere of influence for PNF techniques than strength increments of opposing muscle groups. This researcher reported a bilateral transfer effect of hamstring flexibility when a PNF technique was used on the lower extremity. This transfer effect gives credence to the motor learning-integration aspect of flexibility development. The paradigm that portrays flexibility as exclusively the lengthening of connective tissue or the strength development of opposing muscle groups is only a partial model; the neurointegration component should not be neglected.

Trilogy of Exercises

Flexibility/or ROM exercises may be classified into three basic types: passive, active, or a combination of active and passive movements. Included in the passive category is guiding of a body part through a ROM with or without a prolonged stretch at the end of the movement. An extremity is lifted by a trainer through a range of motion until resistance is perceived; this position is held or additional pressure is applied for a brief period of time. These positions are established at or below the pain threshold; subsequently, the extremity is returned passively to the original position. There are several variations of this basic static stretch exercise such as the use of relaxation or mind-set techniques by the athlete as resistance is felt.

Sapega et al. (26) recommended contrast temperature treatments in conjunction with the stretched position. Heat is applied to the target muscle group while a traction system applies low to moderate tension to the stretched position. Before the tension is eliminated cold is applied to the elongated muscles.

Active range of motion involves the athlete slowly moving an extremity or body part in a desired direction until resistance precludes further movement. At this point the athlete may hold this position for a brief period of time and then return the body part to the starting position. A variation of this technique is to move the body part several consecutive times through a desired ROM and then hold the body part in the stretched position on the fifth execution. This position is held for six seconds and then returned to the original position.

Active range of motion exercises may be combined with isometric or isotonic contractions. The use of muscle contractions and flexibility exercises fall within the domain of PNF or neuromuscular facilitation (NF) exercises (14, 28). The athlete moves the extremity or body part until the stretched or elongated position is established; at this point the trainer applies appropriate resistance for an isometric or isotonic contraction of the target muscle group.

The combination approach is an amalgamation of active and passive exercises and contains many elements of PNF and NF approaches. An athlete's extremity is passively moved through a range of motion until movement is restricted; then, the trainer changes hand positions and applies appropriate resistance for an isometric or isotonic contraction of the target group. This technique, particularly if done in diagonal movement patterns, would be categorized as a PNF or NF technique. If the trainer allows only rotation to occur with the isotonic contraction, this technique follows very closely the Knott and Voss approach to PNF (14). When this procedure is executed with an isometric contraction, it is designated as "hold-relax". The use of an isotonic contraction is designated as "contract-relax".

Another PNF technique used to establish ROM or flexibility is rhythmic stabilization. This technique involves alternate isometric contractions of the target and antagonistic muscle groups (14, 28). This technique is advocated by Calliet (3, 4) for increasing shoulder and neck ROM. The alternate isometric contractions are executed in cardinal planes and a traction effect is applied to the arm or neck.

Efficacy of Flexibility Techniques

Research comparing some of the aforementioned techniques does not reflect a clear picture concerning the superiority of a specific method. While this paper is not intended to be an exhaustive review of related literature, certain studies have been selected to illustrate various aspects and trends in the literature. Hartley-O'Brien (9), reported no significant differences among passive and active flexibility exercises with or without PNF components. A study by Medeiros et al. (19) reported no differences in flexibility increments between an NF technique and an elongated stretch approach. Moore and Hutton (20) reported that a modified PNF technique produced the greatest increments in hip flexion; no significant differences were found among PNF techniques and an elongated stretch technique. A surprising finding of the Moore and Hutton (20) study was that the modified PNF technique elicited the greatest hamstring electromyographic activity.

It should be noted that in the Hartley-O'Brien (9) study the control group registered gains in ROM. This increase was attributed to subject involvement in physical education classes during the experimental period; such an involvement could confound the results of this study. A procedure in the Medeiros et al. (19) study may in part explain the ineptness of the PNF approach. All measurements and exercises were done in the sagittal plane; PNF exercises are executed normally in diagonal, spiral patterns. In the Moore and Hutton (20) study, female gymnasts were selected specifically as subjects to minimize learning effects; there may have been a confounding of other variables such as previous experience with flexibility programs. While the subjects were counterbalanced in the testing protocol, there still was a possibility of an asymmetrical transfer effect (21).

Several studies have shown the efficiency of PNF techniques for increasing ROM. Holt et al. (10) and Tanigawa (29) demonstrated the superiority of the hold-relax technique over the elongated stretch approach. The superiority of the contract-relax and hold-relax techniques over an active ROM exercise was demonstrated by Markos (17). A transfer effect was reported in this study; contract-relax technique increased hamstring flexibility for the exercised limb and for the contralateral limb.

Variations of Flexibility Exercises

While the PNF research expands the options for flexibility development, the elongation of connective tissues is an important component in establishing flexibility. Jackman (11) and Becker (2) have investigated the interrelationship between elongation of tissue and increments in ROM. Based upon clinical studies, Kottke et al. (15) recommended the use of moderate tension during prolonged stretching of muscle and joint tissues. Sapega et al. (26) contends that heat should be applied during periods of low intensity stretching followed by cooling of the target area before tension is released.

Exclusive use of cold in the form of fluori-methane spray was used by Halkovich et al. (8) to compare elongated stretch exercises with cold to a control group receiving exclusively elongated stretch exercises. The group receiving the spray showed a greater increment in hip flexion than did the control group. Halkovich et al. (8) contended that the role of the spray for increasing ROM was not the result of cutaneous cooling but the tactile stimulation of the jet stream striking the skin. A spindle bias may have been created which allowed greater passive stretch of the hamstrings.

There is not complete agreement among trainers and researchers concerning the use of cold or heat with flexibility and/or ROM type exercises. Knight (13) recommends the use of cryostretch for relief of spasm and concomitant increases in ROM. Cryostretch is the combined used of cold and the PNF technique of hold-relax. Halkovich et al. (8) have demonstrated that the use of fluori-methane spray and passive stretch was superior to passive stretch with tissue of normal temperature.

Rehabilitation Considerations

Flexibility exercises have assumed three roles in sports medicine: facilitating the rehabilitation process (3), preventing injury or re-injury (23), and providing a warmup regimen (28). A role of flexibility or ROM exercises in rehabilitation regimens has been to establish full range of joint motion before proceeding to resistive exercises. The establishment of full range of motion has been replaced in certain rehabilitative protocols by condition specific range of motion programs and functional development of movement.

Knee rehabilitation programs for such conditions as patella chondromalacia (12) and posterolateral instabilities of the knee (16) are examples of limited arc programs. Patellofemoral programs emphasize 0 to 25 degrees of knee flexion-extension in order to reduce the compression force of the patella upon the femur (25, 12). While reduction of compression force is of primary concern during the resistance phase of a rehabilitation program, limitation of motion has carried over into the ROM phase. Initial establishment of full movement by static stretch exercises has been replaced by progressive resistance exercises at or near terminal extension, followed by concomitant increases in strength of the quadriceps femoris and in ROM of the knee. Increases in the latter factor are obtained by such functional activities as assisted and unassisted walking, progressive aquatic activities, bicycle ergometer work, distance walking and jogging (25).

Terminal extension exercises in certain anterior cruciate programs are contraindicated by some sports medicine personnel. The final degrees of extension are eliminated from or regulated in specific ROM exercises or functional exercises such as bicycle ergometer work (25, 18). This may be accomplished by adjusting the bicycle seat height; the amount of terminal extension on the down phase of the peddling motion is regulated by this equipment adjustment.

Prescribed motions are emphasized with ROM exercises for certain conditions. Calliet recommends the establishment of abduction and external rotation of the glenohumeral joint for calcific tendonitis and bursitis (3). Rhythmic stabilization with a traction effect is recommended by Calliet to improve shoulder abduction.

Sapega et al. (26) have developed a model concerning minimal or maximal structural weakening. In situations where unwanted connective tissue such as adhesions should be eliminated, high intensity forces in conjunction with depressed temperatures are recommended.

While Sapega et al. (26) recommended a prolonged, low intensity force with tissue evaluation for increasing ROM, Ostrom (24) contended that an intermittent or oscillating type of stretching force may help reduce the crescendo-pain effect. A diminution in pain perception is a valuable asset for increasing ROM.

Warmup and Flexibility

In a study conducted by Surburg (28) trainers indicated that neuromuscular facilitation exercises were used to prevent injury and as warmup exercises. The hold-relax technique was used most often by trainers in the rehabilitation, prevention, and warmup context.

In the latter context, Sapega et al. (26) recommended five minutes of light, progressive exercise before stretching exercises are included in the warmup regimen. This recommendation is consistent with their model for minimal structural weakening. An additional suggestion made by these authors is to repeat the stretching phase after the major part of the practice or workout was completed.

A practice that has been instituted by trainers and coaches is to have athletes work with peers concerning the development of flexibility. The partner approach is a viable means for reducing the involvement of the trainer in this phase of a conditioning program but there are inherent problems with the partner method. The principle danger is that the athlete will not execute correctly or consistently the correct protocols. Ignorance and lack of attention to task are major contributors to possible problems. Beaulieu (1) has cautioned individuals concerning the use of contract-relax technique. His apprehension is based upon the research of Moore and Hutton (20) and the fact that this technique is often done as a partner exercise. With regard to the latter reason, he believes contract-relax if done incorrectly can cause injury; any stretching exercise if done incorrectly can cause harm.

Research by Moore and Hutton (20) has been discussed in an early section. These authors recommend a contract-relax technique when persons are well-motivated and properly instructed in this technique. They do state that for the novice and more comfort oriented person the elongated stretch method is the more desirable technique.

Summary

In conclusion, athletic trainers have a variety of techniques which may be used to increase the property of flexibility. The Hartley-O'Brien (9) model illustrated a dichotomous approach for developing flexibility. Techniques may be applied to the target muscle group and/or the antagonistic muscle group. Range of motion exercises are part of the flexibility continuum and serve as the precursor for flexibility exercises, per se. Flexibility exercises in the generic sense encompass rehabilitation, training and prevention of injuries. In all these phases, recent practices and research illustrate the need to re-examine the method and mode of using flexibility exercises.

References

1. Beaulieu JE: Developing a stretching program. *Phys. Sportsmed.* 9(11):59-69, 1981.

2. Becker AH: Traction for knee-flexion contractures. *Phys. Ther.* 59(9):1114, 1979.

3. Calliet R: *Shoulder Pain.* Philadelphia, FA Davis 1972 pp 56-57.

4. Calliet R: *Neck and Arm Pain.* Philadelphia, FA Davis 1972 p. 84.

5. Coursey RD: Electromyograph feedback as a relaxation technique. *J. Consult. Clin. Psychol.* 43(6):825-834, 1975.

6. Dintiman GB: The effects of various training programs on running speed. *Res. Q. Am. Assoc. Health Phys. Ed.* 35(4):456-463, 1964.

7. Grzesiak RC: Relaxation techniques in treatment of chronic pain. *Arch. Phys. Med. Rehabil.* 58:270-272, 1977.

8. Halkovich LR, Personius WJ, Clamann HP, Newton RA: Effect of fluori-methane spray on passive hip flexion. *Phys. Ther.* 61(2):185-189, 1981.

9. Hartley-O'Brien SJ: Six mobilization exercises for active range of hip flexion. *Res. Q. Am. Assoc. Health, Phys. Educ.* 51(4):625-635, 1980.

10. Holt LE, Travis TM, Okita T: Comparative study of three stretching techniques. *Percept. Mot. Skills.* 31:611-616, 1970.

11. Jackman RV: Device to stretch the achilles tendon. *Phys. Ther.* 43:729, 1963.

12. Knight KL: Rehabilitating chondromalacia patellae. *Phys. Sportsmed.* 7(10):147-148, 1979.

13. Knight KL: Cryostretch for muscle spasm. *Phys. Sportsmed.* 8(4):129, 1980.

14. Knott M, Voss DE: *Proprioceptive Neuromuscular Facilitation: Patterns and Techniques.* New York, Haeber-Harper 1965 pp. 1-135.

15. Kottke FJ, Pauley DL, Ptak RA: The rationale for prolonged stretching for correction of shortening of connective tissue. *Arch. Phys. Med. Rehabil.* 47:345-352, 1966.

16. Malone T, Blackburn TA, Wallace LA: Knee Rehabilitation. *Phys. Ther.* 60(12):1602-1610, 1980.

17. Markos PD: Ipsilateral and contralateral effects of proprioceptive neuromuscular facilitation techniques on hip motion and electromyographic activity. *Phys. Ther.* 59(11):1366-1373, 1979.

18. McLeod WD, Blackburn TA: Biomechanics of knee rehabilitation with cycling. *Am. J. Sports Med.* 8(3):175-180, 1980.

19. Medeiros JM, Smidt GL, Burmeister LF, Soderberg GL: The influence of isometric exercise and passive stretch on hip joint. *Phys. Ther.* 57(5):518-523, 1977.

20. Moore MA, Hutton RS: Electromyographic investigation of muscle stretching techniques. *Med. Sci. Sports.* 12(5):332-329, 1980.

21. Morris H: Experimental considerations in the analysis of repeated measurements. Presented at AAHPERD Research Consortium, Boston, Mass. April 16, 1981.

22. Nicholas JA: Injuries to knee ligaments. *J.A.M.A.* 212(13):2236-2239, 1970.

23. O'Neil R: Prevention of hamstring and groin strain. *Athletic Training.* 11(1):27-31, 1976.

24. Ostrom RC: Knee rehabilitation following surgical procedures. *Phys. Ther.* 57(12):1376-1379, 1977.

25. Pevsner DN, Johnson JR, Blazina ME: The patellofemoral joint and its implications in the rehabilitation of the knee. *Phys. Ther.* 59(7):869-874, 1979.

26. Sapega AA, Quedenfeld TC, Moyer RA, Butler RA: Biophysical factors in range-of-motion exercise. *Phys. Sportsmed.* 9(12):57-65, 1981.

27. Steadman JF: Rehabilitation after knee ligament surgery. *Am. J. Sports Med.* 8(4):294-295, 1980.

28. Surburg PR: Neuromuscular facilitation techniques in sportsmedicine. *Phys. Sportsmed.* 9(9):114-127, 1981.

29. Tanigawa MC: Comparison of the hold-relax procedure and passive mobilization on increasing muscle length. *Phys. Ther.* 52(7):725-735, 1972. +

CEU Credit Quiz

The Lateral Aspect of the Knee Joint

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Edited by: Don Kaverman, ATC

Introduction

The lateral aspect of the knee presents a difficult challenge in diagnosis largely due to the anatomic proximity and confluence of the involved structures. Therefore, a thorough knowledge of the anatomy of this region is a prerequisite for those who must unravel its mysteries.

Skeletal Anatomy

The lateral femoral condyle leaves the femoral shaft at less of an angle than its mate and is wider in breadth with a larger articular surface. This accounts for its greater excursion with knee motion. The lateral tibial plateau is concave in the frontal plane but convex when viewed in the sagittal plane. This creates an incongruity in joint surfaces which is partially remedied by the interposition of the lateral meniscus.

Lateral Meniscus

The lateral meniscus is a wide, nearly circular structure, triangular in cross section which occupies a large portion of the surface of the lateral tibial plateau. The anterior cornu or horn is inserted into the tibia and sends discrete fibrous prolongations to the base of the anterior cruciate ligament. It is joined to the anterior horn of the medial meniscus by a second fibrous structure, the transverse ligament. The anterior horn is tethered to the patella by the meniscopatellar ligament. The periphery of the meniscus is secured by the coronary ligament, a fibrous extension of the joint capsule which yields in the mid portion of the meniscus to the popliteus hiatus creating the only area of discontinuity in its peripheral fixation. The hiatus is occupied by the tendon of the popliteus muscle enroute to its insertion into the lateral femoral condyle. Near the joint level the muscle sends a short flat tendon to insert onto the posterior aspect of the lateral meniscus. The posterior horn of the meniscus is attached to the intercondylar eminence of the tibia. In its posterior aspect the lateral meniscus may be further anchored by one or rarely both of the meniscofemoral ligaments which are known by their location relative to the posterior meniscofemoral ligament of Wrisberg. Actual statistics vary among examiners but, in general, the knees of approximately 70% of the population contain one of these ligaments while only a small percentage will have both. The ligaments extend from the posterior horn of the lateral meniscus to the lateral aspect of the medial femoral condyle. (Figs. 1, 2, 3, 4)

Mobility of the Lateral Meniscus

Mobility of the lateral meniscus results from its being pushed or pulled as the knee moves. As the knee joint moves into extension the lateral femoral condyle "pushes" the meniscus anteriorly causing a distortion of the meniscus as it moves about the fixed points of its anterior and posterior horns. During knee flexion, with the knee fixed, the posterior horn of the lateral meniscus is pulled medially and anteriorly by the meniscofemoral ligament increasing the congruity of this portion of the joint. Concomitant contraction of the tibial meniscal portion of the popliteus muscle pulls the posterior horn posteriorly preventing it from being crushed by the lateral femoral condyle.

Ligamentous Support of the Lateral Side of the Knee

The Fibular Collateral Ligament

The fibular collateral ligament is actually comprised of superficial and deep portions. The deep portion of the ligament, sometimes known as the short external lateral ligament, is actually a thickening in the fibrous capsule. The superficial portion of the fibular collateral ligament is a prominent cord-like structure which is secured

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proximally to the lateral femoral condyle in continuity with its deep member. It is free of the joint capsule and inserts into the proximal aspect of the fibula. It is separated from the periphery of the lateral meniscus by the popliteus tendon and its synovial sheath. (Fig. 5) In its distal fourth it is surrounded by the middle layer of the biceps femoris tendon which gains a fibrous attachment over the ligament's posterior aspect.

Function of the Fibular Collateral Ligament

The fibular collateral ligament is taut with the knee in hyperextension and extension and appears to be the primary restraint resisting abnormal varus stress between full extension and 30°. The ligament undergoes significant relaxation beyond this point to render it ineffective in resisting varus stress. (Fig. 6) The ligament also has no significant function as a rotational stabilizer of the knee joint.

Iliotibial Band

The iliotibial band represents the distal lateral extent of the fascia lata; it is attached to the lateral supracondylar tubercle of the femur via its connection with the lateral intermuscular septum of the thigh and appears as a dense ligament extending to the tubercle of Gerdy. It acts as a static stabilizer of the knee and is not under the influence of the active contraction of the gluteus maximus or tensor fascia lata muscles. (Fig. 7)

Musculature of the Lateral Side of the Knee

Biceps Femoris

The common biceps tendon, formed by the union of the short and long heads, splits into three layers (the superficial, medial and deep) before reaching its final destination on the head of the fibula. (Fig. 7) Two to three inches above the joint line the biceps forms an expansive fibrous attachment to the iliotibial tract. With contraction of the biceps this attachment serves to pull the iliotibial tract posteriorly and perhaps functions to keep it taut in various degrees of flexion.

The biceps femoris flexes the knee joint, antagonistically controls extension, and externally rotates the tibia on the femur. The biceps works synergistically with the anterior cruciate ligament to resist abnormal anterior displacement of the tibia on the femur.

Popliteus Muscle

The muscle fibers of the popliteus arise from the posterior-superior tibia and travel superiorly and laterally to insert on the lateral wall of the lateral femoral condyle. In its superior ascent the tendon formed by the

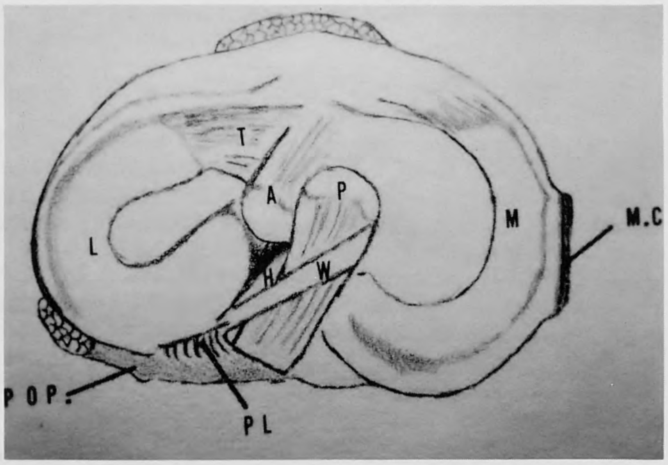

Figure 1. Superior surface of tibia. L: lateral meniscus; M: medial meniscus; MC: medial capsular ligament; A: anterior cruciate ligament; P: posterior cruciate ligament; H: ligament of Humphrey; W: ligament of Wrisberg; POP: popliteus tendon; PL: popliteus insertion into lateral meniscus; T: transverse ligament.

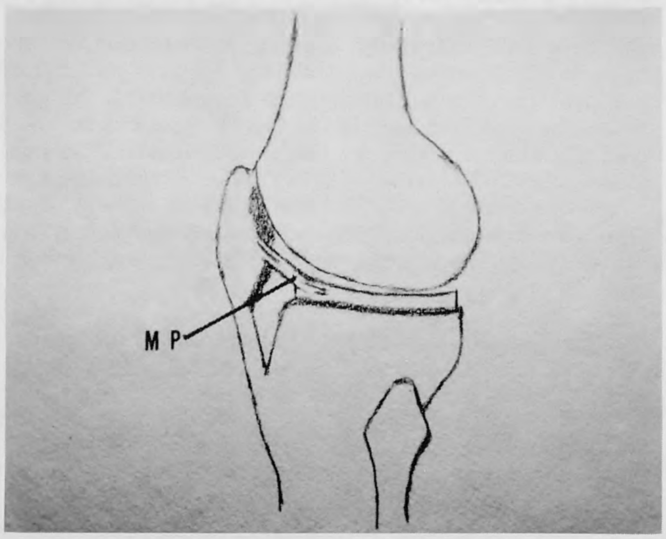

Figure 2. MP: meniscopatellar ligament.

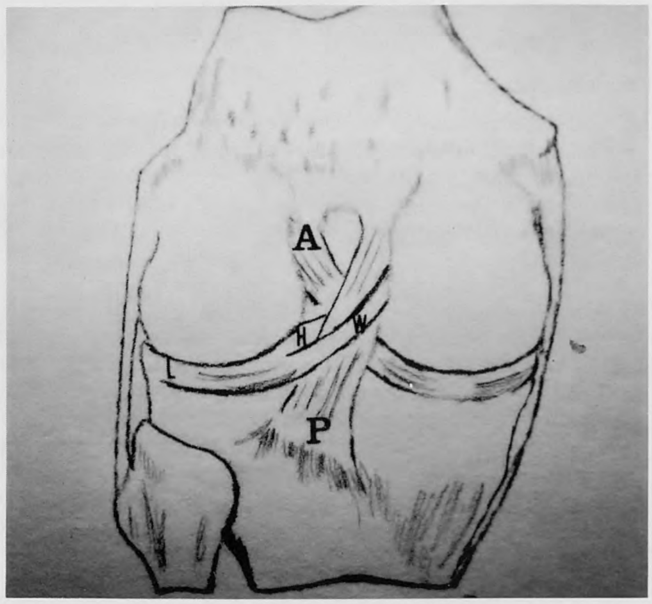

Figure 3. Posterior Aspect of the Knee. A: Anterior cruciate ligament; P: posterior cruciate ligament; H: ligament of Humphrey; W: ligament of Wrisberg.

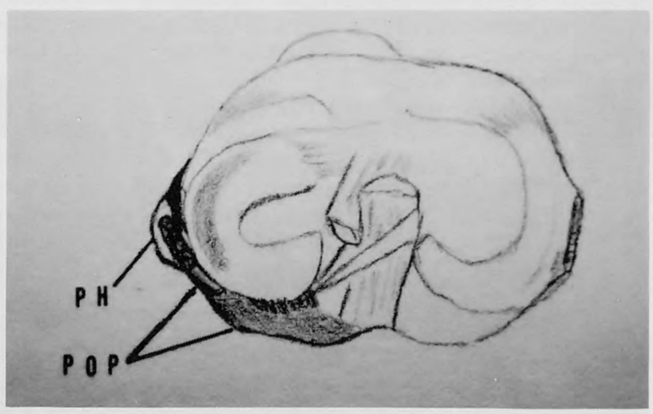

Figure 4. Superior surface of tibia. PH: popliteal hiatus; POP: popliteus.

lateral portion of the muscle belly becomes intra-articular by passing beneath the arcuate ligament of the lateral capsule of the knee joint. As the tendon enters the joint it passes through the popliteal hiatus and insinuates itself between the lateral meniscus and fibular collateral ligament. From the medial side of the muscle belly a short flat tendon is formed which inserts into the posterior convexity of the lateral meniscus. (Figs. 1, 4, 5, 7, 8) The popliteus muscle is active at the onset of knee flexion when it unlocks the joint and medially rotates the tibia relative to the femur. Its effect on knee flexion is negligible. A contraction of the muscle simultaneously retracts the lateral meniscus posteriorly away from the advancing lateral femoral condyle. The popliteus augments the function of the posterior cruciate ligament and antagonizes the anterior cruciate ligament by tending to pull the tibia anteriorly on the femur.

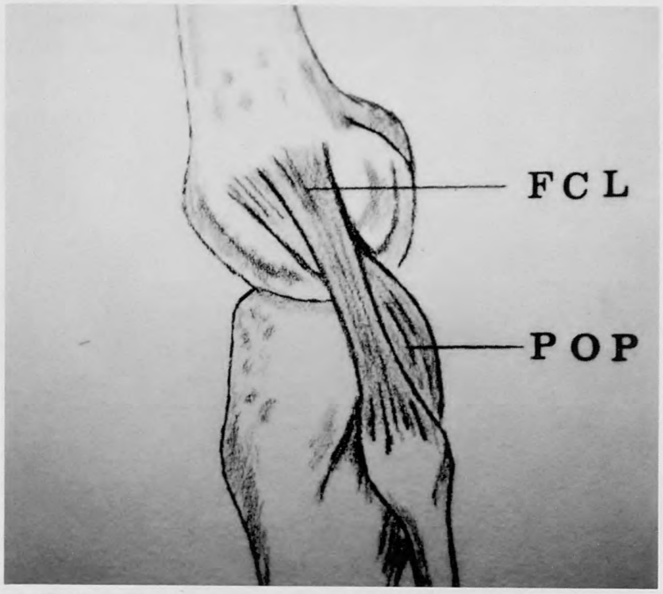

Figure 5. Lateral aspect of knee. FCL: Fibular collateral ligament; POP: popliteus tendon.

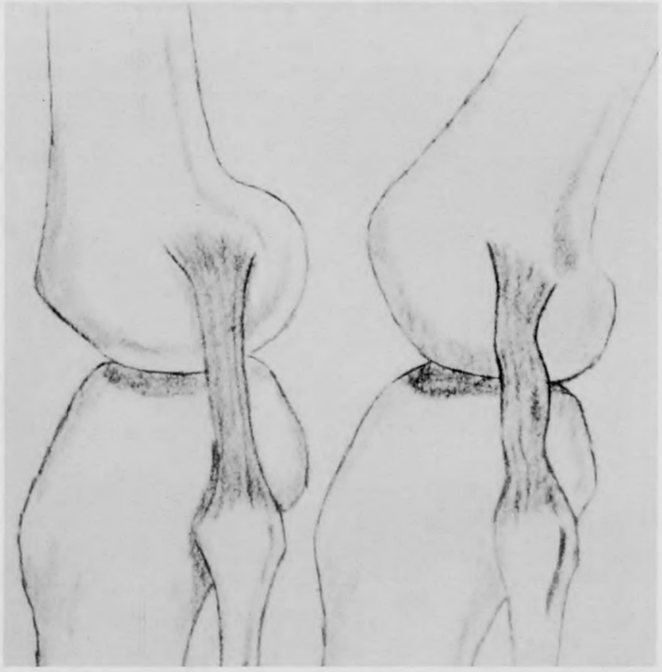

Figure 6. Lateral aspect of knee. left: fibular collateral ligament taut with knee in extension; right: fibular collateral ligament slackens rapidly with knee flexion.

Athletic Injuries Affecting the Lateral Side of the Knee

1. Meniscus Injury

Refinements in arthrographic techniques and increasing use of diagnostic arthroscopy have uncovered an increased frequency of injury to the lateral meniscus. The lateral meniscus is commonly injured in conjunction with the anterior cruciate ligament in which case the protean manifestations of the latter often obscure meniscal derangement. All torsional weight bearing injuries resulting in anterior cruciate ligament rupture should raise a high index of suspicion for concomitant injury to the lateral meniscus. Tears of the lateral meniscus occurring with cruciate ligament injury are usually found in the posterior aspect of the meniscus and are best diagnosed by arthroscopy. Tears located at the periphery of the meniscus may be sutured (meniscoplasty, meniscorrhesis) while most tears involving the more mesial segments of the meniscus lend themselves to low-morbidity partial meniscectomy. Total meniscectomy

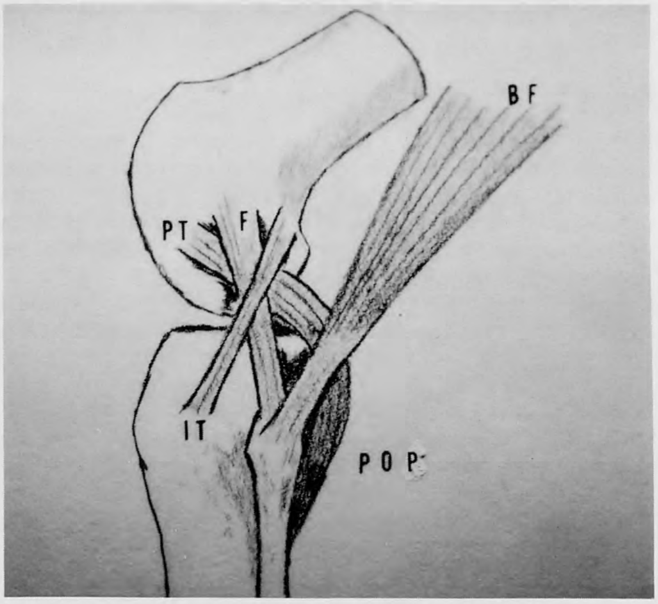

Figure 7. Lateral aspect of knee. IT: iliotibial band; PT: popliteus tendon; POP: popliteus muscle; F: fibular collateral ligament; BF: biceps femoris.

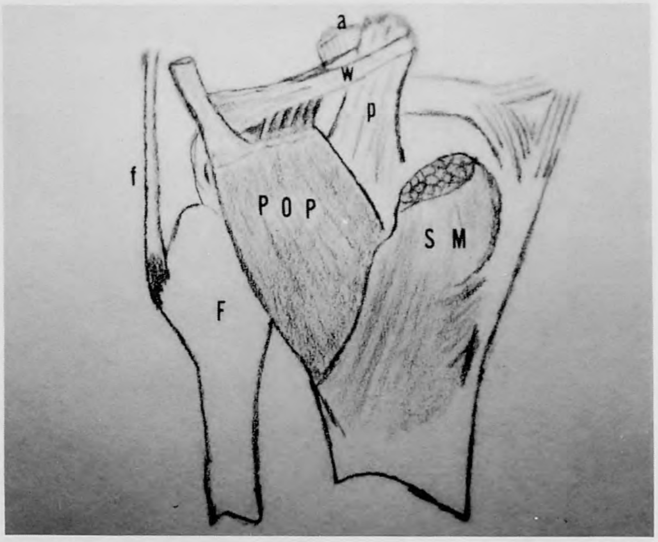

Figure 8. Posterior aspect proximal tibia with femur removed. a: anterior cruciate ligament; p: posterior cruciate ligament; w: ligament of Wrisberg; POP: popliteus muscle; SM: semimembranosus muscle; F: fibula; f: fibular collateral ligament.

should be avoided if at all possible. It must be borne in mind when evaluating the athlete with lateral knee pain that posterior tears of the medial meniscus may give lateral joint reference. Also, the joint should be inspected with the limb in flexion and extension to uncover cysts of the lateral meniscus.

2. **Post Meniscectomy Knee Pain**

The menisci play an important role in shock absorption and load transmission across the knee joint. Accordingly, meniscectomy results in increased joint forces and wear, eventually manifested clinically as pain over the lateral aspect of the joint. Such discomfort is usually proportional to activity and in its earliest manifestation presents as low grade aching following physical exertion. Joint effusion and immobility stiffness (gelling phenomena) may also be present. Xrays may show post meniscectomy changes of degenerative arthrosis as described by Fairbank in the lateral tibiofemoral joint. (Fig. 9) Artificial playing surfaces appear to be especially troublesome to these athletes insofar as activity pain and joint effusion are concerned.

3. **Osteochondritis Dissecans**

Osteochondritis dissecans is a lesion affecting the femoral condyles with a peak incidence in the adolescent decade. Etiologic factors include trauma, bone ischemia, epiphyseal growth variant and heredity. The lesion often occurs in individuals who are physically active. In the juvenile group the incidence of bilaterality is 25-30%. The presenting complaint is usually intermittent and non-specific knee pain related to activity. Physical examination may reveal an antalgic gait, joint effusion with restricted motion and localized tenderness over the site of the lesion. This is best elicited by palpating the involved femoral condyle with the knee acutely flexed. Quadriceps atrophy is common in chronic cases. In the older patient, late adolescence or early adulthood, the symptoms may include joint locking or giving away due to loose bodies caused by detachment of the osteochondritis fragment from the femoral condyle.

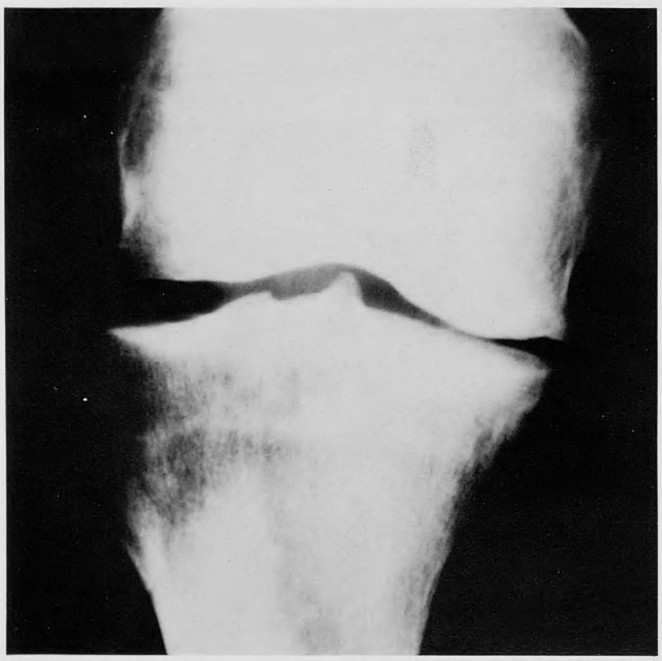

Figure 9. Post-meniscectomy Fairbank changes of degenerative arthrosis, here shown in the medial joint: joint space narrowing, flattening of femoral condyle with hypertrophic periarticular new bone, subchondral sclerosis and squaring of tibial margin.

Xray examination shows a circumscribed area of bone separated from the parent femoral condyle by a radiolucent line. Classically, the lesion is found on the lateral aspect of the medial femoral condyle but in 15% of cases the lateral femoral condyle is involved. (Fig. 10)

4. **Osteochondral Fracture**

Osteochondral fractures about the knee may involve the femoral condyles or the patella as a result of a direct blow or twisting injury. They often present as an acute internal derangement with an "audible pop," bloody effusion, and loss of knee extension. Thus the presenting symptoms and signs may strongly resemble an anterior cruciate ligament injury. Adolescents are decidedly more at risk with respect to osteochondral fractures than adults.

A. **Lateral Femoral Condyle**

Osteochondral fracture of the lateral femoral condyle may result from the direct application of an external force (kick) or from a non-contact torsional weight bearing injury. Fractures of the lateral

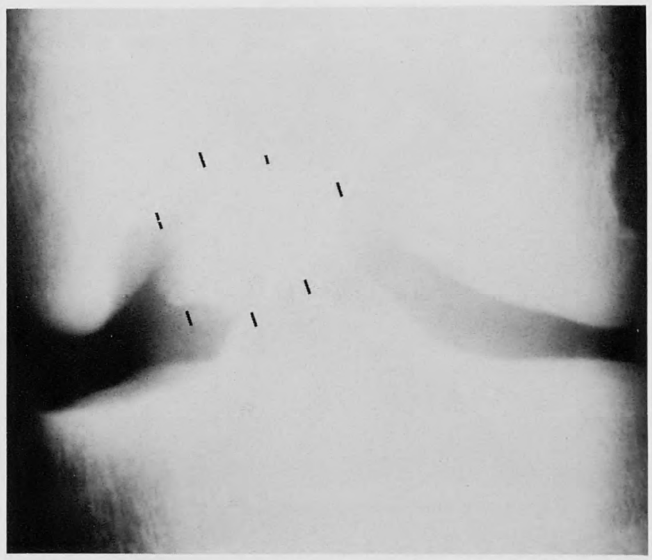

Figure 10. Large osteochondritic fragment detached from femoral condyle.

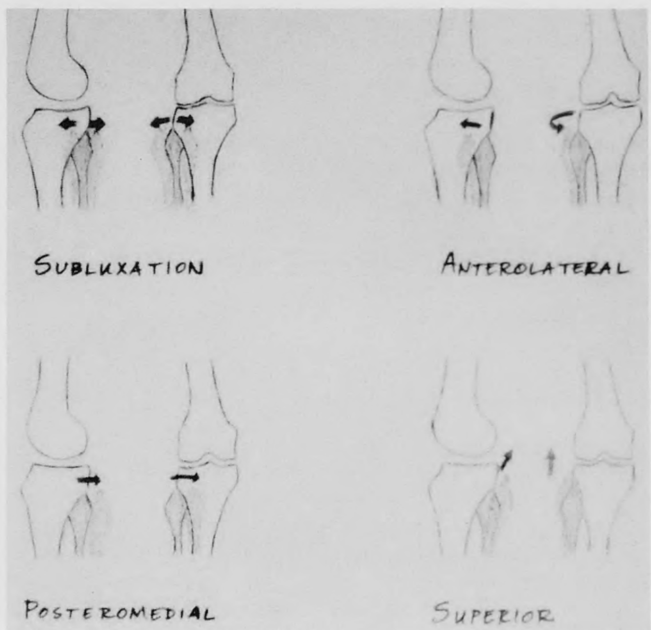

Figure 11. Proximal tibiofibular joint: subluxations and dislocations.

femoral condyle may also occur as a result of lateral dislocation of the patella.

B. **Patellar Osteochondral Fractures**
Osteochondral fractures of the patella may occur as a result of shearing forces produced either at the time of lateral dislocation or reduction and usually involve the inferomedial aspect of the patella.

5. **Injuries to the Proximal Tibiofibular Joint**
Disruptive injuries to the proximal tibiofibular joint are often initially overlooked as a result of acute trauma. There are four basic types — subluxations and dislocations, the latter of which may be classified as anterolateral, posteromedial or superior. The anatomic orientation of the proximal tibiofibular joint is found to be either oblique or horizontal. The majority of subluxations and dislocations occur in joints which are obliquely oriented since this type of joint is less able to rotate in order to accommodate torsional stress. (Figs. 11, 12)

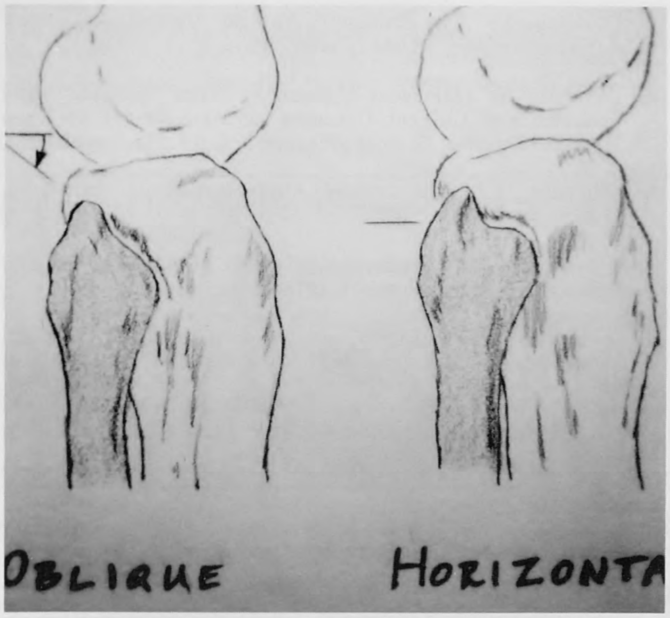

Figure 12. Orientation of proximal tibiofibular joint.

A. **Subluxation**
Subluxation of the proximal tibiofibular joint is diagnosed when displacement occurs without frank dislocation. Pain along the lateral side of the knee and lower leg is a common symptom. Tenderness can be elicited by applying direct pressure over the fibular head.

B. **Anterolateral Dislocation**
Most anterolateral dislocations occur during athletic activity usually as a result of the following mechanisms: (1) Sudden inversion and plantar flexion of the foot, (2) Simultaneous knee flexion, (3) Concomitant twisting of the body.

Most often there is pain and tenderness along the proximal fibula. However, the major symptoms may be in the lateral popliteus fossa along the course of the stretched biceps femoris tendon. Transient paresthesias along the distribution of the common peroneal nerve may occur; motor palsy with foot-drop is rarely encountered.

C. **Posteromedial Dislocation**
This injury usually results from a posteriorly directed severe blow to the flexed knee. The fibular head is driven posteriorly and medially disrupting the capsular ligaments of the proximal tibiofibular joint and fibular collateral ligament. The biceps femoris will then serve to draw the proximal fibula posteriorly and medially. This injury may result from car bumpers and is also known as "horseback riders knee" since the equestrian may fall victim to a post, tree or narrow gate. The common peroneal nerve is more at risk in this injury.

D. **Superior Dislocation**
This type of dislocation is produced by a severe

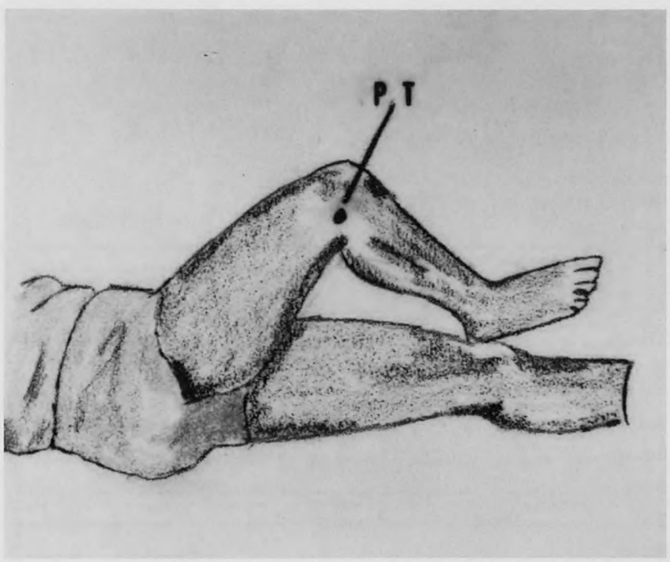

Figure 13. PT: area of point tenderness in patient suffering with popliteus tendinitis.

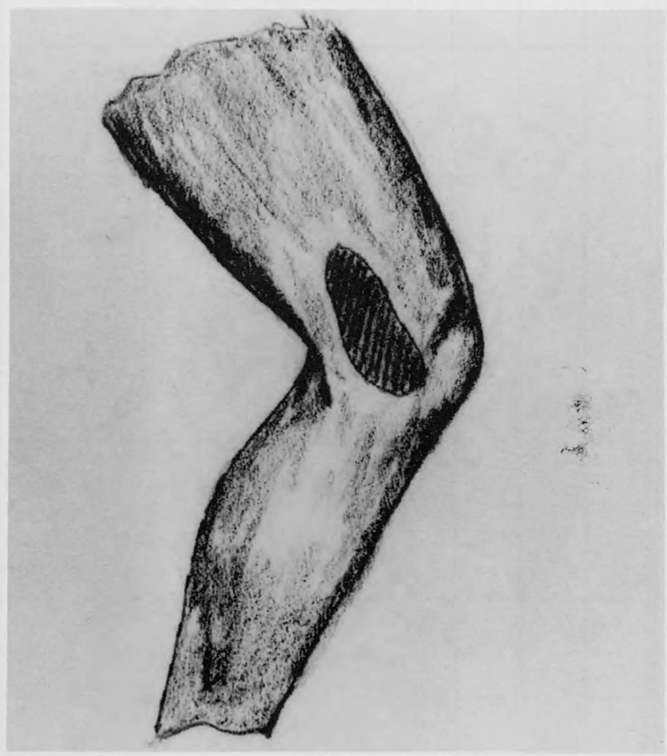
Figure 14. Lateral aspect of the lower extremity. Striped area denotes site of pain caused by iliotibial band friction syndrome.

force directed upward through the ankle and is usually associated with fractures of the tibial shaft. These fractures often demand primary attention and may divert suspicion from the proximal tibiofibular joint. It is most commonly seen as a result of a fall from a height resulting from parachute, hang gliding and sky diving mishaps.

6. **Popliteus Tendinitis**

This cause of lateral knee pain is thought to be related to hyperpronation and running downhill. It is seen in runners who run on a banked surface which increases the pronation of the foot on the higher part of the slope. Since the popliteus acts to prevent the femur from moving forward on the tibial plateau during midstance, running downhill puts an excessive strain on the tendon. The pain of popliteus tendinitis is usually found over the proximal portion of the tendon immediately anterior to the fibular collateral ligament. Physical examination reveals point tenderness at this location and serves to differentiate the injury from iliotibial band friction syndrome and afflictions of the lateral meniscus. The examination is conducted with the patient supine and the affected knee flexed at least 90° with the hip flexed, abducted and externally rotated. The foot is then placed on the knee of the other leg. This maneuver alone, without palpation, often elicits pain over the lateral aspect of the knee in these athletes. (Fig. 13)

7. **Iliotibial Band Friction Syndrome**

As the knee flexes and extends during running the iliotibial band repeatedly rubs over the lateral femoral condyle, which may cause an inflammatory response. The resulting lateral knee pain is not as localized as that caused by popliteus tendinitis (Fig. 14). Tibia vara (bowlegs) and hyperpronated feet are commonly associated.

References

1. CIBA Clinical Symposium: Running Injuries. Vol. 32:4, 1980.
2. DiStefano V: Functional Anatomy and Biomechanics of the Knee Joint. *Athletic Training*, 113, Fall 1978.
3. DiStefano V: The Enigmatic Anterior Cruciate Ligament. *Athletic Training*, 16:244, Winter 1981.
4. DiStefano V: Meniscus Update. Function, Post-Traumatic Sequelae and Current Concepts of Management of Knee Meniscus Injuries. *Clinical Orthopaedics*, 151:143, Sept. 1980.
5. Kennedy JC: The Injured Adolescent Knee. Baltimore, William and Wilkins, 1979.
6. O'Donoghue DH: Treatment of Injuries to Athletes. 3rd ed., Philadelphia, W.B. Saunders, 1976.
7. Ogden JA: Subluxation and Dislocation of the Proximal Tibiofibular Joint. *J. Bone and Joint Surg.*, 56-A: 145-154, Jan. 1974. +

CEU Credit Quiz

The Lateral Aspect of the Knee Joint

Vincent J. DiStefano, MD
Edited by: Don Kaverman, ATC

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Questions		a	b	c	d	e
1. Which of the following statements is/are true of the lateral meniscus? 1. it occupies a large portion of the surface of the lateral tibial plateau 2. the posterior horn of the meniscus is attached to the intercondylar eminence of the tibia 3. the periphery of the meniscus is secured by the coronary ligament 4. mobility of the lateral meniscus results from its being pushed or pulled as the knee moves	a. 1, 2, 3 b. 1, 3 c. 2, 4 d. 4 only e. 1, 2, 3, 4					
2. Which of the following statements is/are true of the fibular collateral ligament? a. it appears to be the primary restraint resisting abnormal varus stress between full extension and 30°. b. it is the major rotational stabilizer of the knee joint c. both a and b above d. none of the above						
3. Which of the following muscles works synergistically with the anterior cruciate ligament?	a. biceps femoris b. popliteus c. both a and b above d. none of the above					
4. Which of the following statements is/are true of the popliteus muscle? 1. it antagonistically controls extension of the knee 2. it is active at the onset of knee flexion when it unlocks the joint 3. it externally rotates the tibia on the femur 4. it augments the function of the posterior cruciate ligament	a. 1, 2, 3 b. 1, 3 c. 2, 4 d. 4 only e. 1, 2, 3, 4					
5. The lateral meniscus is commonly injured in conjunction with the	a. fibular collateral ligament b. iliotibial band c. posterior cruciate ligament d. anterior cruciate ligament					
6. Does the type of surface an athlete plays on appear to influence the problems associated with post-meniscectomy knee pain?	a. Yes b. No					

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	a	b	c	d	e

7. Which of the following statements is/are true of osteochondritis dissecans?
   1. this most commonly occurs during adolescence
   2. bone ischemia is an etiologic factor in this disease
   3. joint effusion with restricted motion of the joint may be present
   4. juvenile patients with osteochondritis dissecans generally have this problem bilaterally

   a. 1, 2, 3
   b. 1, 3
   c. 2, 4
   d. 4 only
   e. 1, 2, 3, 4

8. The presenting signs and symptoms of an osteochondral fracture may resemble a lateral meniscus injury.

   a. True
   b. False

9. Lateral dislocation of the patella may result in an osteochondral fracture of the

   a. lateral femoral condyle
   b. patella
   c. a and b above
   d. none of the above

10. Which of the following statements is/are true of anterolateral dislocations of the proximal tibiofibular joint?
    1. these injuries usually occur during athletic activity
    2. most often there is pain and tenderness along the proximal fibula
    3. transient paresthesias along the distribution of the common peroneal nerve may occur
    4. motor palsy with footdrop is rarely encountered

    a. 1, 2, 3
    b. 1, 3
    c. 2, 4
    d. 4 only
    e. 1, 2, 3, 4

11. Which of the following types of dislocations of the proximal tibiofibular joint is produced by a severe force directed upward through the ankle?

    a. posteromedial
    b. superior
    c. both a and b above
    d. none of the above

12. Which of the following statements is/are true of popliteus tendinitis?
    1. this most commonly occurs in basketball players
    2. physical examination reveals point tenderness over the proximal portion of the tendon immediately anterior to the fibular collateral ligament
    3. individuals with tibia vara are at risk for the development of this problem
    4. in examining for this problem the patient should be supine with the affected knee flexed at least 90° with the hip flexed, abducted and externally rotated

    a. 1, 2, 3
    b. 1, 3
    c. 2, 4
    d. 4 only
    e. 1, 2, 3, 4

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Pre-Planning for a Large Multi-Sport Event

Linda Arnold, ATC

The staging of a large multi-sport event can be a very challenging and rewarding experience. It can also be a total disaster in regard to safety service, if many hours are not spent in pre-planning for the event. The magnitude of such an event makes it impossible to organize its coverage at the last minute, and it cannot be run poorly.

The 1982 AAU National Jr. Olympics was held at Memphis State University August 3-8. The writer served as the safety supervisor.

Following is a short summary of details which must be planned months in advance, in addition to all the planning an athletic trainer normally does for a large event. This six day event included 3,000 athletes who participated in 13 sports. These guidelines will hopefully provide a general checklist for those who plan to host such events in the future.

1. Contact any person who has hosted the event in the past. Their recommendations and knowledge of problem areas will be very beneficial. Each site will have to be evaluated and realistically planned for according to facilities, community involvement, safety staff, etc.
2. Secure a safety staff which includes, at a minimum, certified athletic trainers, student trainers, physicians, ambulance personnel, Red Cross volunteers, and students to serve as runners.
3. Organize a work schedule of when each staff member can and cannot work. Obtain phone numbers of where each person can be reached when they are not on duty. Due to daily changes in the schedule of events, the staff schedule constantly changes as well.
4. Contact all local medical facilities of the upcoming event. If the participants are minors, it is necessary to decide beforehand the procedure for getting parental consent for treatment.
5. Make a list of every possible phone number that might be needed during the event. Encourage the staff to keep the list with them at all times. There is no time to search for phone numbers during an event this large.
6. Secure maps of the city and pamphlets from local clinics and hospitals to aid in directing people from out of town to the medical facilities.
7. Estimate well in advance the number of cups, coolers, ice, etc., that will be needed. Memphis State used 40 six- and ten-gallon coolers, 20,000 cups, 3,280 pounds of ice, and 2,000 gallons of drink. All supplies must be easily accessible.
8. Contact local merchants and manufacturers for the possibility of donated supplies. Provide free advertisement for those companies donating supplies.
9. Secure meal tickets, housing, reserved parking, staff shirts, and any other necessary items for the staff.
10. Make signs which very visably show all first aid areas, parking areas, and instructions for the use of certain areas.
11. Contact the local police department, campus security, and the campus health center to alert them to the responsibilities of the safety staff. This will eliminate the problem of these people trying to serve as first aid personnel if they know where to locate the safety staff.
12. Organize a specific plan of communication for the staff. This can include beepers, phones, walkie talkies, portable phones, etc. It is highly recommended that there be at least three ways in which to contact each site. Do not rely solely on phone communication.
13. Be prepared for a life and death emergency with all sports. Extra emergency equipment may have to be borrowed to accomplish this. It is recommended that two certified athletic trainers and several student trainers be assigned to each sport.
14. There must be a constant communication between the meet directors and the safety supervisor. This communication should be established 6-8 months prior to the event so that the needs of each individual sport is known. During the event, changes occur daily, and the safety staff must be kept informed about these changes.
15. Secure information concerning all aspects of the event. There should be a general idea of areas such as registration, athlete's transportation, etc. Much of this knowledge can be obtained by attending organizational meetings.
16. Seek advice as to what type of liability insurance is provided or needed for the safety staff.
17. Arrange for any kind of transportation needed by the safety staff including the use of golf carts, university vehicles, vans, etc.
18. Assign one group in the staff the responsibility for ensuring sanitary conditions. This includes such responsibilities as disinfecting the wrestling mats, taping down the lids to the drink coolers, etc.

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19. Prior to the event starting, do a safety check on each site. Inform the meet director of the location for the first aid station at their sport. This eliminates a conflict involving two groups using the same floor space.
20. Arrange to have supplies delivered two days prior to the beginning of all events. Supplies or equipment which must be returned should be picked up a few days after the conclusion of the events.
21. Establish policies for treating ill athletes and where they can seek medical attention.
22. Secure keys to all areas to be used at all the sites.
23. Assign people to be responsible for the security of each first aid area, as well as keeping the area clean and sanitary.
24. Plan an organizational meeting of the safety staff one week prior to the event.

    Staff meetings should also be held each morning to give the members a chance to discuss problem areas, new changes in schedule, and injuries of the previous day. These meetings also confirm that the staff has arrived each day.
25. Establish policies to be followed by the staff. Organize a staff notebook which includes every important piece of information they need to know. The staff should be able to handle most problems by referring to the notebook. It is recommended that the notebook include at least the following information:
    a) All necessary telephone numbers
    b) Physician's office and event work schedule
    c) Maps of the city with routes to all medical facilities clearly marked
    d) Suggestions in regard to type of clothing needed, expected weather conditions, etc.
    e) Staff responsibilities
    f) Procedures for:
        1. Emergency room referrals
        2. Ill athletes
        3. Pharmacy referrals
        4. Transportation of athletes
        5. Dental referrals
    g) Injury log sheets
    h) Location of ice and additional supplies
    i) Daily schedule of events
    j) Pens
    k) Dimes and quarters for phone calls
    l) First aid kit availability and required supplies

An *organized* staff can very effectively care for all the safety needs of the athletes in a multi-sport event. This particular event produced 292 significant injuries and another estimated 200 minor problems not recorded in the injury log. The staff included 15 physicians, 9 certified trainers, 10 student trainers, and 5 runners, providing care at 5 different sites. The need for organization was apparent.

There was much pride instilled in the safety staff for the 1982 Jr. Olympics as they saw how important their skills were to the safety of the athletes. Due to their efforts, many athletes, parents and coaches, were made aware of the need for organized safety personnel in sports. +

Editor's Note: Anyone wishing to have an idea, technique, etc. considered for this section should send one copy to **Dave Burton, Duncanville High School, Duncanville, TX 75116.** *Copy should be typewritten, brief, and concise, using high quality illustrations and/or black and white glossy prints.*

The Effectiveness of Strapping Techniques During Prolonged Dynamic Exercises

Donald R. McIntyre, PhD
Michael A. Smith
Nancy L. Denniston

Review of Literature

For those individuals who participate in athletic activities the ankle joint is particularly susceptible to injury. According to Mack (11), ankle injuries constitute 20-25 percent of all time-loss injuries in every running or jumping sport. The most common ankle injury is a ligamentous sprain (8, 17) with approximately 85 percent being of the inversion type (3).

The severity classification, location, injury mechanism and treatment modalities for ankle sprains have been well documented (5, 7, 9). A treatment commonly used by athletic trainers is to partially immobilize previously injured ankles by strapping them with either adhesive tape or cloth wrapping. This practice is also used with healthy ankles as an injury prevention measure.

There exists a selection of materials that are used to strap the ankle. The most common materials are adhesive tape and cloth wraps in both elastic and inelastic forms. Despite numerous opinions and some research-based literature, there still exists disagreement as to the relative merits of each of the materials. Several authors (3, 4, 18, 19) claim that cloth ankle wraps provide adequate protection whereas others (3, 15, 17) recommend the use of adhesive tape. Malina (12) found that under both pre- and post-exercise conditions a basketweave with stirrups and a heel lock applied directly to the skin provided greater support than either a stockinette or Louisiana wraps. Simons (16), however, found no difference between adhesive tape and cloth wrap in terms of the number of incurred injuries and that neither material afforded any significant amount of protection.

The effectiveness of ankle strapping during prolonged dynamic exercises has been the subject of some scientific scrutiny. Rarick (14) examined four different methods of ankle strapping before and after exercise. The results of the study indicated that the greatest support before and after exercise is provided by the basketweave with a combination stirrup and heel lock. The least support was given by the standard basketweave. The results also showed that as much as 40 percent of the net supporting strength of the strapping was lost after ten minutes of vigorous exercise. In a similar study, Malina (12) found that exercise of no more than five minutes duration produced significant reductions in the supporting strength provided by tape-on-skin, a stockinette and the Louisiana wrap. The Louisiana wrap provided the least support under the pre-exercise and post-exercise conditions.

Although there exists general agreement that the ankle is protected by preactivity taping (2, 15, 17, 18), there is little objective and conclusive evidence that the procedure reduces the incidence of injuries.

A potential problem associated with ankle strapping concerns the effects of partial immobilization on the functioning of the lower limbs. Mayhew (13) observed restrictions in some running and jumping activities. Libera (10) noted that taping restricted anterior-posterior movements. Abdenour (1), however, found no differences between taped and not-taped conditions for plantar-flexion and dorsi-flexion. In this study the only significant difference recorded was for that of inversion which concurs with the observation of Mayhew (13). There also exists the possibility that strapping may restrict the intrinsic shock absorption mechanisms of the foot, i.e., pronation, or the ability of the foot to accommodate movement over uneven terrain. For example, Ferguson (6) considers that taping limits the "natural safety action of the muscles and tendons." Wells (20), however, provided no research evidence to support this contention.

In summary, although strapping is widely used by athletic trainers to both prevent ankle injuries and as a post injury treatment there exists controversy concerning the effectiveness of the practice and the relative support provided by the commonly used materials. This conflict is further confounded by the apparent decrease in the provided restriction following continuous exercise. There also exists the potential that "natural" lower limb movements may be inhibited by the partial immobilization. This inhibition is apparently of particular concern in those movements requiring extreme dorsiflexion and plantarflexion and/or those movements in which intrinsic shock absorption is deemed important.

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Procedures

Ten male subjects ranging in age from 21 to 32 years ($\bar{X}$ = 25.6 years, SD = 4.4 years) each walked on a treadmill on five separate occasions. Each trial corresponded to one of the following right foot ankle taping/wrapping techniques: 1) Gibney basketweave with the Louisiana heel lock using two inch width white adhesive tape (adhesive tape), 2) Louisiana heel lock using an elastic conform wrap (elastic wrap), 3) Louisiana heel lock using cloth webbing wrap (cloth wrap), 4) Castiglia* ankle wrap (velcro) and 5) barefoot. The taping/wrapping conditions were selected after surveying the most common ankle support techniques used by the resident athletic trainers. The performance order of each trial was randomly assigned to each subject. Each of the ankle joint restraints was applied by one certified athletic trainer. For each trial, the speed of the treadmill was set at 4.5 miles per hour and inclined at a 15% grade. The operating conditions of the treadmill both permitted the subjects to perform ten minutes of continuous walking exercise and ensured extreme ankle dorsiflexion and plantar flexion during each stance phase.

Prior to the commencement of each trial a clearly visible mark was drawn on the lateral border of the right foot in line with the center of the second metatarsal-phalangeal joint. Additional marks were drawn on the skin overlaying the lateral projection of the right knee and right ankle joint. A straight line was also drawn down the middle of the posterior surface of the right leg and foot. This line extended from the popliteal fossa and to the lower border of the calcaneous. The landmarks were subsequently used in the determination of the angles of the involved segments and joints. Each trial was of ten minute duration. High speed cinematographical techniques were employed to obtain film records of three successive left foot stance phases after 30 seconds, 300 seconds, 585 seconds of exercise. A plane mirror vertically orientated and at 45° to the optical axis of the camera ensured that both rear and lateral projections of the right lower limb were recorded on film. The operating speed of the camera was set at 100 frames per second.

The processed film depicting the second of the three recorded stance (heel strike to toe-off) phases were analyzed. The x- and y- coordinates of the marked landmarks, two points on the line on the back of the right leg above a line linking the right malleoli and two points on the line drawn on the skin-immobilization material over the posterior surface of the right calcaneous, were digitized and recorded for each film frame. The data thus obtained was used in the computation of an indicator of right foot pronation, the angles of the right foot, the right leg and the right thigh and the angles at the right knee and the right ankle joints. The reference system used to measure each of the angles is shown in Figure 1.

All of the above parameters were "smoothed" using cubic spline curve fitting techniques and maximums, minimums and ranges recorded. Average values of the smoothed parameters were computed for each condition.

A statistical analysis ($p<0.5$) utilizing repeated measures analysis of variance procedures was conducted to determine either the presence and source of duration of exercise and taping/wrapping condition interactions, or duration and taping/wrapping condition main effects. Newman Keuls post hoc evaluations were used to determine the location of any significant main effects. The instantaneous temporal and angular displacement values were entered as the dependent variables.

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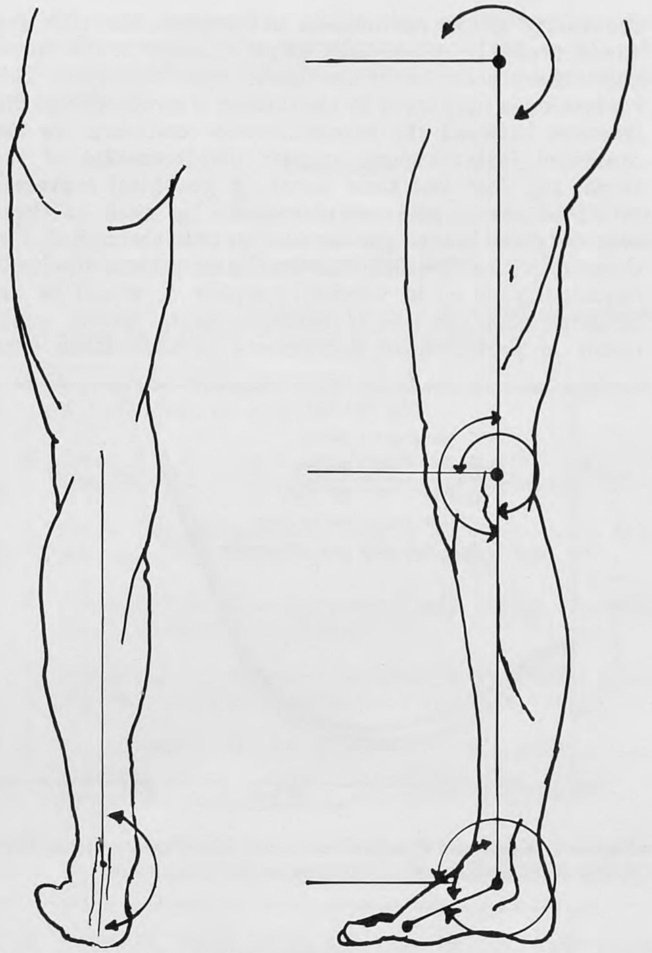

Figure 1. Reference System used for Each of the Computed Angles

Results and Discussion

A statistical analysis conducted on the extracted instantaneous angular displacements of the right thigh, right leg, right foot, right knee joint, right ankle joint and right foot pronation revealed no significant duration of exercise and strapping condition interactions. The analysis also showed that the measured gait characteristics did not change as a function of the duration of the exercise. This indicates that all of the immobilization techniques were effective in retaining the immobility (or mobility) of the restrained segments. This result is in contrast to those of Rarick (14) and Malina (12) although differences in the imposed exercise must be taken into consideration. The angle of the ankle joint at toe-off minus the angle of the ankle joint at heel-strike for the adhesive tape condition was found to be significantly less than the corresponding angle for the other conditions (Table 1). It would therefore appear as though adhesive tape and/or the application technique restricts the range of plantar flexion during the latter part of the walking stance phase. An illustration of the angular displacement of the right ankle joint for each of the immobilization conditions appears in Figure 2. During the latter part of the stance phase the muscles causing plantar flexion contribute to the forward and vertical propulsion of the body. It would therefore seem reasonable that restrictions in the range of plantar flexion necessitate that for a required work the muscles must either contract more vigorously or that the propulsive contributions of the extensors of the lower limb segments must be increased. Such adaptations would necessarily result in changes in the normal gait of the performers. However, in relatively short duration walking performances these changes would be unlikely to affect the ability of the performers to complete the task and would probably invoke only slight changes in the movement characteristics of the lower limb segments. This contention is supported by the finding of no significant differences between the immobilization conditions for the examined instantaneous angular displacements of the thigh, leg, foot and knee joints. A graphical representation of the angular displacements of each of these segments and joints appear in Figure 3 through 6. For those activities in which near maximum plantar flexion is required, such as in vertical jumping, it would be anticipated that the use of adhesive ankle taping would result in performance decrements in accordance with previous research findings and opinions (1, 10, 13). It would also be anticipated that the angle of the ankle joint at heel strike minus the minimum angle, i.e., relative dorsiflexion, would be reduced by the use of adhesive tape. The results of the statistical analysis did not support this contention.

The pronation/supination angles for all of the conditions are shown in Figure 7. A statistical analysis with the initial, maximum and maximum minus initial angles entered as the dependent variables showed that at the instant of heel strike the foot was in a lessened supinated position for the barefoot condition than for the other immobilization conditions (Table 2). The greatest initial

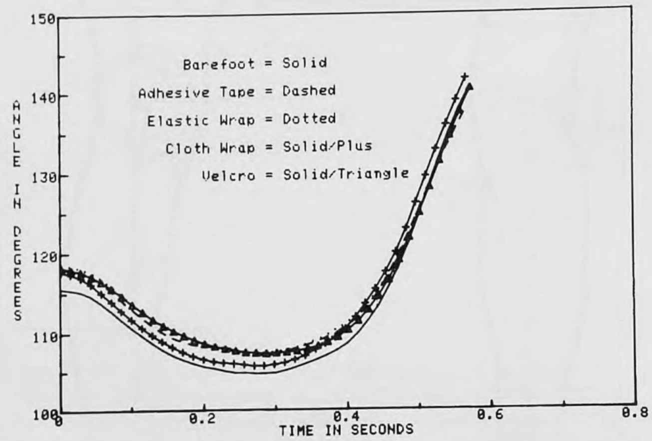

Figure 2. Angles of Plantarflexion and Dorsiflexion of the Right Ankle Joint for Each of the Immobilization Conditions

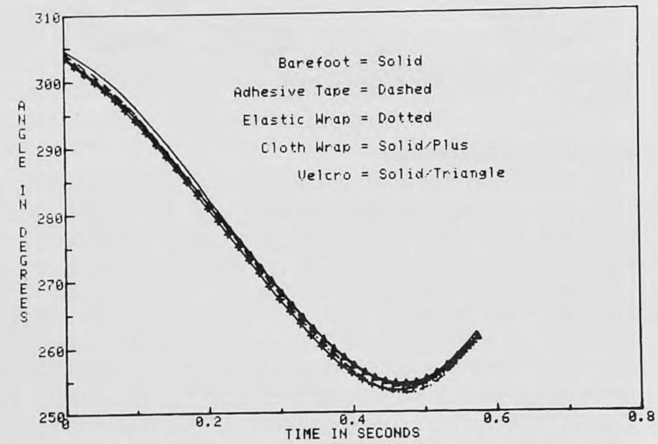

Figure 3. Inclination Angles of the Right Thigh for Each of the Immobilization Conditions

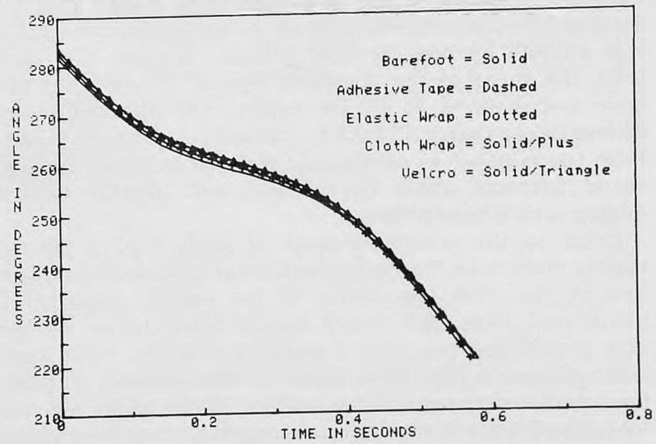

Figure 4. Inclination Angles of the Right Leg for Each of the Immobilization Conditions

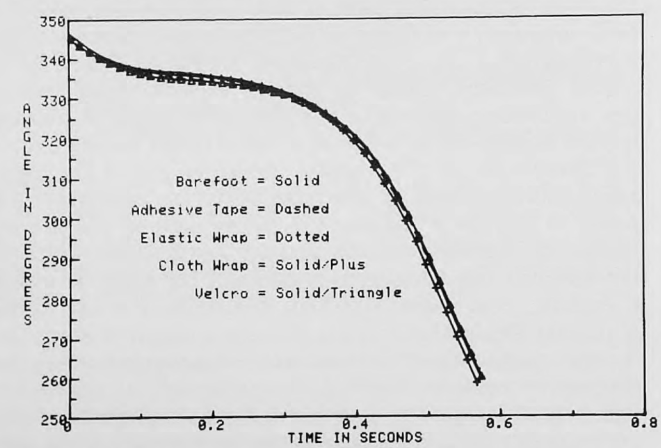

Figure 5. Inclination Angles of the Right Foot for Each of the Immobilization Conditions

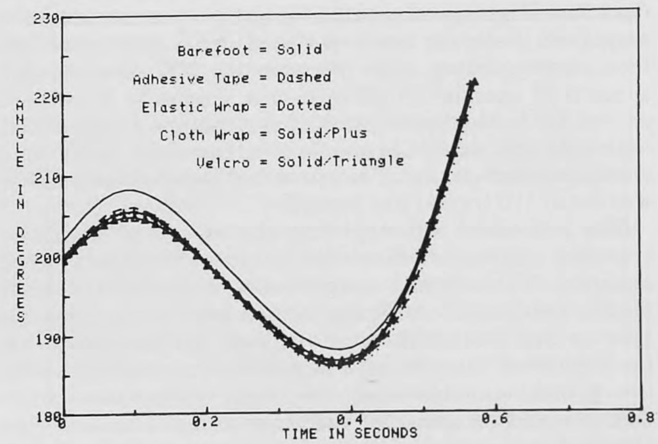

Figure 6. Angles of the Right Knee Joint for Each of the Immobilization Conditions

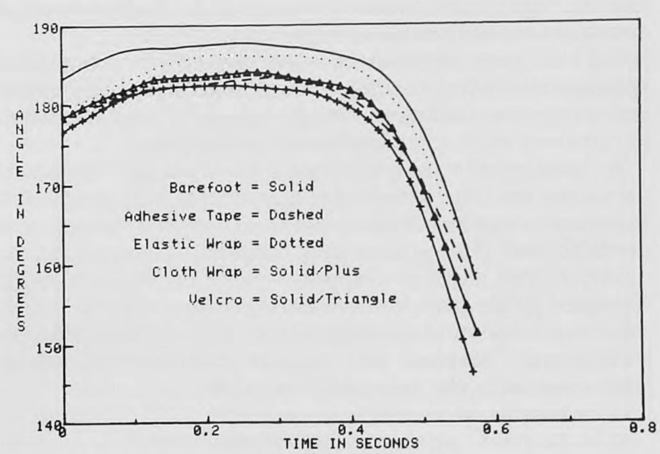

Figure 7. Angles of Right Foot Pronation/Supination for Each of the Immobilization Conditions

Table 1

Mean Instantaneous Angles at the Right Ankle Joint for Each of the Immobilization Conditions

Immobilization Condition	Angle: Heelstrike Minus Minimum	Angle: Toe-Off Minus Heelstrike	Angle: Toe-Off
Barefoot	13[a]	28	143
Adhesive Tape	12	21	138
Elastic Wrap	13	25	143
Cloth Wrap	14	27	144
Velcro	11	26	141

[a]All angles measured in degrees

value of supination was found for the cloth wrap condition, followed by the adhesive tape condition and velcro condition, then finally the elastic wrap condition. During typical walking gaits the foot is supinated prior to heelstrike. It then becomes pronated during the initial part of the contact phase. It is conceivable that if the immobilization materials restrain the foot in excessive supination prior to heelstrike then the intrinsic shock absorption provided by the pronation mechanism may be limited and possibly predispose continuing supination with the concomitant potential for an inversion sprain.

Table 2

Mean Instantaneous Angles of Right Foot Pronation/Supination for Each of the Immobilization Conditions

Immobilization Condition	Angle: Initial	Angle: Maximum
Barefoot	184	189
Adhesive Tape	177	184
Elastic Wrap	181	191
Cloth Wrap	175	183
Velcro	177	185

[a]All angles measured in degrees

These potential effects would obviously be particularly hazardous to those individuals who have inherently supinated feet. However, the results of this study provide no evidence to suggest a restriction in the intrinsic shock absorptions mechanism in that the recorded values of relative pronation (maximum minus initial) were not significantly different between the conditions.

Conclusions

Based on the results of this study the following conclusions would appear to be warranted.

1. All of the ankle strapping techniques examined were equally effective in maintaining consistent immobilization for 10 minutes of continuous uphill treadmill walking.
2. Adhesive taping restricts the range of plantarflexion at the ankle joint during the latter part of the contact phase during uphill treadmill walking.
3. Prior to heelstrike, all of the strapping materials and/or application techniques cause the foot to be supinated beyond that normally found under a barefoot condition.

References

1. Abdenour TE, Saville WA, White RC, Abdenour MA: The effect of ankle taping upon torque and range of motion. *Athletic Training.* Winter: 227-228, 1979.
2. Bevans R: The Athletic Trainer's Handbook. Englewood Cliffs, New Jersey, Prentice Hall, Inc., 1956.
3. Davies GJ: The ankle wrap: variation from the traditional. *Athletic Training.* 12(4):194-197, 1977.
4. Dolan JP: Treatment and Prevention of Athletic Injuries. Danville, Illinois, Interstate Printers and Publishers, 1955.
5. Dziob JM: Ligamentous injuries about the ankle joint. *American Journal of Surgery.* 91(4):692-698, 1956.
6. Ferguson AB: The case against ankle taping. *Journal of Sports Medicine.* 1:46-47, 1973.
7. Floriani LP: Ankle injury mechanism and treatment guides. *The Physician and Sports Medicine.* 4(9):72-78, 1976.
8. Jackson DW, Ashley RL, Powell JW: Ankle sprains in young athletes: relation of severity and disability. *Clinical Orthopaedics and Related Research.* 101:201-215, 1974.
9. Leonard MH: Injuries of the lateral ligaments of the knee. *The Journal of Bone and Joint Surgery.* 31-A(2):375-377, 1949.
10. Libera D: Ankle taping, wrapping, and injury prevention. *Athletic Training.* 7:73-75, 1972.
11. Mack RP: Ankle injuries in athletics. *Athletic Training.* 10(2):94-95, 1975.
12. Malina RM, Plagenz LB, Rarick GL: Effect of exercise upon the measurable supporting strength of cloth and tape ankle wraps. *The Research Quarterly.* 34(2):158-165, 1963.
13. Mayhew JL: Effects of ankle taping on motor performance. *Athletic Training.* 7:73-75, 1972.
14. Rarick GL, Bigleg G, Karst R, Malina RM: The measurable support of the ankle joint provided by conventional methods of taping. *The Journal of Bone and Joint Surgery.* 44-A(6):1183-1190, 1962.
15. Rawlinson KB: Athletic training, protective equipment, and protective support. *Journal of American Medical Association.* 171:1670-72, 1959.
16. Simons JE: Study of the comparative effectiveness of ankle taping and wrapping on the prevention of ankle injuries. *Journal of the National Athletic Trainers Association.* 4:10-13, 1969.
17. Thorndike A: Athletic Injuries: Prevention, Diagnosis and Treatment. 4th edition. Philadelphia, Lea and Febiger. 59-60, 1956.
18. Quigley TB, Cox J, Murphy J: A protective wrapping for the ankle. *Journal of American Medical Association.* 132:924 (December 14), 1946.
19. Quigley TB: Management of ankle injuries. *Journal of American Medical Association.* 169(13):119-124, 1959.
20. Wells J: The incidence of knee injuries in relation to ankle taping. *Journal of the National Athletic Trainers Association.* 4:10-13, 1969. +

A Comparison of Static Stretching and PNF Stretching for Improving Hip Joint Flexibility

William E. Prentice, PhD, ATC

Flexibility may be defined as the range of movement which is possible about a single joint or through a series of articulations. The maintenance of a full, nonrestricted range has been recognized as an essential component of physical fitness. Flexibility may be important not only for successful athletic performance but also for the prevention of injury.

The goal of an effective flexibility program should be to improve the range of movement at a given articulation by altering the extensibility of the musculotendinous units which produce movement at that joint.

It is well documented that exercises which stretch these musculotendinous units over a period of time will increase the range of movement possible at that joint. There is considerable disagreement as to which type of stretching exercise will produce the greatest increase in range of movement. For many years a technique known as static stretching has been advocated. Recently, however, another group of stretching techniques known collectively as proprioceptive neuromuscular facilitation techniques (PNF) have also been recommended.

The effectiveness of each of these two stretching techniques for improving the range of movement about a particular joint may be attributed to an alteration of the myotatic stretch reflex, which involves the muscle spindles, Golgi tendon organs, and the gamma system.

To determine which stretching technique is most effective in improving the range of motion, goniometry can be used to measure changes in joint movement.

This study examines the use of both static stretching and a technique of PNF stretching (slow-reversal-hold method) to determine which technique is most effective in improving the range of movement about the hip joint as indicated by goniometric measurement of hip joint flexion.

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Methods and Procedures

Forty-six subjects, both male and female students, ages 18-34 years, were randomly assigned to one of two treatment groups, the static stretching group, or the slow-reversal-hold group. Each subject was involved in a ten-week general fitness program concentrating on flexibility and cardiovascular endurance. At the beginning of the ten-week session a pre-treatment range of motion of both the right and left hip joints were measured and recorded using a goniometer. During the ten-week session, each subject was asked to follow a specified flexibility program, three days per week, under the direct supervision of an exercise leader. Using the right leg as the experimental leg and the left as the control leg, each subject stretched the right hamstring group using either the static or slow-reversal-hold techniques. The left hamstrings were not stretched at all during the session. At the conclusion of the ten-week program a post-treatment range of motion goniometric measurement was taken and recorded for both experimental and control legs of each subject.

Stretching Techniques

In both the static and PNF stretching, subjects were in a supine position on a treatment table. The knee was fully extended and ankle flexed to 90^0. The left leg was passively flexed at the hip joint to a point where either the subject complained of a feeling of tightness or discomfort in the hamstring group or the experimenter perceived muscle tightness or resistance to stretch.

In the static stretching technique, this position of stretch was held for a period of 10 seconds, followed immediately by a 10-second period of relaxation in which the experimenter released passive pressure on the leg. This static stretch sequence was repeated three times.

The specific PNF technique used can be referred to as the slow-reversal-hold method (5). Once again, the leg is flexed at the hip to the point of discomfort. At that point, the experimenter instructs the subject to push against his resistance by isometrically contracting the antagonist hamstrings. This force is met with resistance to maintain the original joint angle. The push phase lasts for 10 seconds. Then the experimenter instructs the subject to relax. During the 10-second relax phase, the antagonist hamstrings are relaxed while the agonist quadriceps group is contracted thus moving the leg into the agonist pattern and further stretching the antagonist. The experimenter applies passive pressure to assist in the hamstring stretch. This push-relax sequence was repeated three times.

Goniometric Technique

Hip joint flexion was measured using a 360° goniometer. Subjects were supine and measurements were taken at the lateral aspect of the hip. The stationary arm was placed parallel with the long axis of the trunk; the movable arm was placed along the long axis of the femur toward the lateral condyle. The axis of rotation falls in the region of the greater trochanter. All measurements were taken with the knee fully extended and the ankle flexed at 90°. Maximum range of movement for each subject in both the pre- and post-treatment measurements was defined as the point at which either the experimenter perceived tightness or resistance to further stretching, or the subject complained of pain or discomfort. Measurements for each subject were recorded in degrees.

Results

The experimental design used in this study was a completely randomized 2x2 factoral analysis.

Pre-treatment and post-treatment goniometric measures of hip joint flexion were recorded for all subjects for both experimental and control legs. This investigation was primarily concerned with determining 1) if both static stretching and PNF (slow-reversal-hold) stretching would improve hip joint flexion during the 10-week period; and 2) whether one technique was superior to the other for improving hip joint flexibility. To accomplish this, gain scores (Post-treatment minus Pre-treatment scores) were used in the analysis to indicate changes which occurred between pre- and post-treatment measurements.

The analysis of variance (Table 1) found the F ratios for both between stretching techniques and between control and experimental legs sources of variance to be significant ($p < 0.05$) indicating that a difference did exist between the groups.

Table 1

Analysis of Variance to Determine Differences Between Treatment Groups

Source of Variance	Degrees of Freedom	Sum of Squares	Mean Square	F Ratio
Between Experimental and control legs	1	1141.05	1141.05	70.11*
Static and PNF Stretching	1	66.13	66.13	4.06*
Interaction	1	50.25	50.25	3.08
Within	88	1432.18	16.27	
Total	91	2689.61		

* indicates significance at $p < 0.05$

An analysis of the means for each group (Table 2) showed that both stretching techniques were effective in increasing hip joint flexion during the 10-week training period. It is also apparent that the slow-reversal-hold technique was superior to the static stretching technique for improving hip joint flexibility. A slight gain in range of motion at the control leg of subjects tested suggests that some training effect did occur to improve flexibility even though no specific stretching exercises were done during the training session.

Table 2

Treatment Group Mean Gain Scores Indicating Changes in Hip Joint Flexion Between Pre- and Post-Treatment Measurements

	Static Stretching Group	PNF (slow-reversal-hold) Stretching Group
Experimental Leg	8.86	12.04
Control Leg	3.30	3.52

Measurements indicate degrees of change.

Discussion

The static stretching technique has been widely accepted as an effective technique for the improvement of flexibility. PNF techniques have been used for some time by physical therapists as a treatment method for various neuromuscular disorders. However, the use of these PNF techniques as an effective method for improving flexibility has not to this point been clearly documented.

The effectiveness of both techniques may be attributed to neurophysiologic mechanisms involving the stretch reflex.

Basically, the stretch reflex involves two types of receptors: (1) muscle spindles which are sensitive to a change in length as well as the rate of change in length of the muscle fiber, and (2) Golgi tendon organs which detect changes in tension.

Stretching of a given muscle causes an increase in the frequency of impulses transmitted to the spinal cord from the muscle spindle, which in turn produces an increase in the frequency of motor nerve impulses returning to that same muscle, thus reflexly resisting the stretch. On the other hand, the development of excessive tension within the muscle activates the Golgi tendon organs whose sensory impulses are carried back to the spinal cord. These impulses have an inhibitory effect on the motor impulses returning to the muscle, thus causing that muscle to relax. A summary of this stretch reflex is presented in Figure 1.

There are two neurophysiologic phenomena which may explain the effectiveness of the different stretching techniques in improving flexibility.

The first is known as autogenic inhibition, and is defined as "inhibition which is mediated by afferent fibers from a stretched muscle and acting on the alpha motorneurons supplying that muscle, thus causing it to relax" (9). When a muscle is stretched, motorneurons supplying that muscle receive both excitatory and inhibitory impulses from the receptors. If the stretch is continued for a slightly extended period of time, the inhibitory signals from the Golgi tendon organs eventually override the excitatory impulses, therefore causing relaxation (6). Since inhibitory motorneurons receive impulses from the Golgi tendon organs, it would appear that while the muscle spindle creates an initial reflex excitation leading to contraction, the Golgi tendon organs send inhibitory impulses which last for the duration of increased tension (resulting from either passive stretch or active contraction) and eventually dominate the weaker impulses from the muscle spindle. This inhibition seems to protect the muscle against injury from reflex contractions resulting from excessive stretch.

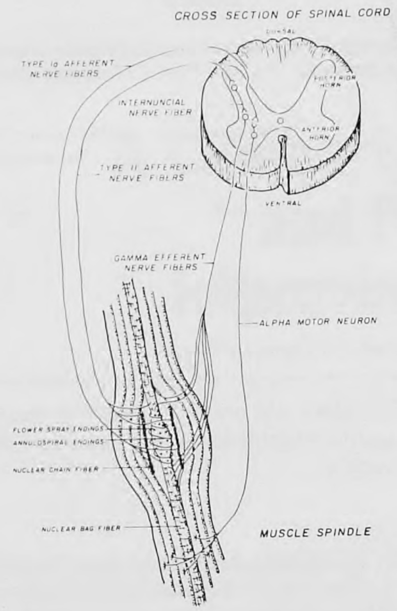

Figure 1 DIAGRAMMATIC REPRESENTATION OF THE MYOTATIC REFLEX (Illustrated by Cindy Morris)

A second mechanism known as reciprocal inhibition deals with the relationships of the agonist and antagonist muscles (Figure 2). When motorneurons of the agonist muscle receive excitatory impulses from afferent nerves, the motorneurons which supply the antagonist muscles are inhibited by the afferent impulses (1). Thus contraction or stretch of the agonist muscle will elicit relaxation of the antagonist.

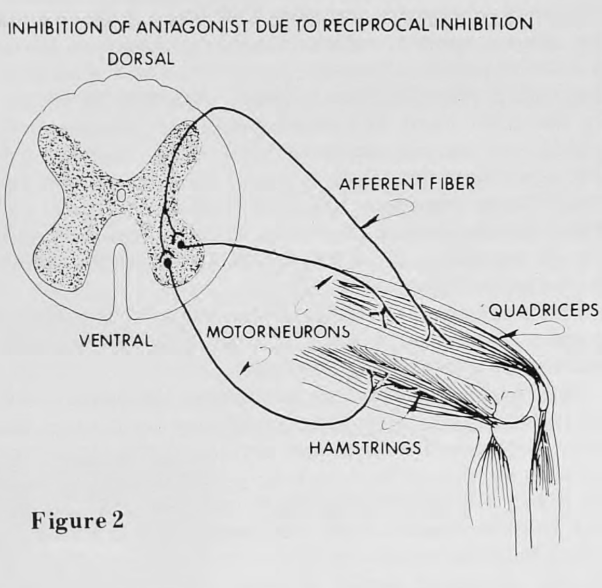

Figure 2

A final point of clarification should be made regarding both autogenic inhibition and reciprocal inhibition. The motorneurons of the spinal cord always receive a combination of inhibitory and excitatory impulses from the afferent nerves. Whether these motorneurons will be excited or inhibited depends on the ratio of these two types of incoming impulses.

Static stretching involves moving the body part slowly into a position of stretch, and then holding that position by locking the joints involved, which places the muscle and connective tissue at their greatest possible length.

The static stretch will initiate the stretch reflex or myotatic reflex involving the muscle spindle which causes a reflex contraction of the muscle being stretched. Additionally, the static stretch will cause an increase in tension on the Golgi tendon organs, thus resulting in inhibition to the muscle being stretched. This allows the muscle to be stretched to a greater length because of the decreased resistance to stretch (6). Since the threshold stimulus of the muscle spindle is lower than that of the Golgi tendon organ, the initial reflex response to stretch will be excitation of the muscle spindle which opposes stretch, followed by excitation of the Golgi tendon organ which inhibits not only reflex contraction of muscle, but the muscle spindle as well (7).

The therapeutic techniques of facilitation were first used in the treatment of patients with paralysis and in the treatment of neuromuscular disorders. Most of the principles underlying modern therapeutic exercise techniques can be attributed to the work of Sherrington, who first defined the concepts of facilitation and inhibition (4).

An impulse traveling down the corticospinal tract or afferent impulses from peripheral receptors in the muscle cause an impulse volley, which results in the discharge of a limited number of specific motorneurons as well as the discharge of additional surrounding (anatomically close) motorneurons in the so-called subliminal fringe area. An impulse causing the recruitment and discharge of additional motorneurons within the subliminal fringe is said to be facilitory. Conversely, any stimulus which causes motorneurons to drop out of the discharge zone and away from the subliminal fringe is said to be inhibitory. Facilitation results in increased excitability, and inhibition results in decreased excitability of motorneurons. Thus the function of weak muscles would be aided by facilitation and muscle spasticity would be opposed by inhibition (4).

Sherrington attributed the impulses transmitted from the peripheral stretch receptors via the afferent system as being the strongest influence on the alpha motorneurons. Therefore, it should be possible for the therapist to modify the input from the peripheral receptors and thus influence the excitability of the alpha motorneurons. The discharge of motorneurons can be facilitated by peripheral stimulation which causes afferent impulses to make contact with excitatory neurons, resulting in increased muscle tone or strength of voluntary contraction. Motorneurons can be inhibited by peripheral stimulation which causes afferent impulses to make contact with inhibitory neurons, thus resulting in muscle relaxation (4).

The objective, when attempting to improve flexibility, is to induce relaxation through the use of inhibitory mechanisms rather than facilitory mechanisms. Consequently, the implications of the term, proprioceptive neuromuscular facilitation, may well be misleading and inappropriate in describing a technique of stretching for the purposes of relaxation. Therefore, PNF should be used to indicate any technique in which input from peripheral receptors is used for the purpose of either facilitation or inhibition (4).

Several different approaches to therapeutic exercise based on the principles of facilitation and inhibition have been proposed. Among these are the Bobath Method (2), Brunnstrom Method (3), Rood Method (8), and the Knott and Voss Method, which they called Proprioceptive Neuromuscular Facilitation (5).

While each of these techniques is important and useful, the PNF technique of Knott and Voss probably makes the most explicit use of proprioceptive stimulation (4).

The static stretching technique attempts to take advantage of the phenomenon known as autogenic inhibition (6) by placing the muscle in an extended sustained position of stretch. The inhibitory impulses from the Golgi tendon organs reduce the level of electrical activity in the motor units of the antagonist muscle resulting in relaxation.

The slow-reversal-hold technique also relies on autogenic inhibition but carries it one step further. The sustained isotonic contraction by the antagonist muscle increases the tension in the muscle again exciting the inhibitory Golgi tendon organs. In addition, the isometric contraction of the agonist which assists in placing the antagonist on stretch takes advantage of a second phenomenon known as reciprocal inhibition. When the motorneurons of the agonist receive excitatory afferent impulses from the contracting agonist muscle, the motorneurons which supply the antagonist muscle are inhibited by the afferent impulses causing a reflex relaxation of the antagonists (1).

Thus it would seem logical that the slow-reversal-hold method should be more effective than static stretching for inducing relaxation and improving range of motion about a particular joint. The results of this study indicate that while both stretching techniques increased range of motion during the training period, the PNF technique was superior to the static stretch technique for improving hip joint flexion.

Summary

This investigation indicates that both static stretching and PNF (slow-reversal-hold) stretching techniques are capable of improving range of movement in hip joint flexion over a 10-week training period. The PNF technique produced a significantly greater improvement in hip joint flexion over a 10-week session than did the static stretching technique. The use of PNF stretching for improving flexibility may be effective both in training and conditioning, and as a therapeutic technique which may be utilized following injury to the musculotendinous unit.

References

1. Basmajian J: Neuromuscular control of voluntary movement, in Buerger A, *Neurophysiologic Aspects of Rehabilitation Medicine.* Springfield, Illinois, Charles C. Thomas Publisher, 1976.

2. Bobath B: The treatment of Motor disorders of pyramidal and extrapyramidal origin by reflex inhibition and by facilitation of movements. *Physiotherapy.* 41:146, 1955.

3. Brunnstrom S: *Movement Therapy in Hemiplagin.* New York, Harper and Row, 1970.

4. Harris F: Facilitation techniques and therapeutic exercise, in Basmajian J, *Therapeutic Exercise.* Baltimore, Waverly Press, 1978, pp. 93-137.

5. Knott M, Voss D: *Proprioceptive Neuromuscular Facilitation: Patterns and Techniques.* New York, Harper and Row, 1968.

6. McCough G, Deering I, Stewart W: Inhibition of Knee jerk from tendon spindles and Crureus. *Journal of Neurophysiology,* 13:343-350, 1950.

7. Ralston H: Recent advances in Neuromuscular physiology, *American Journal of Physical Medicine* 36:94-120, 1957.

8. Rood M: Neurophysiological Reactions as a basis of Physical Therapy, *Physical Therapy Review* 34:444, 1954.

9. Ruch T, Patton H, Woodbury J, Towe A: *Neurophysiology.* Philadelphia, W.B. Saunders Co., 1965. +

NOTES *from the* National Office

"To inform and update the membership on various subjects of interest and answer the most frequently asked questions."

BACK ISSUE UPDATE

*** After the Winter issue was submitted to our printer the National Office received back issues of the Journal from Brad Wilson. We are most grateful for these and all other donations from the previously mentioned contributors. We now have an ALMOST complete library of back issues of *ATHLETIC TRAINING*. If we could locate copies of the Spring, Summer and Winter issues from 1956, the Summer 1960 issue and the Summer 1961 issue, our reference library would be complete.

FROM THE CERTIFICATION OFFICE

*** One of the requirements that determines a candidate's eligibility to sit for the Certification examination is a bachelor's degree or a candidate's enrollment in his/her last semester prior to graduation. If a candidate has not graduated, but is enrolled in his/her final semester, a letter of "intent to graduate" must be included with the application for Certification. This letter should be from the Registrar's office or the Dean of the College or University and should state that the candidate is currently enrolled and give the projected date of graduation. This allows the candidate to be scheduled for examination but does NOT complete the application for Certification. It simply confirms that the candidate will be graduating within that semester and thus is eligible to take the exam, providing all other requirements are met. In all cases the candidate must submit an official transcript to the Certification Office (proof of graduation) and the transcript must include the degree earned and the date of graduation. Certification will not be awarded until (a) candidate has successfully completed the Certification examination AND (b) candidate has submitted a complete Certification application (including official transcript). PLEASE SHARE THIS INFORMATION WITH ANY CANDIDATES FOR CERTIFICATION TO HELP THEM PREVENT DELAYS IN THE CERTIFICATION PROCESS.

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*** When sponsoring a meeting that will use the automatic CEU submittance method, please follow these steps: (1) Contact the appropriate District Representative to have your program evaluated. Do this well in advance. (2) Contact the National Office. We have forms available for listing attendants' names, member number and certification number. (3) Submit the list to the National Office within thirty (30) days after your meeting. (The only exception to the "30-day rule" is the CEU quiz offered in the Journal. Late submittances will not be accepted. If a member is not sure of the CEU value, send in the request and the National Office will determine the correct number of CEUs to be assigned. Please DO NOT send CEU requests to the District Representative.)

FROM THE MEMBERSHIP OFFICE

*** Questions about the following points frequently arise: (1) At this time the NATA has no classification of membership open to high school students. The CAREER brochure is available upon request, however, and subscribing to the Journal is recommended. (2) A $5.00 reprocessing fee is charged on all applications that must be returned for correction. Please remind students to read the directions carefully. (3) Members, please contact the National Office for Change of Classification applications. (4) The membership year for NEW members changes on August 5th. No dues are pro-rated. (5) Certified Athletic Trainers supervising student trainers should request the Membership Packet from the National Office. This will probably give all the information you need but please contact us if you have any unanswered questions. (6) The District Transfer form may be copied from the Journal or may be requested from the National Office. Please complete in triplicate. (7) When prospective members request applications from the National Office, please have them state (a) college/university and (b) graduate/undergraduate. (8) In order for an ATC to supervise or sponsor a new member or a student, that ATC must be a member in good standing with the NATA. (9) New student and associate applications are now available. ATC's, please contact National Office for correct applications.

THANKS TO OUR COMMITTEES

*** The outstanding achievements of the National Athletic Trainers Association's various committees are obviously the end result of much effort and dedication on the part of our Committee Chairpersons. As in any successful endeavor, however, there are those who work behind the scenes. In the NATA these are the people who assist our Committee Chairpersons. These selfless and very valuable workers deserve recognition and thanks for their contributions to the success and growth of our Association. During 1982 some of the volunteers who served the NATA through its committees were: AUDIO VISUAL AIDS COMMITTEE: John Streif, Michael Rule, Patrick Connors, John Joseph Kasik, Robert Gray, Jr., Jerry Nowesnick, Jerry Weber, Allen Eggert, Thomas Abdenour, Robert Smetanka, James Madaleno, Dennis Murphy; CAREER INFORMATION & SERVICES COMMITTEE: Charles Demers, Robert Behnke, Fred Kelley; CERTIFICATION COMMITTEE: Paul Grace, John Leard, Steve Bair, Mary Allen Watson, Marge Albohm, Steve Risinger, Harold Bennett, Ben Davidson, Carlynn Smith, Al Green, Terry Lewis, Dick Irvin, Carl Krein, Ron Barnes, Joe Gieck, Kathy Heck, Lynn Bott, Jim Dodson, Bruce Kola, Bruce Swart, David Green, Janet Anderson, C. David Burton, Dennis McMeekin; CONTINUING EDUCATION COMMITTEE: Jim Gallaspy, Harriett Pearce, Don Kessler, Debbie Granner, Fred Turner, Reginald Speak, Ron Carroll, Mike Nesbitt, Larry Krock, Dan Bailey, Linda Arnold, Jackie Laws; DRUG EDUCATION COMMITTEE: John Wells, Scott Biron; ETHICS COMMITTEE: "Tow" Diehm, Chris Patrick, Kevin O'Neill, Cash Birdwell, Kent Falb, Debra Granner, Wesley Jordan; GRANTS AND SCHOLARSHIPS COMMITTEE: "Pinky" Newell, Tenley Albright MD, Robert Brashear MD, Carson Conrad, Don Cooper MD, "Ducky" Drake, Cliff Fagan, "Whitey" Gwynne, Thomas Hamilton, Kenny Howard, Chuck Medlan, Gene Monahan, Don O'Donoghue MD, Jules Reichel, W.K. Smith MD, Howard Waite; HISTORY AND ARCHIVES COMMITTEE: Mike O'Shea; HONOR AWARDS COMMITTEE: George Sullivan, Troy Young; INTERNATIONAL GAMES COMMITTEE: Troy Young, Lewis Crowl; JOURNAL COMMITTEE: Ken Wolfert, Clint Thompson, Dennis Aten, T. David Burton, Paul Concialdi, Jeff Fair, Kathy Fox, Sue Halstead, Don Kaverman, Deloss Brubaker, Dan Libera, Bob Moore, David Yeo, Jim Rankin, John Wells, Ray Baggett, Ed Christman, Ken Knight; LICENSURE COMMITTEE: Robert Behnke, Louis DiNitto, John Sciera, J.J. Bush, Ed Crowley, Spanky Stephens, Steve Antonopulos, Jerry Lewis, Jim Murphy, Rick Troxel; MEMBERSHIP COMMITTEE: Bruce Melin, Chris Troyanos, Don Lowe, Larry Sutton, Patricia Troesch, Denis Isrow, James Dodson, Daniel Libera, Buford Harmon, Doug May, Dennis Sealey, Hunter Smith, Mark Smaha; MEMORIAL RESOLUTIONS COMMITTEE: Jim Rudd, Connie Bauman, Donald Kessler, Max Crowder, Dennis Helwig, Ivan Milton, Ken Murray, Tom Abdenour, William Nakaso, Warren Morris, Gary Smith; NATIONAL CONVENTION COMMITTEE: Fred Hoover, Tim Kerin, John Pickering, Ross Bailey, Mayfield Armstrong, Dean Weber, Glen Johnson, Al Green; PLACEMENT COMMITTEE: Craig Sink, Phillip Mateja, John Sciera, Terry Middleswarth, Larry Leverenz, Jim Booher, Steve Smith, Larry Willock, Jerry Lloyd, Ernie Golen, Phil Luckey; PROFESSIONAL EDUCATION COMMITTEE: Gary Delforge, Gerald Bell, "Tow" Diehm, Joanne Dolcemaschio, Dan Foster, Ken Murray, Lou Osternig, David Perrin, Bill Prentice, Al Proctor, Jack Redgren, Ron Sendre, Glen Snow, Dennis Sealey, Leon Skeie; PUBLIC RELATIONS COMMITTEE: Dick Vandervoort; PUBLICATIONS COMMITTEE: Gerald Bell, Rick Carey, Karl Glass; RESEARCH AND INJURY COMMITTEE: John Powell, Jerry Bell, Dan Libera, Bob Moore, Brad Taylor, Steve Antonopulos.

The National Office Staff compiled these names from various sources over a period of several months. If there were others, inadvertently omitted, who freely gave of their time and effort to assist our Committee Chairpersons, we apologize for such omissions and will happily recognize them here in a future issue if we are informed.

GRAFFITTI

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*** Be sure to get address changes in at least 30 days in advance of publication of the Journal in order to keep your volumes intact.

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*** The National Athletic Trainers Association welcomed 576 new certified members into the Association in 1982. Congratulations to those who are listed on page 61. +

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Cuboid Syndrome and the Techniques used for Treatment

Amy Woods, RPT and Wayne Smith, RPT, ATC

Introduction

Little information is found in the literature about the cuboid syndrome: it is a relatively common and often misdiagnosed cause of foot pain. Newell described the symptoms occurring frequently in patients with excessively pronated feet or by trauma with the foot in a plantar flexed and inverted position. The cuboid becomes partially displaced causing hypomobility and pain. The following case study illustrates the cuboid syndrome and the techniques used for treatment.*

Case Report

An eighteen year old male recruit was running when his left foot landed in a pothole causing him to fall with his foot in a plantar-flexed and inverted position. He complained of a sharp pain upon weight bearing and was unable to continue his activities. He reported to the dispensary the following morning with complaints of increased foot pain.

On initial examination he presented full range of motion and normal strength; tenderness was present to palpation around the cuboid and along the fourth metatarsal. Postural exam demonstrated a moderate pes planus deformity. A diagnosis of cuboid syndrome was made and the treatment program was:

1. Cool whirlpool at 80 degrees for 15 minutes
2. Manipulation of the cuboid
3. Pulsed u.s. at .75 w/cm^2 for five minutes to the plantar and lateral aspect of cuboid
4. Segmental balance pad
5. Low-dye strapping

The patient was treated for 72 hours whereupon he began to experience relief of symptoms; at that time a progressive resistive exercise program was initiated to strengthen the left peroneal muscles. The patient was able to resume full activity by the fifth day post injury.

Mechanisms of Injury

The peroneus longus originates from the upper two-thirds of the fibula, surrounding fascia and intramuscular septum. It passes posterior to the lateral malleolus, changes to an oblique direction through a groove in the cuboid and inserts in the lateral base of the first metatarsal and cunneoform. In the person with a pronated foot, the peroneus longus has a greater mechanical advantage and can gradually, or with trauma, immediately cause a partial displacement of the cuboid. The peroneus longus pulls the lateral portion of the cuboid dorsally and the medial portion moves in a plantar direction. Pain may be localized to the cuboid, fourth and/or fifth metatarsal or follow the course of the peroneus longus tendon. Pain is increased by palpating the peroneal groove of the cuboid.

Ms. Woods and Mr. Smith are on staff at the United States Coast Guard Training Center in Camp May, NJ 08204.

Discussion of Treatment Techniques

The patient was placed in a cool whirlpool to decrease inflammation and for its anesthetic affects for 15 minutes. This was immediately followed by manipulation of the cuboid.** The patient was in a prone position with both ankles off the edge of the table. The forefoot was grasped by the therapist's fingers, thumbs placed over the cuboid. The manipulation is a quick downward thrust to move the cuboid dorsally and laterally (see Fig. 1).

Pulsed ultrasound at .75 w/cm² was applied to the lateral and plantar aspect of the cuboid and along the fourth metatarsal to promote healing (see Fig. 2). A segmented balance pad was placed in the shoe to relieve pressure under the cuboid and the fourth metatarsal head. A low-dye strapping was used for support and to counteract the pull of the peroneus longus. It was applied in a lateral to medial direction (see Fig. 3).

Summary

On initial evaluation, the patient complained of a sharp pain in his left foot with weight bearing. Following initial treatment he was able to walk without a limp. In three days he returned to marching and in five days to running without pain.

*Technique used was described by Newell and Woodle in April '81 issue of *The Physician and Sports Medicine.*

**The technique used as described by Newell and Woodle.

References

1. Newell SG, Woodle A: Cuboid Syndrome. *Phys. and Sports Med.* 9(4):71-76, April 1981.

2. Gray H. *Anatomy, Descriptive and Surgical.* Edited by PICK TP, NY Bounty Books, 1977, pp. 440-442. +

Literature from page 17

"Modalities in Athletic Training," Simpson, S. *Texas Coach.* 26(2): 24, September, 1982.

"Muscle Injuries to the Thighs," Hart, D. *Texas Coach.* 26(3): 36, October, 1982.

"National Sports Rehabilitation Foundation," Simpson, S. *Texas Coach.* 26(2): 36, September, 1982.

"Rotator Cuff Impingement Syndrome in Sports," Brunet, M. *The Physician and Sportsmedicine.* 10(12): 86, December, 1982.

"Soft Playing Splint for Protection of Significant Hand and Wrist Injuries in Sports," Bergfeld, J., Weiker, G., Andrish, J., and Hall, R. *The American Journal of Sports Medicine.* 10(5): 293, September-October, 1982.

"Strength and Conditioning," Fix, B. *Texas Coach.* 26(3): 16, October, 1982.

"Stress Fractures of the Ulna in Athletics," Mutoh, Y., Mori, T., Suzuki, Y., and Sugiura, Y. *The American Journal of Sports Medicine.* 10(6): 365, November-December, 1982.

"Use of Body Composition Methodology in Sports Medicine," Lohman, T.G., *The Physician and Sportsmedicine.* 10(12): 46, December, 1982. +

Potpourri from page 16

moves the recuperating limb through a series of exercises that continue even while the patient sleeps.

The results? Minimal pain and maximal healing in the shortest possible time. In one case, a teenage girl, whose previously repaired knee had been so painful she wouldn't move it or put weight on it, recovered so thoroughly that she was able to go water-skiing.

What's the secret of CPM? In contrast to immobilization, which can lead to a buildup of stiff fibrous tissue in the joint, movement stimulates cells in the injured tissue to regenerate normally, producing a new supply of cartilage. Salter isn't sure why CPM also reduces pain, but speculates that the continuous flow of motion-related impulses from the area may block pain impulses to the brain.

Several other doctors in Canada and Europe are experimenting with CPM regimens, and Salter's device is presently being refined for experimental use in nine Canadian hospitals. He expects it to help athletes who have had severe knee trauma and want to try to make it back onto the playing field in six weeks instead of six months.

Aspirin with Vitamin C

Good Health Digest, July, 1982

The Food and Drug Administration has reported that taking aspirin with large doses of vitamin C may be more damaging to the stomach than taking aspirin by itself. Those who regularly take large doses of vitamin C should wait until the stomach is free of aspirin or take enteric-coated aspirin which does not dissolve in the stomach. Large amounts of vitamin C in urine also interfere with the excretion of aspirin, resulting in higher levels of aspirin in the bloodstream.

"Acupinch"

Good Health Digest, July, 1982

"Acupinch" is a treatment for muscle cramps that the National Safety Council reports is effective nine times out of ten. Team doctors and physicians across the country also agree the acupinch works, but have no explanation for it. The technique, which was first brought to the attention of Dr. Donald Cooper, the 1968 Olympic team doctor, consists taking firm hold of the upper lip with thumb and index finger at the first sign of cramping and maintaining pressure for about 30 seconds, at which point the cramping usually begins to subside. +

A Tip From the Field

Prevention of Neck Injuries THE BAR ROLL

Gerald W. Slagle, ATC

According to Blyth and Mueller, a total of 53 fatalities occurred in football from 1976-1981. Forty-nine of those fatalities were on the high school level and four were at the college level. In over 90% of the fatalities, the head and neck were involved. It was also found that in almost 75% of the fatalities, tackling or being tackled were the activities involved during the time of injury. (1)

Researchers and individuals involved in the sports environment are concerned with the number of catastrophic injuries that occur. Although catastrophic injuries were not recorded until recent years, it is believed to be in the number of thousands. There were 129 reported football deaths alone caused by cervical cord injuries from 1931-1968. (2) Dr. Joseph S. Torg, Director of Sports Medicine and Professor of Orthopedic Surgery at the University of Pennsylvania School of Medicine, reported eight cases of cervical-spine injuries which resulted in quadriplegia in Pennsylvania and New Jersey in the single year 1975. (3)

Dr. Torg, in a study of twelve cases of neck and head injuries, found that the injuries were caused by a force along the axial alignment of the spine. He cautioned the athlete against using the crown of the helmet as a primary point of contact. (4) Head-butting has been described as one of the most serious mechanisms of injury.

Dr. Torg's recent study of catastrophic injuries indicates a reduction of injuries (catastrophic) in recent years. In 1980, Dr. Torg reported: "Although the incidence of fatal and non-fatal intracranial hemorrhages among tackle football players appears to have decreased, the prevalence of these injuries is still impressive." (5) Rule changes, increased supervision of strength programs and improved standards and equipment have helped to reduce such injuries.

With the neck slightly rotated and forced into hyperextension, the athlete may describe a "burning" sensation which travels the neck, shoulder and, many times, reaches his arm and hand. This particular injury is commonly known as "burners" or "stingers"; however, it must be recognized as a brachial plexus or cervical nerve root injury.

Neck collars have been worn by those athletes who have had or have such cervical nerve injuries. The collars have also been built up on both sides and in the back in order to help prevent full range of motion of the neck, thus preventing a stretching or pinching of the cervical nerves.

In order to help prevent hyperextension of the neck, the following bar roll has been designed.

To construct the bar roll:

1. Cut a piece of orthoplast 12" x 9".
2. Heat the orthoplast and fold into thirds, making a bar 12" long and 3" wide (Figure 1).
3. With a piece of ½" ensulite or sponge rubber, cut a piece 3" x 6" and tape around the center of the bar (Figure 2). Additional pieces of ensulite or sponge rubber may be added to the roll for further restriction.
4. Have the athlete put on shoulder pads, collar, and helmet. Place the bar roll on the posterior aspect of the shoulder pads and adjust the level of the bar roll by having the roll touching the neck collar (Figure 3).
5. Mark bar at both ends with magic marker.
6. Drill ¼"-hole at each end of the bar and into the shoulder pads.
7. Using a ¼" bolt and hex nut with two lock washers, attach bar roll to the shoulder pads. Cut off excessive bolt.

It is important that the athlete wear a neck collar with the bar roll.

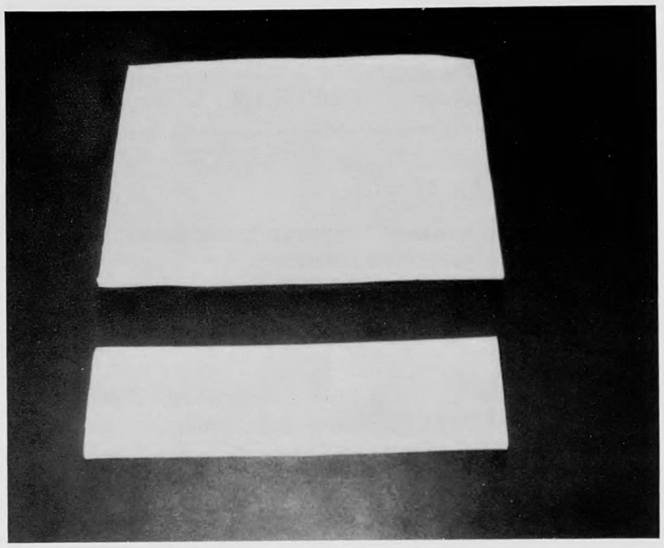

Figure 1. Fold a piece of orthoplast into thirds to make a bar.

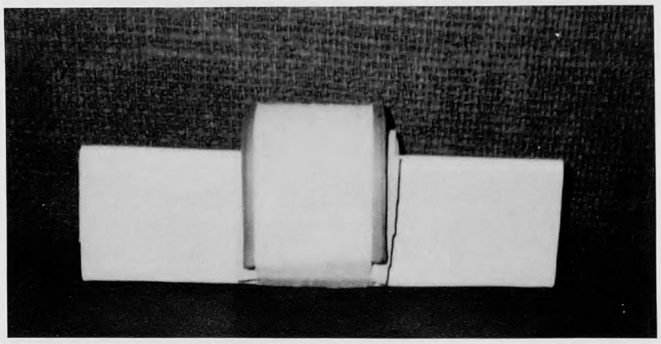

Figure 2. With a piece of ½" ensulite or sponge rubber, cut a piece 3" x 6" and tape around the center of the bar.

Mr. Slagle is an assistant professor at Penn State University. He is currently instructing in the Student Athletic Training Program and is an athletic trainer for the Penn State football team in University Park, PA 16802.

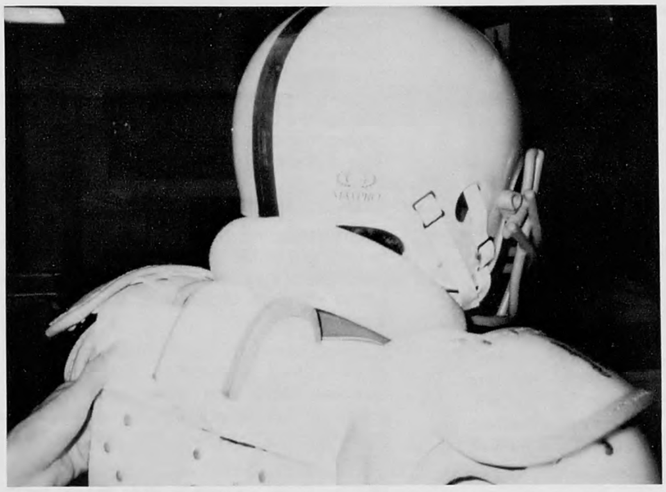

Figure 3. Adjust the level of the bar by having the roll touching the neck collar.

Summary

In many cases, with the head rotated and forced into hyperextension, a brachial plexus injury will occur. Neck collars and a bar roll have been designed to help prevent such movement.

Along with proper treatment, the athlete must develop and maintain the strength level of the neck and shoulder.

References

1. Mueller FO, Blyth CS: Fatalities and Catastrophic Injuries in Football. *The Physician and Sportsmedicine*, October, 1982.
2. *Head-Neck Injuries and Helmetry.* Riddell Inc., 1981, p. 42.
3. Ibid., p. 64.
4. Ibid., p. 58.
5. Ibid., p. 75. +

Editor's Note: Anyone wishing to have an idea, technique, etc. considered for this section should send one copy to **Dave Burton, Duncanville High School, Duncanville, TX 75116.** *Copy should be typewritten, brief, and concise, using high quality illustrations and/or black and white glossy prints.*

5th Annual NATA Student Writing Contest

In an effort to promote scholarship among young athletic trainers, the National Athletic Trainers Association sponsors an annual writing contest.

1. This contest is open to all undergraduate student members of the NATA.
2. Papers must be on a topic germane to the profession of athletic training and can be case reports, literature reviews, experimental reports, analysis of training room techniques, etc.
3. Entries must not have been published, nor be under consideration for publication by any journal.
4. The winning entry will receive a $100.00 cash prize and be published in *Athletic Training* with recognition as the winning entry in the Annual Student Writing Contest. One or more other entries may be given honorable mention status.
5. Entries must be written in journal manuscript form and adhere to all regulations set forth in the "Guide to Contributors" section of this issue of *Athletic Training*. It is suggested that before starting students read: Knight KL: Writing articles for the journal. *Athletic Training* 13:196-198, 1978. NOTE: A reprint of this article, along with other helpful hints, can be obtained by writing to the Writing Contest Committee Chairman at the address below.
6. Entries must be received by May 1. Announcement of the winner will be made at the Annual Convention and Clinical Symposium in June.
7. The Writing Contest Committee reserves the right to make no awards if in their opinion none of the entries is of sufficient quality to merit recognition.
8. An original and two copies must be received at the following address by May 1, 1983. **NATA Student Writing Contest, c/o Clint Thompson, Jenison Gym, Michigan State University, East Lansing, MI 48824.**

Guide to Contributors

Athletic Training, The Journal of the National Athletic Trainers Association, welcomes the submission of manuscripts which may be of interest to persons engaged in or concerned with the progress of the athletic training profession.

The following recommendations are offered to those submitting manuscripts:

1. Seven copies of the manuscript should be forwarded to the editor and each page typewritten on one side of 8½ x 11 inch plain paper, triple spaced with one inch margins.
2. Good quality color photography is acceptable for accompanying graphics but glossy black and white prints are preferred. Graphs, charts, or figures should be of good quality and clearly presented on white paper with black ink in a form which will be legible if reduced for publication. Tables must be typed, not hand written. Personal photographs are encouraged.

   All art work to be reproduced should be submitted as black and white line art (either drawn with a Rapidograph [technical fountain pen] or a velox stat or PMT process) with NO tonal values, shading, washes, Zip-a-tone — type screen effects, etc. used.

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   a. Knight K: Preparation of manuscripts for publication. *Athletic Training* 11 (3):127-129, 1976.
   b. Klafs CE, Arnheim DD: *Modern Principles of Athletic Training*. 4th edition. St. Louis, CV Mosby Co. 1977 p. 61.
   c. Albohm M: Common injuries in womens volleyball. *Relevant Topics in Athletic Training*. Edited by Scriber K, Burke EJ, Ithaca NY: Monument Publications, 1978, pp. 79-81.
   d. Behnke R: Licensure for athletic trainers: problems and solutions. Presented at the 29th Annual Meeting and Clinical Symposium of the National Athletic Trainers Association. Las Vegas, Nev, June 15, 1978.
4. In view of *The Copyright Revision Act of 1976*, effective January 1, 1978, all transmittal letters to the editor must contain the following language before manuscripts can be reviewed for possible publication: "In consideration of the NATA taking action in reviewing and editing my submission, the author(s) undersigned hereby transfers, assigns or otherwise conveys all copyright ownership, to the NATA in the event that such work is published by the NATA." We regret that transmittal letters not containing the foregoing language signed by all authors of the manuscript will necessitate return of the manuscript.

   Manuscripts are accepted for publication with the understanding that they are original and have been submitted solely to *Athletic Training*. Materials taken from other sources, including text, illustrations, or tables, must be accompanied by a written statement from both the author and publisher giving *Athletic Training* permission to reproduce the material. Photographs must be accompanied by a signed photograph release form.

   Accepted manuscripts become the property of the Journal. For permission to reproduce an article published in *Athletic Training*, send requests to the Editor-in-Chief.
5. Manuscripts are reviewed and edited to improve the effectiveness of communication between the author and the readers and to assist the author in a presentation compatible with the accepted style of *Athletic Training*. The initial review process takes from six to eight weeks. The time required to process a manuscript through all phases of review, revision, and editing, to final publication is usually six to eight months depending on the timeliness of the subject. The author accepts responsibility for any major corrections of the manuscript as suggested by the editor.

   If time permits, galley proofs of accepted papers will be sent to the author for corrections prior to publication. Reprints of the article may be ordered by the author at this time.
6. It is requested that submitting authors include a brief biographical sketch and acceptable black and white glossy photograph of themselves. **Please refrain from putting paper clips on any photograph.**
7. Unused manuscripts will be returned, when accompanied by a stamped, self-addressed envelope.

   Address all manuscripts to:

   Clint Thompson
   Department of Athletics
   Michigan State University
   East Lansing, Michigan 48824

The following recommendations are offered to those submitting CASE HISTORIES:

1. The above recommendations for submitting manuscripts apply to case studies as well but only two copies of the report need be sent to the Editor-in-Chief.
2. All titles should be brief within descriptive limits. The name of the disability treated should be included in the title if it is the relevant factor; if the technique or kind of treatment used is the principal reason for the report, this should be in the title. Often both should appear. Use of subtitles is recommended. Headings and Subheadings are required in the involved report but they are unnecessary in the very short report. Names of patients are not to be used, only first or third person pronouns.
3. An outline of the report should include the following components:
   a. Personal data (age, sex, race, marital status, and occupation when relevant)
   b. Chief complaint
   c. History of present complaint (including symptoms)
   d. Results of physical examination (Example: "Physical findings relevant to the physical therapy program were . . .")
   e. Medical history — surgery, laboratory, exam, etc.
   f. Diagnosis
   g. Treatment and clinical course (rehabilitation until and after return to competition) use charts, graphs when possible
   h. Criteria for return to competition
   i. Deviation from the expected
   j. Results — days missed
4. **Release Form**

   It is mandatory that *Athletic Training* receives along with the submitted case a signed release form by the individual being discussed in the case study injury situation. Case studies will be returned if the release is not included.

The following recommendations are offered to those submitting material to be considered as a TIP FROM THE FIELD:

1. The above recommendations for submitting manuscripts apply to tips from the field but only two copies of the paper need be submitted.
2. Copy should be typewritten, brief, concise, in the first or third person, and using high quality illustrations and/or black and white glossy prints.

Journal Deadlines

In order to avoid confusion and delays for any contributions to the Journal the deadlines for various sections of the Journal are provided below.

Send all materials for any section of the Journal other than formal articles and "Calendar of Events" to:

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This includes sections such as "Tips From the Field", "Announcements", "Case Studies", "Letters to the Editor", etc.

Information on upcoming events for the "Calendar of Events" section should be sent to:

Jeff Fair, ATC
Athletic Department
Oklahoma State University
Stillwater, OK 74074

Manuscripts must be sent to:

Clint Thompson
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(517)353-4412

"Tips From the Field" should be sent to:

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Duncanville, TX 75116

The Editorial Board will then review each paper and work with authors to help prepare the papers for publication. Each is handled on an individual basis.

The deadlines are:

Journal	Deadline
Spring Issue	December 15
Summer Issue	March 15
Fall Issue	June 15
Winter Issue	September 15

Short-term Weight Training Effects on Resting and Recovery Heart Rates

Michael H. Stone, PhD, Jack K. Nelson, EdD, Sam Nader, PhD, David Carter, PhD

Positive effects of weight training on changes in body composition, strength and power are known to occur (3, 4, 5, 11, 13). However, traditional noncircuit weight training has not generally been regarded as important in producing increases in cardiovascular fitness. Most studies investigating cardiovascular fitness have focused on aerobic power (i.e., max V_{O_2}) (3, 8); few studies have investigated the effects of noncircuit weight training on heart rate (6, 7). Resting and recovery heart rates are constructs of cardiovascular fitness and therefore will reflect positive changes in cardiovascular fitness as a result of training (9). The purpose of this paper is to study the effects of a short term noncircuit weight training program on dynamic strength power, skinfolds, circumferences, and two measures of cardiovascular fitness, resting heart rate and recovery heart rate after a step test.

Materials and Methods

The subjects were 34 healthy college age males (nonathletes). The training period lasted six weeks. The training (3 days/week) consisted of squats (bottom of thigh below parallel), 1/4 squats in a power rack (45° angle at the knee), bench press and incline press. Training was preceded by stretching and light and moderate warmup sets were performed before each exercise. The subjects then performed 3 X 6 (RM) on each exercise. (Preliminary instruction and subject practice was given two days before beginning the training period.) Each subject trained and increased the weight of exercise at his own pace. An experimenter observed each training session to insure that the subjects were using proper technique and safety precautions.

Changes in strength were assessed using a 1RM for the squat, 1/4 squat, Bench Press and Incline press. All strength measures were made in the above order. Sufficient rest was given between exercises to insure maximum effort. The maximums for each lift were summed to produce a total weight score for each measurement period.

Power was assessed using two methods: 1) the vertical jump (VJ) and Lewis Formula (2) which is $p = \sqrt{4.9} \times BW_{kg} \times \sqrt{VJ_m}$ and 2) using a stair climbing technique (modified Margaria test). The vertical distance of stair climbing was 1.47 m. Time of ascent was measured using a Dekan Performance Analyzer. Timing pads were placed on the 2nd and 8th steps. The stair climbing runway (Lead-in) was 2.0 m.

Gross changes in body composition were estimated using skinfold (SF) and circumference measures. Triceps, pectoral, abdominal, and thigh SF were measured on the right side with Lange skinfold calipers. Each SF was taken 3 times and averaged. Upper arm, thigh and waist measurements were taken using a metal tape measure. Body weight was measured on a medical scale.

Changes in recovery heart rate were determined using the Louisiana State University (LSU) step test (9). The LSU step test consists of a two minute stepping period at 30 steps per minute on a 33 cm bench. Heart rates were taken immediately (5 sec) after completion of the test and at 1, 2 and 3 minute intervals. In addition, preceding the step test, seated resting heart rate was assessed after sitting still for 5 minutes. Heart rate was determined by palpation of the radial artery.

All variables were assessed at the beginning (T_1), after 3 weeks (T_2), and after 6 weeks (T_3). All variables were measured by experimenters who had considerable previous experience. The same experimenter measured the same variable at T_1, T_2, and T_3.

Statistical Analysis

Significant differences across time were determined using ANOVA with Duncan's multiple range tests as a follow-up. Correlations were determined using the Pearson's Product Moment Method. The alpha level was set at $p<0.05$.

Results

All strength measures except handgrip showed significant increases over time (Table 1). Power measures are shown in Table 2; only SCP showed a significant increase over time. Skinfolds showed a significant trend toward reduction, and circumferences show an increase or no change (Table 3). Heart rates showed significant reductions across time (Table 4). Correlations between the total weight score and heart rate are shown in Table 5.

Discussion

The six week training program produced general trends of increasing maximum strength and power, agreeing with previous research (4, 11). The changes in skinfolds and circumferences suggest a loss of fat and a gain in lean body mass (LBM) (i.e., an increase in muscle mass). Positive changes in body composition (such as those suggested in this study), especially an increase in LBM, are strongly related to strength and power gains (11, 13).

Table 4 shows the reductions in resting and post exercise heart rates. These data are in agreement with previous investigations (6, 7). One explanation for this reduction in heart rate is an increase in the parasympathetic/sympathetic input ratio (1). This reduction in HR is likely accompanied by an increased stroke volume due to an increased venous return (longer diastole) but

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Table 1: Strength Measures (mean ± S.D.)

*P ≤ 0.05 Anova
**P ≤ 0.01
Duncan's P ≤ 0.05
a = significantly different from T1
b = significantly different from T2

	T1	T2	T3
**Squat (kg)	93.0 ± 18.4	109.7 ± 20.0a	125.0 ± 16.6ab
**1/4 squats (kg)	171.1 ± 31.7	216.1 ± 35.2a	236.0 ± 33.6ab
**Bench press (kg)	71.5 ± 15.2	76.2 ± 13.0a	81.1 ± 13.9ab
**Incline press (kg)	60.1 ± 11.5	63.5 ± 11.0a	70.0 ± 10.4ab
N.S. HG-D (kg)	58.6 ± 8.5	59.2 ± 6.1	60.9 ± 7.8

Table 2: Power Measures (mean ± S.D.)

*P ≤ 0.05 Anova
**P ≤ 0.01
Duncan's P ≤ 0.05
a = significantly different from T1
b = significantly different from T2

	T1	T2	T3
N.S. VJ (cm)	49.4 ± 8.3	50.0 ± 9.3	50.8 ± 10.3
N.S. VJP (Kg-m/sec)	104.0 ± 14.9	105.3 ± 16.5	106.7 ± 15.1
N.S. SCT (sec)	0.72 ± 0.08	0.72 ± 0.07	0.69 ± 0.08
*SCP (Kg-m/sec)	139.0 ± 21.4	138.0 ± 22.7	147.0 ± 20.3a

Table 3: Skinfolds and Circumferences (mean ± S.D.)

*P ≤ 0.05 Anova
**P ≤ 0.01
Duncan's P ≤ 0.05
a = significantly different from T1
b = significantly different from T2

	T1	T2	T3
**Triceps (mm)	18.0 ± 8.4	14.2 ± 8.6a	15.6 ± 7.5a
**Pectoral (mm)	14.8 ± 7.8	11.1 ± 7.2a	12.0 ± 6.4a
**Abdominal (mm)	30.2 ± 14.7	26.8 ± 14.5a	27.6 ± 12.5a
**Thigh (mm)	21.9 ± 12.8	16.2 ± 10.6a	18.2 ± 10.6ab
**Total Skinfold (mm)	85.0 ± 40.8	68.3 ± 39.0a	73.8 ± 35.4ab
N.S. Upper Arm (cm) Circumference	30.7 ± 4.0	32.0 ± 2.6	32.2 ± 2.3
N.S. Waist (cm) Circumference	82.6 ± 10.1	81.6 ± 12.5	82.7 ± 7.2
**Thigh (cm) Circumference	56.9 ± 9.0	58.7 ± 4.5a	58.6 ± 4.5a
N.S. Body Weight (lbs.)	171.00 ± 24.16	170.58 ± 26.10	173.16 ± 23.54

Table 4: Heart Rate Measures (mean ± S.D.)

*P ≤ 0.05 Anova
**P ≤ 0.01
Duncan's P ≤ 0.05
a = significantly different from T1
b = significantly different from T2

	T1	T2	T3
**RHR	84.5 ± 10.1	78.4 ± 14.2a	73.7 ± 12.3ab
*HR - 5 sec.	160.5 ± 16.7	158.1 ± 22.7	148.3 ± 16.5ab
**HR - 1 min.	120.3 ± 20.6	111.9 ± 20.2a	107.8 ± 19.0a
**HR - 2 min.	106.3 ± 19.2	98.1 ± 16.8a	94.5 ± 17.3a
**HR - 3 min.	99.0 ± 17.0	89.6 ± 16.5a	87.9 ± 16.5a

Table 5: Correlations Between Heart Rate and Total Weight Score

		HR Rest	HR 5-sec	HR 1-min	HR 2-min	HR 3-min
Total Weight Score	Test 1	–.26	–.09	–.08	–.12	–.17
	Test 2	–.41	–.11	–.13	–.21	–.27
	Test 3	–.50	–.29	–.26	–.33	–.30

probably does not reflect an increase in chamber volume (6). A second possible reason for the HR reduction after work is concerned with the relative stress imposed by the step test at T2 and T3 compared to T1. Body weight did not change significantly (Table 3), thus the external work performed during each test was essentially the same. Because of the increase in leg and hip strength the work demanded by the step test would be relatively less stressful at T2 and T3. This is consistent with the findings of increased strength on short term endurance (4). The reduced muscular stress might be reflected in lower heart rates. However, if reduced stress were the only factor, the lower resting HR would not be expected to occur.

If we conclude that weight training will elicit a central cardiovascular effect, then the following hypotheses would be reasonable.

1) Those subjects working the hardest (greatest workloads) would realize the greatest strength gains.

2) Those subjects working the hardest would realize the greatest reductions in heart rate.

Support for these hypotheses would be evidenced by an increasingly negative relationship between strength and heart rate measures. Weak but increasingly negative correlations were found between the total weight score and HR at all levels across time (Table 5).

Practical Significance

Typically, endurance training (usually distance running) is used to obtain increased aerobic power and cardiovascular fitness. This type of training will likely interfere with the performance of strength-power athletes (i.e., weightlifters, throwers) (5, 10, 12); therefore it is often avoided. These athletes are usually heavily dependent upon resistive training for performance enhancement. While cardiovascular fitness is relatively unimportant for these athletes' performance, it is likely related to their health status. The exact relationship between training bradycardia and health status is unknown. However, this, and other studies cited, suggest that weight training may positively effect cardiovascular fitness and perhaps health status.

Cardiovascular fitness and high aerobic power are strongly related to endurance athletes' performance (e.g., long distance running, swimming). There are times, usually because of injury, that these athletes cannot follow their typical training program but could engage in some weight training. The weight training *might* minimize the loss in cardiovascular fitness.

Conclusion

Based on the results of this study, weight training can produce a positive central effect reflected in reduced heart rate at rest and after work. The magnitude of the central effect may be related to the total work accomplished.

References

1. Ekblom B, Kolblom E, Soltysiak J: Physical training, bradycardia and autonomic nervous system. *Scandanavian Journal of Clinical Investigation* 32:251-256, 1973.

2. Fox EL, Mathews DK: *The Physiological Basis of Physical Education and Athletics.* 3rd edition, New York, CBS College Publishing, 1981, p. 620.

3. Gettman LR, Pollack ML: Circuit weight training: A critical review of its physiological benefits. *The Physician and Sports Medicine* 9:45-60, 1981.

4. Hickson RC, Rosenkoetter MA, Brown MM: Strength training effects on aerobic power and short term endurance. *Medicine and Science in Sports and Exercise* 12:336-339, 1980.

5. Hickson RC: Interference of strength development by simultaneously training for strength and endurance. *European Journal of Applied Physiology* 45:255-263, 1980.

6. Kanakis L, Hickson RC: Left ventricular responses to a program of lower-limb strength training. *Chest* 78:618-621, 1980.

7. Kusinitz I, Keeney C: Effects of progressive weight training on health and physical fitness of adolescent boys. *Research Quarterly* 29:294-301, 1958.

8. Nagle F, Irwin I: Effects of two systems of weight training on circulorespiratory endurance and related physiological factors. *Research Quarterly* 31:607-615, 1960.

9. Nelson JK: Fitness testing as an education process. *Physical Education: sports and the sciences* (J. Broedhoff, Ed.) Microform Publications, University of Oregon, Eugene, Oregon, pp. 65-73.

10. Ono M, Miyashita M, Asam T: Inhibitory effect of long distance running training on the vertical jump and other performances among aged males. *Biomechanics V-B*, Baltimore, University Park Press, 1976, pp. 94-100.

11. Stone MH, O'Bryant H, Garhammer J: A hypothetical model for strength training. *Journal of Sports Medicine and Physical Fitness* 21:342-351, 1981.

12. Stone MH: The integration of running and weight training. Presented at Strength-Power Symposium III, Auburn University, February 19, 1982.

13. Ward T, Groppel JL, Stone MH: Anthropometry and performance in master and first class olympic weightlifters. *Journal of Sports Medicine and Physical Fitness* 19:205-212, 1979. +

A Combination of Adhesive Ankle Strappings

Joe Harbottle, ATC

Introduction

In the rehabilitation of ankle sprains there eventually comes a time when an athlete has to gradually begin running, cutting, and jumping on the healing extremity. As athletic trainers dealing with post injury ankle taping, our main concern is to support the affected ankle as much as possible in order to limit discomfort and to prevent recurring injury. Various trainers over the years have devised their own techniques on how injured ankles should be supported. From these innovations, different methods have come about in the taping of ankles. We have an idea which utilizes a combination of techniques in providing maximum support for ankles needing special attention. Our suggestion uses moleskin adhesive felt, a "Spartin" taping, and a closed blanket weave taping.

Materials Needed

Heel and Lace Pads	1½ or 2 inch White Tape
Adhesive Spray	3 inch Elastikon
Pre-wrap	3 inch Moleskin adhesive felt

Taping Procedure

Figure 1. With the ankle shaved and heel and lace pads in place, put on three anchors (using 1½" or 2" white tape), two approximately 4 inches above the malleoli and the other around the arch and instep.

Figure 2. Next put on three stirrups, starting all three on the medial aspect of the ankle as would be the case in inversion sprains. These stirrups provide a good foundation for the moleskin to adhere. The first stirrup runs posterior to both malleoli. The second stirrup covers both malleoli. The third stirrup runs anterior to both malleoli making sure to cover the anterior talofibular ligament.

Figure 3. Using 3 inch wide moleskin, cut a strip long enough to cover the stirrups. Starting on the medial side of the calf anchor, adhere the moleskin so it is centered over the medial malleolus. Pulling taut, center the moleskin over the lateral malleolus and anchor it to the lateral side of the calf anchor. Secure the moleskin by anchoring at the top and in the middle just above the malleoli. This should place the ankle into slight eversion (for inversion sprains), but it would be neutral when weight bearing.

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Figure 4. Over the moleskin we put a "Spartin" taping. Begin the "Spartin" by cutting a strip of unstretched 3" elastikon roughly 14 inches long. Stretching the elastikon tight, center it on the heel directly under the malleoli.

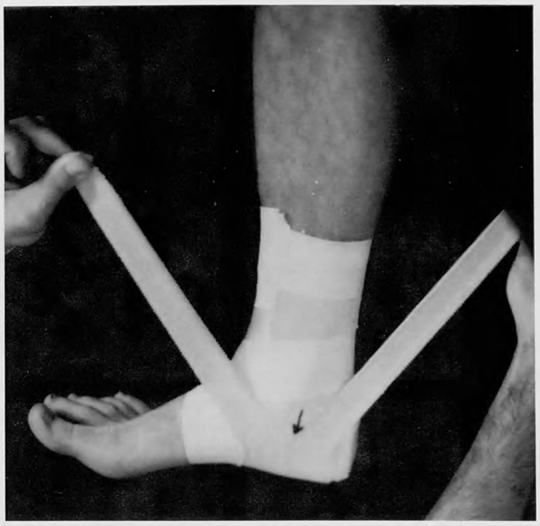


Figure 5. Next take the tape on the medial side and split it down to just under the medial malleolus.

Figure 6. Take the split tails and pull them tightly over the anterior and posterior portions of the ankle. Continue pulling and wrap the tails around the lower leg.

Figure 7. Repeat the same procedure on the lateral side as that performed to the medial side in Fig. 5 and 6. A couple of "Spartins" can be used if additional support is desired.

Figure 8. Finally, cover everything with a closed basket weave taping including heel locks.

Editor's Note: Anyone wishing to have an idea, technique, etc. considered for this section should send one copy to **Dave Burton, Duncanville High School, Duncanville, TX 75116.** *Copy should be typewritten, brief, and concise, using high quality illustrations and/or black and white glossy prints.*

Final Remarks

Careful attention should be taken not to apply the tape too tightly for this will insure proper circulation to the foot and decrease the chance of tape cuts. The correct amount of tension applied is best determined through experience. +

Brochure Requests

Requests for the brochure entitled "Careers in Athletic Training" should be sent to the National Office at P.O. Drawer 1865, Greenville, N.C. 27834. Single brochures are supplied upon request at no charge. NATA officers and committees, schools having an approved athletic training curriculum, and those having an apprenticeship program are furnished multiple copies of the brochure at no charge.

Constitution of the National Athletic Trainers Association

Article I -- Name

The name of this organization shall be the National Athletic Trainers' Association.

Article II -- Objectives

The objectives of this association shall be:

(1) The advancement, encouragement, and improvement of the athletic training profession in all its phases, and to promote a better working relationship among those persons interested in the problems of training.

(2) To develop further the ability of each of its members.

(3) To better serve the common interest of its members by providing a means for a free exchange of ideas within the profession.

(4) To enable members to become better acquainted personally through casual good fellowship.

Article III -- Membership

Section I
There shall be eight (8) classes of membership as follows:

(1) Certified
(2) Associate
(3) Retired
(4) Student
(5) Affiliate
(6) Advisory
(7) Allied
(8) Honorary

and no individual shall be eligible for more than one (1) class of membership at the same time.

Section 2
Qualifications for membership and the rights and obligations of members shall be as indicated in the By-Laws.

Article IV -- Election of Members

Section 1
Application: Each applicant for any class of membership shall sign an application stating his desire and intention to become a member of the association, to advance its best interests in every reasonable manner and to accept as binding upon himself its constitution and By-Laws.

Section 2
Membership in the National Athletic Trainer's Association is based on approval of each District's membership committee, the National Athletic Trainers' Association membership committee, in addition to completion of requirements for membership as listed in the By-Laws.

ARTICLE V -- DUES

Section 1
The dues of all classes of members shall be as prescribed by the By-Laws.

ARTICLE VI -- SUSPENSION OF MEMBERSHIP

Section 1
Membership cancellations may be recommended by any member of the association for a cause and the membership of any member be caused to cease by a two-thirds majority vote of those members present at the annual business meeting.

Section 2
Appeals: A person whose membership is cancelled in accordance with Section 1 shall be allowed, either in person or through some member of the association, to appeal to the National Membership Committee for reconsideration. Information in the appeal shall be presented to the Board of Directors and the Board shall, by a majority vote, decide whether to submit the question of the membership cancellation to the association membership for another one in accordance with Section 1.

ARTICLE VII -- VOTING POWER

Section 1
Certified and certified retired members shall be entitled to one vote upon all questions submitted to the association for decision.

ARTICLE VIII -- ORGANIZATION

Section 1
National: The governing body of this organization shall be The Board of Directors.

Section 2
Regional: Each District Athletic Trainers' Association will be self-governing as per its own specific Constitution and By-Laws. Nothing in a District Constitution and By-Laws shall be contrary to the National Constitution and By-Laws. In its relations with the National Organization, the District Association will be under the jurisdiction of the National Athletic Trainers' Association Constitution and By-Laws.

(a) For the purpose of facilitating the work of the National Athletic Trainers' Association the United States and Canada shall be divided into ten (10) geographic areas and each district organization shall have district jurisdiction throughout one of the areas. District area boundaries shall be set by the Board of Directors, and the districts shall be designated and identified by the numbers one (1) through ten (10).

(b) Each District shall elect a District Director who must be a Certified member of the National Athletic Trainers' Association. Each District Director shall serve as a member of the Board of Directors of the national organization and act with full authority for the district in carrying out the functions and responsibilities of The Board of Directors.

Section 3
(a) President: The president shall be elected by a majority popular vote of the voting membership of the National Athletic Trainers Association. The Board of Directors shall be the nominating committee. Candidates must have served on the Board of Directors

some time during the four years immediately preceding the meeting at which nominations are made. Two candidates shall be nominated at the meeting in June one year before the end of the term of the current President. The biography of each candidate shall be published in the fall issue of the Journal of the N.A.T.A. ATHLETIC TRAINING following the nominations.

The membership voting shall be by mail. A ballot shall be mailed to each voting member at his/her address of record by November 15th and the marked ballot must be returned by mail to the Executive Director at the designated address and be postmarked no later than December 1st.

The term of the President shall be two years and he/she may not serve more than two consecutive terms. The term of office shall begin at the business meeting of the Association at the Annual Meeting and Clinical Symposium following the election.

(b) Vice President: The District Director from one of the ten districts shall be elected to the office of Vice President by the Board of Directors. One or more district directors may be nominated by members of the Board and election shall be by majority vote.

The Vice President must be a District Director, also. If the Vice President ceases to be a District Director a new Vice President must be elected.

The term of office of the Vice President shall be one year and he/she may be reelected.

If the office of President becomes vacant before the end of the term for which the President was elected, the Vice President shall become President immediately and shall serve as President for the remainder of the term for which the previous President was elected. In the event that the President-elect is unable to assume the office of President, the Vice President shall become the President-elect and then become President at the beginning of the term for which the original President was elected, and serve for the full term. It is therefore possible that a vice-president could serve a partial term as President followed by a full term. In such a circumstance a President shall be eligible for nomination and election for one consecutive term following the first full term.

The Vice President has no constitutional duties other than to assume the office of President or President-elect as prescribed.

Section 4
Removal of Officers: All national officers may be impeached and convicted on the following grounds: embezzlement, malfeasance in office, and actions contrary to or in violation of this Constitution and its By-Laws. Before impeachment proceedings can be instituted, a brief, containing the charges shall be drawn up and presented by a board member to the Board of Directors sitting in executive session. The aforementioned brief must then be adopted by a majority vote prior to the formal presentation of the charges. Impeachment of any officer shall require a two-thirds vote of the voting membership of the Association present at the annual meeting.

ARTICLE IX -- POWERS AND DUTIES OF OFFICERS

Section 1
The officers are the President, Vice-President, Board of Directors and Executive Director.

Section 2
All powers and duties of officers are as prescribed in the By-Laws and Article VIII Section 3 of the constitution.

ARTICLE X -- COMMITTEES

All committees, except the membership committee, shall be appointed by the President with the approval of the Board of Directors.

ARTICLE XI -- MEETINGS

Section 1
The annual business meeting shall be held each year at a time and place set by the Board of Directors.

A quorum for the annual meeting shall consist of one-fifth of the voting membership of the Association, excluding Certified Retired members in figuring the one-fifth.

Section 2
The Board of Directors may submit items of association business to the voting membership for a vote by mail. Approval of items so submitted shall require a "yes" majority of a respondence of at least one-fifth of the voting membership of the association.

Section 3
The Board of Directors shall meet at the National Convention and at any other time that the President determines it necessary to call a Board meeting.

A quorum for a Board of Directors meeting shall be six (6).

The President may submit appropriate items of association business to the Board of Directors for a vote by mail. For such a voting procedure the President shall first secure a "second" to the proposal and then submit the proposal to each member of the Board by mail with a request to mail a "yes" or "no" vote on the proposal by a definite date not sooner than ten (10) days after the mailing of the proposal. Board approval of items submitted shall require a "yes" vote of at least six members of the Board.

The President may submit emergency items of Association business that are appropriate for Board action to the Board of Directors for a vote by telephone. For such a voting procedure the President shall first secure a "second" to the proposal and then call each member of the Board for his vote on the proposal. Board approval of items so submitted shall require a "yes" vote by at least six members of the Board.

ARTICLE XII -- AMENDMENTS TO THE CONSTITUTION

Section 1
All proposed amendments to the constitution shall be submitted in writing to the Executive Director at least six weeks prior to the annual business meeting. The Executive Director shall distribute copies of the proposal to all voting members at least three weeks prior to the annual business meeting.

Section 2
A proposed amendment to the constitution that has been properly submitted shall be read at the annual business meeting and a two-thirds (2/3) majority vote of the voting membership present shall be necessary for the adoption of the said amendment.

ARTICLE XIII -- AMENDMENTS TO THE BY-LAWS

The By-Laws may be amended at any official meeting of the Board of Directors by a majority vote.

By-Laws may not be added, deleted or amended by a vote by mail or telephone. •

Case Report:

Cold-Induced Nerve Palsy

J. Terry Parker, ATC; Neal C. Small, MD; Paul Glenn Davis, LAT

For more than twenty years now, the use of cold has been implemented almost exclusively in the initial treatment and rehabilitation of athletic injuries. Since 1961 (1), this modality has been discussed, investigated, proved, refined, validated and rediscussed. (2) However, little, if any, information is available regarding the incorrect or haphazard use of cold and its effect on an unsuspecting athlete. Therefore, it is the intention of this paper to make the reader more aware of this potential hazard and to present a case that illustrates such an occurrence.

Case Report

During the 1980 football season, a 15 year old high school athlete sustained a non-specific injury to his left knee. Because the injury brought about recurrent episodes of joint effusion, ice was applied to the affected knee by a coach and the young man was instructed to leave the ice in place for the duration of practice. When the ice was removed, approximately two hours later, the athlete noted anesthesia over the anterolateral tibial musculature and over the dorsal aspect of his left foot. He also experienced weakness in dorsiflexion and in his ability to extend his great toe. Further examination by the team physician (NCS) revealed decreased function in the lateral compartment musculature and palsy in both the superficial and deep distributions of the peroneal nerve.

Treatment

At the recommendation of the team physician, the athlete was placed in a polyprophelene foot-drop brace and electrical muscle stimulation was applied to the anterolateral tibial musculature by the attending athletic trainer (PGD). This was done for a ten day period, after which peroneal nerve function had improved substantially and the athlete was able to dorsiflex and evert the ankle against some resistance. Again at the recommendation of the team physician, the athlete continued to wear the prophylactic brace for another three weeks, at which time complete function and sensation was restored, eliminating the need for painful EMG studies.

Subsequent Injury Management

During the 1981 football season, the same athlete sustained both a left lateral ankle sprain and a peroneal muscle strain. The attending athletic trainer (JTP) modified the initial cold application by first soaking an elastic bandage in an ice/water combination for a five minute period. It was then wrapped around the athlete's ankle one time, followed by an ice bag that was secured by the remaining elastic bandage. Uneventful treatment and rehabilitation took place and the athlete returned to full activity in a very short time.

Summary

Reports of cold-induced nerve palsies are rare, and very few, if any, have been reported in the existing medical literature. The neuropathology reported in this case was undoubtedly the result of improper use of an otherwise beneficial modality. The authors believe that the education of parents, coaches and athletes in the proper use of treatment modalities will prevent further notoriety of this problem and help eliminate conditions of this nature in the years to come.

Mr. Parker, Dr. Small and Mr. Davis are affiliated with the Plano Independent School District, Plano, Texas.

References

1. Bennett D: Water at 67 to 69 fahrenheit to control hemorrhage and swelling encountered in athletic injuries. *J NATA*, Winter 1961.

2. Barnes L: Cryotherapy — putting injury on ice. *Physician Sportsmed* 7:130-136, June 1979. +

A Review of Orthotic Plastics

Alan Peppard, ATC, LPT
Michael O'Donnell, CP

Orthopaedic appliances provide a necessary aspect within both the care and prophlaxis for many athletic injuries. Effective utilization of orthopaedic appliances is dependent not only upon the trainer's knowledge regarding the nature of the pathology and procedures whereby the orthopaedic appliance will modify the stresses inherent within athletic activity, but also upon the selection of the appropriate material to match the design requirements of the appliance. To maximize both the design and utilization of orthopaedic appliance, the trainer must therefore be knowledgeable of materials commonly utilized within orthotics (the science that deals with the making and fitting of orthopaedic appliance[1]. As a means of maximizing the design and construction of orthopaedic appliances within athletic training the following summary of plastics commonly utilized within orthotics has been developed.

Three different types of plastics utilized within orthotics are:

1) Thermoforming: Plastics that are formed and later may be reformed by the addition of heat. One of the low temperature variety generally these plastics can be formed over the athletes skin for an extremely accurate fit. Because of the ease of fitting and reforming this type of plastics are more commonly used.

2) Thermosetting: These are generally higher temperature plastics with a high degree of cross-linking between the strands. These plastics are generally rigid and difficult to reform. They frequently require a plaster mold of the limb for forming.

3) Thermoplastic foams: Plastics that have been foamed by the addition of agents such as gas, liquids or crystals at high temperatures to produce varying density materials.

Heating, Forming, Cooling, and Finishing Thermoforming Plastics

Thermoforming plastics require sufficient energy generally supplied by heat to increase vibration within its interchain structure. Insufficient heating will not allow enough mobility and the plastic may fracture during forming. Excessive heating will cause disruption of the alignment of the chains and thereby cause possible loss of the material characteristics[2]. Heating for forming therefore requires careful control of the temperature of the plastic. Because of the poor thermal conductivity of most thermoforming plastics, conductive heating tends to only heat the surface and leave the inner bonds of the material cool. Due to this unequal heating, conductive heating generally provides an average means of heating. More effective heating can be obtained by circulating warm air around the plastic (convection method) and thereby slowly heating the material. Radiation (usually infrared) provides a faster means of heating but heats the inner portion of the material while the outer is cooled by the atmosphere. Because of the above problems within heating, the most effective and efficient means of providing even heating is to use both convection surface heating and radiation for inner heating.

Forming can be done by either draping or vacuum forming. Draping involves heating the plastic and then placing it on the limb or mold and pressing it into shape. The plastic may then be removed while still warm (facilitates removal) or after complete cooling has occurred. Vacuum forming involves suspending the plastic from a metal frame over an evacuation chamber. As the plastic is heated, the mold is evacuated and the plastic sheet drops into the chamber and contours closely to the shape of the mold. To assist removal, the plastic is removed from the mold prior to total cooling.

A combination of both vacuum and drape forming provides an excellent method for forming some high temperature plastics to casts. This is done by draping the mold and evacuating the area between the mold and plastic drape.

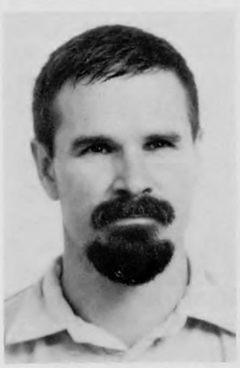
Cooling of the plastic allows the chains to reorient themselves into the most structurally stable configuration and for that reason quick cooling may produce strained configuration and therefore weaken the material. Although slower cooling methods are generally suggested, the advantages of quenching certain plastics is uncertain[3]. Although, at the present time, a negative effect has not been found with ice water quenching techniques.

Trimming of the edges can usually be easily accomplished by sanding, grinding and/or buffing. Other methods of finishing include heating (usually with a propane torch) or the use of organic solvents for some of the materials.

Low Temperature Thermoforming Plastics

AQUAPLAST* low temperature thermoplastic splinting material; polyester sheets with waxy, hard smooth surface; glossy opaque yellow-white; perforated or non-perforated; very rigid material which softens in water at 140 F°; becomes soft and moldable when transparent; able to be cut with scissors when hot, shears when cool; becomes self-adhesive and elastic when hot and transparent; return to shape on heating; can be reformed; protect athlete's hair with soap, vaseline or water on forming; shape right to athlete's skin with hands; available in 1/16″ (moldable for 1-2 min., sets in 5-7 min.); 1/8″ (moldable for 3-4 min. sets in 15-20 min.); may be quenched with ice water to speed setting; shrinks about 2% on cooling; available with green stripe-less pliable, more stretch for larger applications; available with black stripe for fine constructions; (rigidity index 7/10)**; used for fracture and upper extremity splinting; information acquired from (A), (B), (C).

BIOPLASTICS* polyvinyl chloride sheets, thermoplastics; available in opaque, beign or pink; smooth surfaced; possesses high impact strength and rigidity; heat to 170-220 F°



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until soft, cuts with scissors; shape to athlete with heat separator-stockinette recommended; becomes moderately elastic when hot; sets in 1-2 min.; not self adherent, either wet or dry; material is difficult to reshape after first forming; finished with sanding, scraping or buffing; may be cleaned with warm soapy water; (stiffness index of 9/10); used for upper extremity static splinting material; material may crack if notches incorporated into design; information acquired from (C), (D), (T).

GLASSONA cellulose acetate plastic bandages, hard porous wrap; lightweight; in opaque white; becomes pliable but difficult to remold; set is activated with acetone, wrap applied over stockinette; cuts with scissors and is self-adherent; sets in 10-15 min., cures in 24 hrs.; acids cause decomposition, bases produce swelling of material; used for upper and lower limb fracture bracing; information acquired from (C).

HEXCELITE polycapralactone opaque white bandages and splints; rigid porous mesh; difficult to reshape; use heat separator of stockinette; activated with hot water of 160-180 F°; wrap over separator and discard plastic packing material; material cuts with scissors and is self-adherent; sets in 3-5 min. and cures in 15-20; used for fracture bracing and orthotic splinting; information acquired from (C), (U).

KAYSPLINT* polyester polycapralactone sheets; unperforated only; comes with hard smooth semigloss surface; heat to 150-170 F° until pliable, water heated; when hot, cuts with scissors and is self adherent with general organic solvents; stretches with minimal shrinkage; shape directly to athlete, separator not required; sets in 2-5 min., cures in 24 hrs.; used as all purpose orthotic splinting material; index 6/10; material almost identical to Polyform; information acquired from (C), (T).

LIGHTCAST fiberglass and acrylic resin bandages; pliable material with hard porous surface; resists chipping; opaque yellow white color; apply with polypropylene separator; wrap as with standard plaster bandage; hardness with UV light in 6 min.; self-adherent, roll edges to finish; used for fracture and orthotic splinting; information acquired from (C), (V).

ORTHOPLAST* low temperature synthetic rubber thermoplastic available in one thickness, perforated or non-perforated sheets are semi-gloss white material, waxy appearance; cuts with shears when cold, scissors when hot; heat to 170 F° in oven, hydrocolator, water or heat gun; suggested carrying sheet with silicone separator with oven; dry heat preferred for bonding uses; shape to skin, stockinette recommended, sets in 8-10 min, may be quenched with cold water; may be wrapped with bandage during set to shape; may be reformed with heat from heat gun; reinforced with strips and heat gun over metal or straws; may be punched or drilled to ventilate; dissolves with general organic solvents; for storage avoid air and light, promotes decompostion; (rigidity index 4/10); used for fracture treatment and orthotic fabrication; information acquired from (A), (C), and (E).

POLYFLEX II* low temperature isoprene containing thermoplastic; moderately stretchy when warm, moderate flex when cool; semi-gloss white 1/8″ sheets in perforated and non-perforated; heats in water to 160 F° for 3-5 min.; wipe and cut with scissors when heated; reheatable and remoldable after originally formed; non-toxic, non-porous, odorless material which sets in 24 hrs.; self bonding when wiped with solvent; may be shaped directly to athlete; stretches with minimal shrinkage; used for larger support and orthotic applications; information acquired from (A), and (F).

POLYFORM* low temperature polyester polycapralactone sheets; hard smooth white semi-gloss surface; available in 1/8″ sheets, perforated or non-perforated material; is non-toxic, non-porous, and odorless; heated in 160 F° water for 40 sec. until pliable; shapes directly to athlete's skin after surface cooling; stretches with minimal shrinkage; self-bonding with recommended solvents; cut with shears when cool, scissors when hot; reheated with water or heat gun for remolding; sets in 2-5 min. and cures in 24 hrs.; (rigidity index 6/10); used in upper extremity orthotic stabilization; information acquired from (C), (F), (G).

POLYSAR X-414 low temperature synthetic rubber thermoplastic; matte opaque pink or yellow; available in 1/4″ thick sheets or tubes, various dimensions; material is non-toxic with a good strength/weight ration; cuts with saw or shears when cool; heat for 4-6 min. at 180 F° in oven or water; shape over stockinette protected athlete with gloves; sets and cures in 5-10 min.; does not change shape after set, has some flexibility; self adherent when hot and dry; may be finished on disc or other sander; overheating produces breakdown and discoloration; long term perspiration produces deterioration; used for prosthetic socket material and rigid orthotic applications; information acquired from (C) and (H).

SANSPLINT hard surfaced synthetic rubber sheets; available in perforated and non-perforated styles; semi-gloss opaque pink finish with one side grained; slightly rigid; dissolves with general organic solvents; cuts with scissors and has minimal shrinkage; heat to 150-175 F° in oven with silicone separator; shape on athlete, stockinette optional; sets in 10 min., cures in 24 hrs.; self adherent in malleable stage; used for fracture and orthotic splinting material; information acquired from (C).

WARM-N-FORM* hard surfaced polyvinyl chloride sheets; shiney transparent amber one side, gold fabric on other; non-self-adherent with minimal stretch and memory; cuts with saw when cool, scissors when hot; dry heat only to 130-180 F° until moldable; shape to athlete, fabric side to skin; sets in 1-3 min.; used in upper extremity support and immobilization; information acquired from (C), (W).

High Temperature Thermoforming Plastics

ABS (Acrylonitrile — Butadiene — Styrene) rigid tough thermoplastic; heated, usually by convection at 300 F° until flexible; easily shaped for vacuum forming brittle under impact; resists chemical decomposition, usually decomposition stabilized; difficult to thermobond to other materials; used for spinal and sitting supports; information acquired from (I), (J), and (K).

CAB (Cellulose — Acetate — Butyrate) transparent thermoforming plastic; used for prosthetic check sockets; identical to UVEX; information acquired from (J).

CO-Polymer a two monomer containing thermoplastic; available in polyethylene and polypropylene mixtures; has relative properties of both materials; enables selections of most desirable property ratios; heating and flexibility can be adjusted by ratio variations.

HIGH IMPACT VINYL* polyvinyl chloride thermoplastic sheets; transparent blue tint material; heat to 200-225 F° in oven or water until moldable; wipe dry before forming; may be formed to protect athlete or cast; becomes moderately elastic when hot; modifications can be made with a heat gun and pressure; tooled with drills, sanders and buffers; bonded with rivets and contact adhesives; cleaned with hot soapy water; used for upper extremity orthotic positioning devices; (rigidity index 10/10); information acquired from (D).

KYDEX* Polyvinyl chloride acrylic material; available in 1/16″, 1/8″, 3/16″ and 1/4″ thickness; available in many colors; has one side smooth, one side textured; heat in 350 F° oven until becomes malleable; form on cast with gloves; sets in up to 7 min.; elastic when hot, modifications with heat gun; tooled with drills, sanders and buffers; cleaned with hot soapy water; rigid thermoplastic with high impact strength; dynamic or static upper extremity orthotic devices; information obtained from (D).

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*more commonly utilized thermoplastics
**relative index provided by authors

NYLOPLEX* rigid thermoplastic acrylic; available for orthotic used in 2½ and 3 mm thicknesses; material is transparent amber or red-orange; cutting with saw and finishing recommended before forming; may be finished with sanders or buffers; convection heat to 284 F° for no more than 10 min.; slightly elastic when hot; molded with gloves and pressure to dry cast; material sets and cools rapidly; may be ace wrapped and padded for optimum fit; for maximum strength tempered for two hours at 90, 70, and 50 C°; has high tensile strength; resilience and resistence to most chemicals; non-porous plastic, may be cleaned with hot soapy water; slight modifications can be made with a heat gun; stiffness index 10/10; used for Ankle Foot Orthotics and Wrist Spiral and other high strength applications; information acquired from (D).

ORTHOLEN high density polyethylene thermoplastic; skin toned, mechanically strong; softens in oven at 350 F° or Infrared oven; strong forming pressure required to mold to cast; retains shape well over long time periods; white cloudy sheets, 1/16″, 1/8″ and 1/4″; finished by sanding or buffing; may be reheated and reformed by heat gun; easily penetrated by X-rays; hypo-allergenic, tasteless and odorless; resists acids, bases and most solvents; may be cleaned with warm soapy water; used for high stress orthotic devices; information acquired from (M).

PENNLON II super tough high temperature thermoplastic; available in 1/32″ and 1/16″; used for upper and lower extremity orthotics; similar to high density polyethylene; information acquired from (A).

PLEXIDUR rigid high impact strength thermoplastic; constructed of a Nylon-Methocrylate Alloy; transparent sheets 2½ and 3 mm thick; heat at 250-280 F° for up to 10 min.; usually formed over dry cast (preferrably); slightly elastic when hot; short setting time; usually cut and finish pattern before forming; tooled with drills, sanders and buffers; bonded with rivets and contact adhesives; cleans with hot soapy water; material is similar to NYLoplex; used for plastic check sockets and high stress orthotics; information acquired from (D).

PLEXIGLASS Methyl Methacrulate Acrylic; high temperature thermoplastic sheets; clear transparent plastic sheets.

POLYCARBONATE transparent high impact resistant thermoplastic; high fatigue resistance on flexion; easily thermoformed; water removal for 36 hrs. at 270 F°; softens at 400 F° for forming; has good stability and stain resistance; identical to LEXAN; used for prosthetic check sockets; information acquired from (I), (J), and (K).

POLYETHYLENE tough waxy thermoplastic sheet material; rigid or flexible depending upon thickness; available in thickensses of 1/16″, up to 1/2″; heat to 265 F° for 15-20 min. in circulating oven; becomes transparent when ready for forming; self-sealing when thermoformed; odorless, tasteless, and well skin tolerated; available in low density — more flexible, less rigid (high density — see Ortholen); not easily bonded with glues; stiffness index 9/10; used for cast thermoforming most types of orthotic devices for upper, lower and spinal where flexibility may be advantageous; information acquired from (B), (I), (J), (K), (N).

ROYALITE light or dark gray acrylic rubber thermoplastic; heated to 300-350 F° in convection oven or until soft in IR, formed on cast with glove protected hands; elastic when hot, may be reformed with heat gun; short setting and working time; tooled with drills, sanders and buffers; bonded with rivets or contact adhesives; used as polyethylene materials; information acquired from (D).

THERMO-VAC always clear thermoplastic of ionomer resin; heated to 250-275 F° for 1/16″ and 1/8″ thicknesses, heated to 300 F° for 3/16″ and 1/4″ thicknesses; heat for 5-6 min., but no longer than 7; apply to wet cast for retention of clarity; weldable, solvent resistant and non-toxic; easily reformed by addition of heat; rigidity index 9/10; used as polypropylene for orthotic components; information acquired from (Q).

VITRATHENE thermoplastic polythene; non-toxic, smooth, non-adhering material; grade 1 — white opaque, heat at 350 F°; grade 2 — pink opaque, heat at 245 F° available in thicknesses of 1/8″, 3/16″ and 1/4″; odorless, low water and vapor permeability; buffed and sanded with felt and paper; may be riveted or stitched, does not glue well; resists acids and bases, soluble in organic solvents; occasionally used for thoraco-lumbar-sacral orthosis systems; information acquired from (R).

Thermoplastic Foams

ALIPLAST* closed cell polyethylene foam; compressed white matte opaque foam; smooth glossy surface; available in thicknesses of 1/8″, 1/4″ and 1/2″; available in three degrees of rigidity — medium, soft and firm; heat shortly at 275 to 300 F° for forming; non-perforated only; cuts with knife or scissors; protect during heating with talc or silicone paper; on direct forming use stockinette to protect the athlete; used for shoe inserts and many other support and padding applications; information acquired from (A).

EVAZOTE* thermoplastic white foam; moderately high density; thicknesses available are 1/8″, 3/16″, 1/4″, 1/2″, 3/4″, and 1″; used where light padding material is needed; previously named ALIPlast 4E; information acquired from (A).

LATEX FOAM CUSHION* cool high density resilient foam; white fine cellular foam; used where ventilated padding material advantageous, cushioning; information acquired from (A).

NICKELPLAST* thermoplastic white foam; high compression, set and stable resistance to pressure; available in 1/8″, 3/16″ and 1/4″; used as high density support material; information acquired from (A).

PELITE* foamed polyethylene thermoplastic; soft white non-allergenic foam; perforated or non-perforated; available in thicknesses of 1/8″ to 3/4″ by 1/8″; available in soft, medium and firm densities; heat at 265 F° for less than 1 min. until pliable; resist compression on vacuum forming; thermobonds to polypropylene and polyethylene; used as general supportive padding; information acquired from (A), (M), and (O).

PLASTAZOTE* closed cell polethylene sheets, foamed with nitrogen, cross-linked by radiation; shock absorbing soft smooth textured foam; grades #1 — medium, #2 — firm, #3 — rigid; available; in thicknesses of 1/16″ to 1/4″ by 1/16's, 1/2″, 3/4″ and many colors available; available in perforated and non-perforated; heat until 240 F° until malleable; malleable and auto-adhesive on heating; protect during heating with talc or teflon sheet; protect athlete while forming directly with stockinette; sets in 1-5 min. to semi-rigid shell; cuts with knife or scissors; may be drilled, punched or sanded; non-toxic, inert and resistant to acids and bases; resist wetting; multi-use padding for all types of support; information acquired from (A), (K), (O), (S).

SOFT SPONGE flexible soft closed cell foam; low pressure padding material; available in 1/8″, 1/4″ and 1/2″; used for highly pressure sensitive applications, information acquired from (A).

SURGICAL ORTHOPEDIC SPLINTING closed cell polyethylene foamed sheets; available in opaque white and various densities; perforated and non-perforated; flexibility is density dependant; cuts with a knife or scissors; heat at 280 F° until pliable; when oven heated use teflon carring sheet; form on cast or stockinette protected athlete; sets in 1-5 min. after removal from oven; material is self-adherent when hot; used for upper extremity orthotic application of support; information acquired from (C), (V).

TEMPER (T) FOAM* self molding foam padding; available to 38″ by 78″ for pads; thicknesses available are 1″, 1½″, 2″, 3″; densities available are X-soft, soft, medium and firm; possesses breathability; softens under body heat to provide more even pressure distribution, equalizes support; available with contact adhesive back; used for pressure troubled athletes; information acquired from (A).

VELVETEX expanded polyethylene foam; extremely fine flexible foam mesh; posesses high coefficient of friction so moves with skin to eliminate problems of abrasion; used for padding relief where minor motion occurs and abrasion is a problem; information acquired from (K).

Conclusion

It should be noted that plastics, both in the sheet form and in the foam form, are becoming used in the making of orthopedic appliances. It is important, if proper techniques of fabrication are to be achieved, that the athletic trainer have a basic understanding of properties of the plastics that he/she will be working with. Knowing the working properties of the plastic will enable the trainer to select the material which is most corresponding to the athlete and the treatment which he/she desires to deliver. Without the understanding of available materials it would be difficult to select the most appropriate material for providing optimum treatment.

References

1. *Stedman's Medical Dictionary,* 23 ed., Baltimore: Williams and Wilkins, Co. 1976.

2. Wigsten, MR: Thermoforming, *Modern Plastics Encyclopedia,* New York: McGraw-Hill, p. 390.

3. Stupp SI, Supan TJ, Belton D. Ice Water Quenching Techniques for Polypropylene, *Orthotics and Prosthetics,* 33 (1): 16-21, 1979. No. 1, pp. 16-21.

Material Characteristic References

(A) AliMed Catalogue and Information Sheets; AliMed, C&B Associated, 138 Prince St., Boston, MA 02113.

(B) AquaBlast Literature — *Splinting with AquaPlast: A Low Temperature Splint/Brace Material,* Judith Wasserman, OTR, September 1976. WFR Corporation.

(C) New Plastics for Forming Directly on the Patient, Compton J and Edelstein JE. *Prosthetics and Orthotics International,* April 78, N. 2 pp. 43-47.

(D) *Manual on Static Hand Splinting — New Materials and Techniques,* Malick MH, OTR, Harmarville Rehabilitation Center. Pittsburgh, PA 15238.

(E) *Orthoplast Splints,* Johnson and Johnson, New Brunswick, NJ 08903.

(F) Rolyan Medical Products Catalogue; Rolyan Manufacturing Co., Inc., P.O. Box 555, N9OW14635, Commerce Drive, Menomonee Falls, WI 53051.

(G) H-Shaped Wrist Orthosis, Solie GA, OTR, *Orthotics and Prosthetics,* March 1979, Vol. 33, No. 1, pp. 22024.

(H) Direct Forming of Below Knee Patellar-Tendon Bearing Sockets with a Thermoplastic Material, Staff of VAPC, *Orthotics and Prosthetics,* March 1969, pp. 36-61.

(I) Modern Plastics Encyclopedia, 1979-80, McGraw-Hill Inc., 1221 Avenues of America, New York, NY 10020.

(J) Vacuum Forming of Plastics in Prosthetics and Orthotics, Wilson HB Jr, *Orthotics and Prosthetics,* March 1974, Vol. 28, No. 1, pp. 12-20.

(K) Molded Plastics in Bracing, Yates G, *Clinical Orthopedics and Related Research,* Vol. 102, July-August 1974, pp. 46-57.

(L) Fillaurer Catalogue — Fillaurer Orthopedics, P.O. Box 1678, Chattanooga, TN 37401.

(M) Vacuum Forming Procedure for the Fabrication of Non-Standard Spinal Orthoses, Mortenson L, *Orthotics and Prosethetics,* Vol. 33, No. 2, June 1972, pp. 20-30.

(N) Washington Prosthetics Supply Catalogue — Washington Prosthetic Supply Co. 40 Patterson St., N.E., Washington, DC 20002.

(O) Ice Water Quenching Technique for Polypropylene, Stupp SI, Supan TJ, Belton D, *Orthotics and Prosthetics,* March 1979, Vol. 33, No. 1, pp. 16-21.

(P) Thermo-Vac Literature — United States Manufacturing Corporation, 180 North San Gabriel Blvd., P.O. Box 5030, Pasadena, CA 91107.

(Q) Vitrathene — A Multipurpose Plastic, Paul SW, *Orthotics and Prosthetics,* June 1970, Vol. 24, pp. 43054.

(R) Kingsley Manufacturing Company Catalogue — Kingsley Manufacturing Co. 1984 Placentia Ave., Costa Mesa, CA 92627.

(S) Fred Sammons, Inc., Box 32, Brookfield, IL 60513.

(T) Hexcel Medical Products, 11711 Dublin Boulevard, Dublin, CA 94566.

(U) Merck Sharp & Dohme Orthopedics Co., Inc., 2990 Red Hill Avenue, Costa Mesa, CA 92626.

(V) Thermo-Mold Medical Products, Inc., Route 130, P.O. Box 36, Burlington, NJ 08016.

(W) BRB Industries, Inc., 467 11th St., Hoboken, NJ 07030.

Selected References

Lecht S, Kamentz H: Rubber and Plastics in Orthotics, *Orthotics Etcetera, 1966.*

Modern Plastics Encyclopedia 1979-1980, McGraw-Hill Publishing Co., New York, NY.

Park JB: *BioMaterials — An Introduction,* Plenus Press, New York, NY. +

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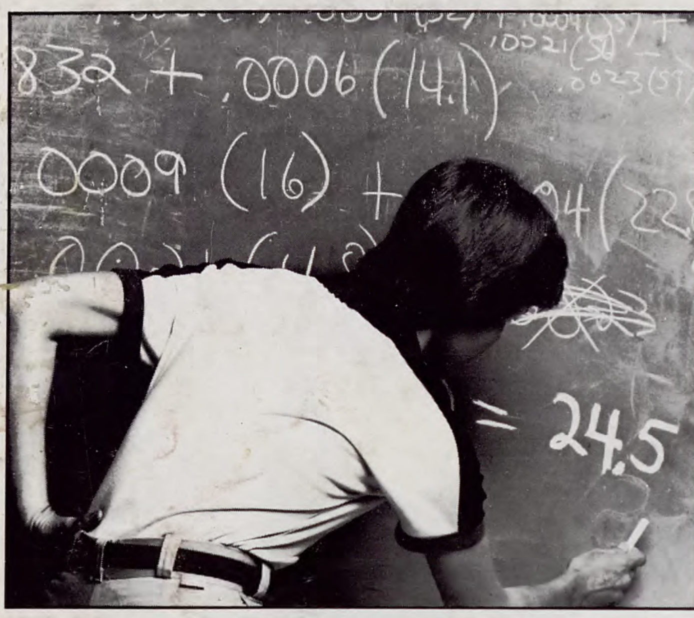

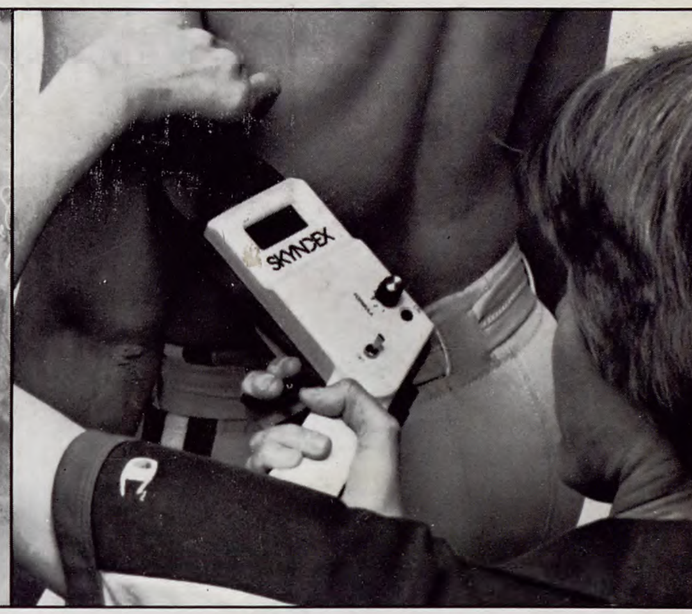

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