ATHLETIC TRAINING

THE JOURNAL OF THE NATIONAL ATHLETIC TRAINERS ASSOCIATION, INC • VOLUME 21 • NUMBER 4 • WINTER 1986

30th Anniversary Year
1956-1986

The National Athletic Trainers Association, Inc.

President
Jerry Rhea
Atlanta Falcons
I-85 & Suwanee Road
Suwanee, Georgia 30174

Executive Director
Otho Davis
Philadelphia Eagles
Veterans Stadium
Philadelphia, Pennsylvania 19148

BOARD OF DIRECTORS

District

Charles Redmond
Springfield College
Springfield, Massachusetts 01109
* * * 1 * * *

E. Hal Biggs
Bucknell University
Lewisburg, Pennsylvania 17837
* * * 2 * * *

Andy Clawson
The Citadel
Charleston, South Carolina 29409
* * * 3 * * *

Dennis Miller
Purdue University
West Lafayette, Indiana 47907
* * * 4 * * *

Denis Isrow
North Dakota State University
Fargo, North Dakota 58102
* * * 5 * * *

Paul Zeek
Lamar University
Beaumont, Texas 77710
* * * 6 * * *

Mike Nesbitt
Northern Arizona University
Flagstaff, Arizona 86001
* * * 7 * * *

Janice Daniels
1525 Woodland Oaks Way
Sacramento, California 95833
* * * 8 * * *

Doug May
University of Tennessee
Chattanooga, Tennessee 37402
* * * 9 * * *

Mark Smaha
Washington State University
Pullman, Washington 99164
* * * 10 * * *

DISTRICT SECRETARIES

Christopher Troyanos
Babson College
Wellesley, Massachusetts 02157

Donald Lowe
Syracuse University
Syracuse, New York 13210

Terry O'Brien
Towson State University
Towson, Maryland

Patricia Troesch
Miami University
Oxford, Ohio 45056

Jerry Weber
University of Nebraska
Lincoln, Nebraska 68588

James Dodson
Midland High School
Midland, Texas 79701

Bill Lyons
University of Wyoming
Laramie, Wyoming 82071

Ed Ferreira
Fresno State University
Fresno, California 93740

Sherry Sutton
5308 S.W. 88th
Gainesville, Florida 32608

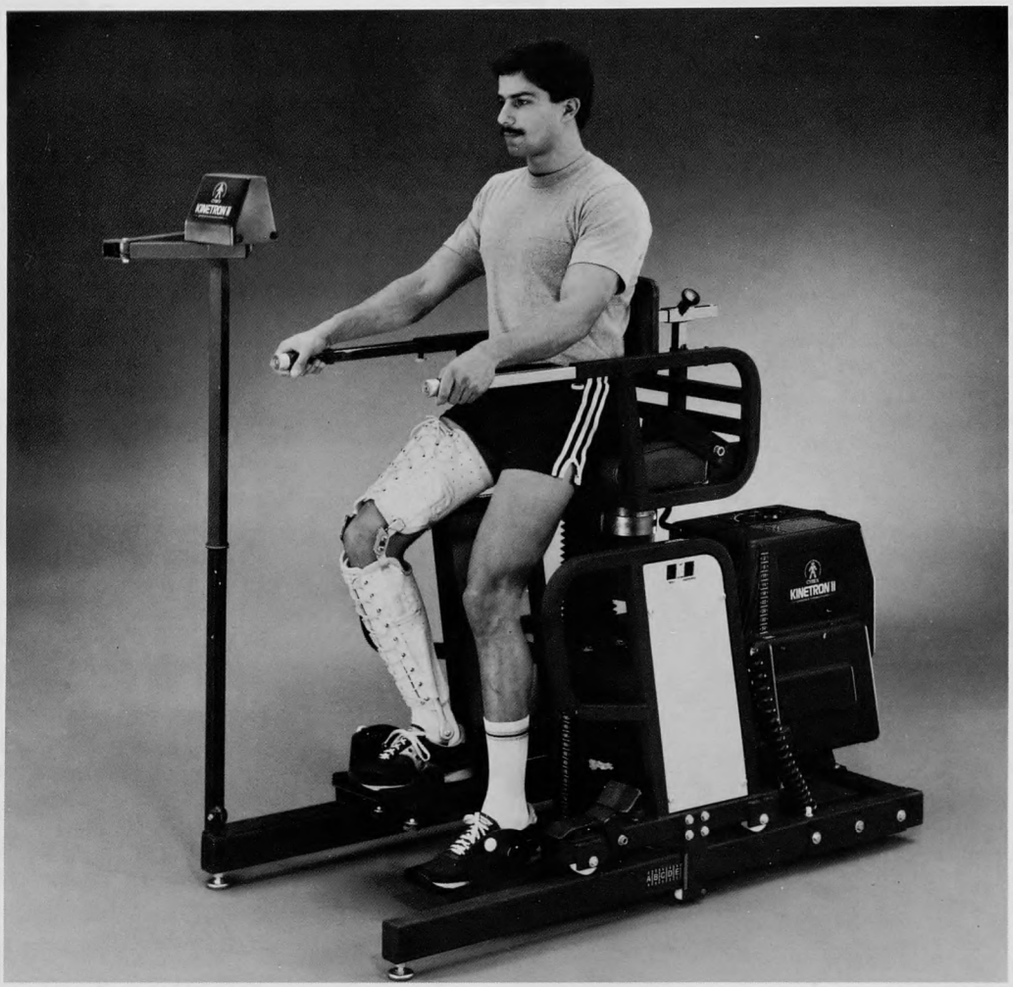
Dennis Sealey
University of Washington
Seattle, Washington 98195

Administrative Assistant
Mary Edgerley
NATA National Office
Greenville, North Carolina 27858

COMMITTEE CHAIRMEN

Audio Visual Aids — Jerry Nowesnick
Career Information & Services — Charles Demers
Certification — Paul Grace
Continuing Education — Jim Gallaspy
Drug Education — John Wells
Ethics — Chris Patrick
Grants & Scholarships — Frank George
History & Archives — Mike O'Shea
Honor Awards — George Sullivan
International Games — Troy Young
Journal — Steve Yates
Licensure — Ed Crowley
Membership — Bruce Melin, Don Lowe
Memorial Resolutions — Dennis Helwig
Minority Athletic Trainers — Phil Horton
National Convention — Fred Hoover
Placement — Craig Sink
Professional Education — Gary Delforge
Public Relations — Bobby Barton
Research & Injury — John Powell

KINETRON® II gets your injured athletes back into action faster



Now, post-surgical lower limb rehabilitation and fast functional speed exercise can begin earlier with KINETRON II.

Controlled Weightbearing and Range of Motion

KINETRON II exercise can begin as soon as some weightbearing is permitted. A prescribed percentage of weightbearing is set by the clinician and easily maintained by the patient. Where flexion and extension must be limited, KINETRON II adjustments give the clinician complete control over hip, knee and ankle range of motion.

Controlled Speed

KINETRON II resistance is Isokinetic — the speed of motion is constant and controlled. This allows the patient to develop fully supported weightbearing force, and ultimately to exercise at fast functional speeds. KINETRON II exercise improves power capacity as the patient develops force more quickly at higher speeds.

End-Loaded Accommodating Resistance

Injuries such as anterior cruciate ligament and Achilles tendon tears, or patellofemoral problems, are effectively rehabilitated with KINETRON II exercise. The end-loaded compressive resistance pattern maintains bone density and provides functional exercise. Resistance accommodates perfectly to patient force output, virtually eliminating the risk of overstressing damaged structures while safely restoring total leg strength.

High-Strength Construction

The welded steel frame construction and the Isokinetic resistance mechanism of KINETRON II are specifically designed to withstand the high forces produced by repeated intense exercise bouts. The high-force gauge provides readouts of up to 350 lbs. and gives motivational feedback of improved performance.

KINETRON II . . . for the only Isokinetic end-loaded resistance exercise that develops total leg strength and power capacity at any level of prescribed weightbearing.

CYBEX Div. of Lumex, 2100 Smithtown Ave., Ronkonkoma, NY 11779

☐ Please send more KINETRON II information

☐ Please have Sales Representative call me AT12/86

Name _____ Title _____

Facility _____

Bus. Phone ( ) _____

Address _____

City _____

State _____ Zip _____

HUMAN PERFORMANCE REHABILITATION FITNESS

CYBEX

Division of Lumex Inc.
2100 Smithtown Ave., Ronkonkoma, NY 11779 •(516) 585-9000

"ATHLETIC TRAINING" (ISSN 0 160 8320) is published quarterly ($20 for one year subscription, $27 foreign) by The National Athletic Trainers' Association, Inc., 1001 East Fourth Street, Greenville, NC 27858. Second-class postage paid at Greenville, NC and additional mailing offices. POSTMASTER: Send address changes to ATHLETIC TRAINING, 1001 East Fourth Street, Greenville, NC 27858.

CHANGE OF ADDRESS may be made by sending old address and new address to ATHLETIC TRAINING. State whether change is temporary or permanent. Allow thirty days for changeover.

ATHLETIC TRAINING

THE JOURNAL OF
THE NATIONAL ATHLETIC TRAINERS ASSOCIATION, INC.

Volume 21, Number 4, Winter 1986

Features

Departments

CEU Credit Quiz

Thoracic Outlet Compression Syndrome

Fred R. Lutz, Jr., MS, ATC
Joe H. Gieck, EdD, ATC, PT

Thoracic Outlet Syndrome can be defined as a compression on the neurovascular bundle causing neurological and vascular symptoms in the upper extremity. The lack of precise objective and clinical tests along with symptoms that are synonymous with other syndromes in the upper extremity cause Thoracic Outlet Syndrome to appear to be a rare entity in athletics. However, it should not be ruled out as a possible etiology of upper extremity pain in the athlete. Treatment consists of therapeutic exercises for developing flexibility and strength in the suspensory muscles of the shoulder and upper back. Surgical intervention is indicated if there are no positive results from conservative therapy.

Thoracic outlet syndrome can be defined as a syndrome in which there is compression on the neurovascular bundle in the supraclavicular fossa, or the costoclavicular fossa, causing a disturbance in nerve and vascular function in the upper extremity (15). The compression involves the brachial plexus, subclavian artery, and subclavian vein. These three anatomical structures are collectively termed the neurovascular bundle.

The etiology is varied and can be attributed to several anatomical anomalies. They may involve the cervical rib, thoracic rib, pectoralis minor, or scalenus anticus. Another common cause of thoracic outlet syndrome (TOS) is sleeping with the arm hyperabducted. The gymnast, volleyball participant, wide receiver in football, weight lifter, and throwers are particularly susceptible as they often have the shoulder in a hyperabducted position.

One postural cause of TOS is weak suspensory muscles in the shoulder. This produces a drooping of the shoulders and results in compression of the neurovascular bundle. TOS tends to mimic other conditions such as angina pectoris, osteoarthritis, carpal tunnel syndrome, and Raynaud's phenomenon (12). Diagnosis of TOS is difficult because of the lack of sensitive diagnostic tests, and the variability of ideas surrounding the etiology of thoracic outlet syndrome.

History

The term thoracic outlet syndrome was initially introduced in 1956 by Peet and associates (8). Peet used this term to describe the symptoms that resulted from compression of the neurovascular structures.

Mr. Lutz is a graduate of the University of Virginia's master's program in athletic training and is currently in physical therapy at Beaver College, Glenside, Pennsylvania 19038.

Dr. Gieck is Associate Professor of Education, Assistant Professor of Orthopaedics and Rehabilitation, Head Athletic Trainer and Curriculum Director of Athletic Training at The University of Virginia, Charlottesville.

The recognition of cervical ribs dates back as far as the early anatomist Galen. The cervical rib causing thoracic outlet compression was first described in 1743 (16). The cervical rib was the primary anatomical anomaly used to explain the neurovascular syndrome. In 1905, the concept of the scalene muscle in combination with the cervical rib producing neurovascular symptoms was introduced (12). In 1919, compression of the brachial plexus and subclavian artery without the involvement of a cervical rib was demonstrated, suggesting the compression was due to the first thoracic rib. In 1925 strengthening of the suspensory muscles of the shoulder girdle was recommended to alleviate this compression. Hyperabduction of the arm as a mechanism for producing TOS was suggested in 1945. The importance of prior non-surgical treatment of TOS with good results was reported in 1957 (13).

Anatomy

In order to thoroughly understand the various etiologies of TOS, the athletic trainer must first understand the anatomical structures that make up the thoracic outlet. The thoracic outlet is a region that allows the passage of vessels and nerves from the base of the neck and mediastinum to the axilla (Fig. 1). The thoracic outlet can be divided into three anatomical regions: the superior thoracic outlet, the costoclavicular passage, and the costoscalenic hiatus. The superior thoracic outlet is bordered entirely by bony structures: the first thoracic rib laterally, the spine and scapula posteriorly, and the sternum anteriorly. The costoclavicular passage is a triangle bounded by the clavicle, the subclavian muscle posteriorly, and the first thoracic rib medially (12). The costoscalenic hiatus is housed within the supraclavicular fossa. The supraclavicular fossa is bounded posteriorly by the scalenus medius and posterior. These two muscles fuse together to insert on the first and second ribs. The roots of the brachial plexus pass between the scalenus anterior and scalenus medius muscles. Inferior to the roots of the brachial plexus is the subclavian artery which is joined laterally by the

subclavian vein. The costoscalenic hiatus is a division between the scalenus anterior and scalenus medius. It is here where the subclavian artery and brachial plexus normally pass. The subclavian vein passes anteriorly to the insertion of these two muscles (7). The Scalenus Anticus (Anterior Scalene) is generally covered by the sternocleidomastoid, and originates from the transverse processes of the third-sixth cervical vertebrae and inserts on the first rib. As previously stated, the subclavian artery and the brachial plexus pass posteriorly to this muscle. Elevation and depression of the shoulder change the relation between the clavicle and the subclavian artery. When the shoulder is elevated, the fossa becomes depressed and the artery is behind the clavicle. With depression of the shoulder, the artery can become exposed so that pulsations may be observed. Not only will elevation and depression of the shoulder effect the integrity of the supraclavicular fossa, but flexion, tension, rotation and abduction of the humerus will also distort the anatomy of the thoracic outlet (13). The pectoralis minor can also be involved in compressing the neuromuscular bundles as they pass into the axilla. The brachial plexus, the subclavian artery and vein pass beneath the pectoralis minor prior to entering the axilla.

Mechanisms

Compression of the neurovascular bundle in the thoracic outlet can be attributed to a number of reasons, some being congenital, others related to trauma or functional disorders. It is important to understand the etiology so that proper treatment may be initiated to alleviate the problem whether it be operative or nonoperative in nature. Causes of compression include anomalies of the cervical rib, a supernumerary rib arising from the cervical vertebrae and the thoracic rib; and compression by the scalenus, costoclavicular joint, clavicle or from shoulder hyperabduction (16). The loss of suspensory muscle tone with resultant kyphosis can also contribute to the compression of the thoracic outlet. Symptoms that result from compression will either be neurological or vascular. In the case of vascular symptomology, it can either be arterial or venous. Some athletes may have several factors contributing to compression, therefore eliciting both neurological and vascular disturbances.

The cervical rib is a very common anatomical anomaly that causes compression of the thoracic outlet. An analysis of the Mayo Clinic's admissions showed that 5.6/1000 patients had cervical ribs present. When present they may contribute to symptomatology (7). The cervical rib usually arises from the seventh cervical vertebrae. It is more common on the left side of the body, but symptoms are more common on the right side (16). The reason the right side produces more symptoms can possibly be attributed to the fact that more people are right-handed. However, there has not been any evidence to support this phenomenon. Cervical ribs are more common in females than in males, consequently, this may be the reason why TOS is found more in women than in men (16). The cervical rib and its fibrous bands can narrow the thoracic outlet by altering the insertions of the scalene muscles. Neurological symptoms of the lower trunk of the brachial plexus will most commonly be of ulnar nerve distribution. The presence of a cervical rib does not indicate that it is definitely the cause of outlet compression; however, it is suggestive. The absence of a cervical rib on x-ray may not rule out its presence since radiolucent bands extending from the cervical rib to the first rib may be present (16). The cervical rib can also cause compression of the subclavian artery since it runs along with the brachial plexus under the anterior scalenus muscle. However, the subclavian vein is usually spared because it passes anteriorly to the anterior scalenus and any alterations of the anterior scalenus insertion usually do not involve the subclavian vein.

In 1927 the first thoracic rib was implicated as a cause of compression symptoms. If the first thoracic rib is not completely developed from its origin at the first thoracic vertebrae, it may cause the lower portion of the brachial plexus to originate from the second thoracic nerve instead of the first. If atrophy of the muscles in the shoulder girdle is present, the neuromuscular bundle may be angulated and thus compressed against the first thoracic rib. This has been the explanation offered in patients with the "sagging shoulder phenomenon," a situation more common in women than in men (16). The first thoracic rib is a common boundary found in three anatomical regions in which the neuromuscular bundle passes: the superior thoracic outlet, the costoscalenic hiatus, and the costoclavicular passage. For this reason, the resection of the first thoracic rib is a common surgical procedure for the treatment of thoracic outlet syndrome (12).

Costoclavicular compression may result in disturbance of the neurovascular bundle. The space between the clavicle and the first thoracic rib may vary depending on the position of the shoulder. As a result of poor posture or carrying heavy weights the clavicle may cause undue pressure on the neurovascular bundle in the case of drooping shoulders. Abduction of the humerous rotates the clavicle so that the structures that traverse the area between the first thoracic rib and the clavicle are compressed. This narrowing is more severe in retraction of the shoulder (16), as in the exaggerated military position of "attention", and with an elevation of the first thoracic rib upon deep inspiration. Reduced speed in the costoclavicular area may produce vascular symptoms affecting the arterial supply to the upper extremities.

Hyperabduction syndrome is often caused by poor sleeping posture. The arm and elbow is used as a pillow. The hyperabduction of the humerus causes a depression of the pectoralis minor at its insertion on the corocoid process (9). This produces traction on the pectoralis minor and thus compresses the neuromuscular structures that pass posteriorly to the muscle. Certain occupations, such as painters, welders, mechanics, and athletes, who assume the hyperabduction position are vulnerable. Hyperabduction can produce symptoms that are indistinguishable from those of scalenus syndrome (7).

Interscalene compression involves the anterior and middle scalenus muscles. The brachial plexus and the subclavian artery normally migrate between these two muscles. There have been reported cases of the brachial plexus and the subclavian artery passing through the belly of the anterior scalene muscle (16). A change in posture could produce intermittent compression. The scalene muscles function as accessory muscles of respiration, and are involved in laterial deviation and flexion of the cervical spine (16). These muscles insert on the first thoracic rib, and originate from the cervical vertebrae. Thus, any deviation of their insertion on the rib will result in a decrease in the interscalene aperture and a compression syndrome.

Signs and Symptoms

The symptoms that develop from thoracic outlet syndrome may be neurological or vascular in origin. Neurological symptoms seem to be the major manifestation of TOS. However, neurological and vascular signs are frequently found simultaneously, and great difficulty can result in trying to differentiate between the two.

Neurologically, the medial cord of the brachial plexus is subject to the most compression since it is the most inferior of the three cords. Therefore, the neurological symptoms are usually in the distributions of C8-T1 (16). The medial cord provides sensation to the medial aspect of the arm and forearm via the medial brachial and medial antibrachial cutaneous nerves as well as the ulnar nerve. The ulnar nerve is most frequently involved because it lies right on the first rib and is inferior to the radial and median nerves (9). Symptoms generally occur in the C-8 dermatone, which is the ulnar nerve distribution. Within this dermatone are the dorsal and volar aspects of the fifth finger and ring finger. Branches of the ulnar nerve also innervate the hypothenar and ulnar intrinsic muscles of the hand, which would be affected by ulnar nerve compression. The biceps, triceps, and brachioradialis reflexes are usually not affected with compression of the brachial plexus. The symptoms that generally develop from compression of the brachial plexus are numbness, pain, parasthesia, and hyperesthesia with pin-prick stimulation over the ulnar nerve dermatome (9). The origin of these symptoms may not be clear since they can radiate into the scapular region, neck, forearm, hand, and chest. This makes it difficult to diagnose and treat TOS because the symptoms may occur in areas other than where they originate.

In more severe cases, the subclavian artery can become compressed and the athlete will develop coldness, pallor, weakness, cyanosis, forearm claudication, and even gangrene (16). As these symptoms may be mistaken for Raynaud's phenomenon, it is important to distinguish whether they are due to a change in temperature, as in Raynaud's, or are activity induced, as in TOS (12). Obstruction of the subclavian vein can lead to stiffness in the arm, edema, venous engorgement, and even thrombophlebitis (13). However, venous involvement is not as common as the previous two because of the anatomical alignment of the subclavian vein with respect to the structures involved in producing TOS. Nevertheless, one should be aware of the possibility of the subclavian vein being involved in producing TOS symptoms.

Differential Diagnosis

The diagnosis of TOS is often missed because of the highly subjective nature of symptoms and the lack of objective tests and examinations. An accurate history is the sine qua non leading to the diagnosis of TOS. As mentioned previously, thoracic outlet syndrome can be misdiagnosed as Raynaud's phenomenon. It also can be diagnosed as a stroke or angina pectoris.

Radicular pain caused by a herniated cervical disc may be difficult to distinguish from that caused by TOS (9). Carpal tunnel syndrome is often associated with TOS. Pain and weakness is found in the ulnar and median nerve distribution. Positive Phalen's and Tinel tests can be helpful in making the proper diagnosis of carpal tunnel syndrome (11).

Posture that is assumed in daily activities may cause these symptoms to arise. An example would be a painter or volleyball player who has his arms above his head during activity or athletes sleeping with the arms hyperabducted. The athlete's shoulder posture when standing erect may also be a cause of TOS. Typically, the shoulders will be drooping forward either bilaterally or unilaterally due to weak suspensory muscles of the shoulder girdle such as the trapezius, serratus anterior. erector spinae, pectoralis mucles, rhomboids, and the deltoid muscles (13).

Objective tests that are used to diagnosis TOS are primarily concerned with reproducing vascular, rather than neurological symptoms. The first of these is the Adson maneuver (Figure 2). This tests compression of the neurovascular bundle between the anterior and middle scalene muscles (5). The arm is abducted, extended and externally rotated (10). The patient then extends the neck and rotates the head to the side being tested while holding his breath. The examiner applies downward traction on the arm while palpating the radial pulse. Obliteration of the radial pulse accompanied with pain indicates a positive test for TOS. Although a positive Adson test is a prime indicator of neurovascular compression, it has been overrated as a physical sign of TOS. In a 1948 study, obliteration of the radial pulse during the Adson maneuver was a normal variant. However, a positive Adson sign may indicate TOS in a patient that also has neurological symptoms (2).

The second physical exam for TOS is known as the Allen's maneuver (9), or hyperabduction-hyperflexion test (Figure 3). The arm is held in full flexion and abduction while the neck is extended. The hand is supinated. Obliteration of the radial pulse and reproduction of symptoms suggest that the pectoralis minor is compressing the neurovascular bundle (2).

A third diagnostic exam for TOS is known as the costoclavicular syndrome, or the military position (Figure 4). This test is performed with the athlete sitting, the shoulders are pulled backward and downward, the arm is in 30° of abduction and extension (2). The patient then takes a deep breath. The test is positive if the athletic trainer feels a disappearance in the radial pulse. This procedure is used to indicate scalene and first rib compression (9).

A final diagnostic exam is the "Claudication test." To perform this test, the patient exercises the forearm by opening and closing his hands rapidly for sixty seconds. If there is a vascular occlusion above the brachial level, this exercise is only tolerated for a few seconds (9). Normally it can be tolerated for 45-60 seconds before fatique develops. For neurological examination, it is possible to assess dermatome levels C7-C8, ulnar and median nerve motor function by testing the hyperthenar and intrinsic muscles of the hand for the ulnar nerve. Motor tests for the median nerve would include thumb pinch, opposition of the thumb, and abduction of the thumb.

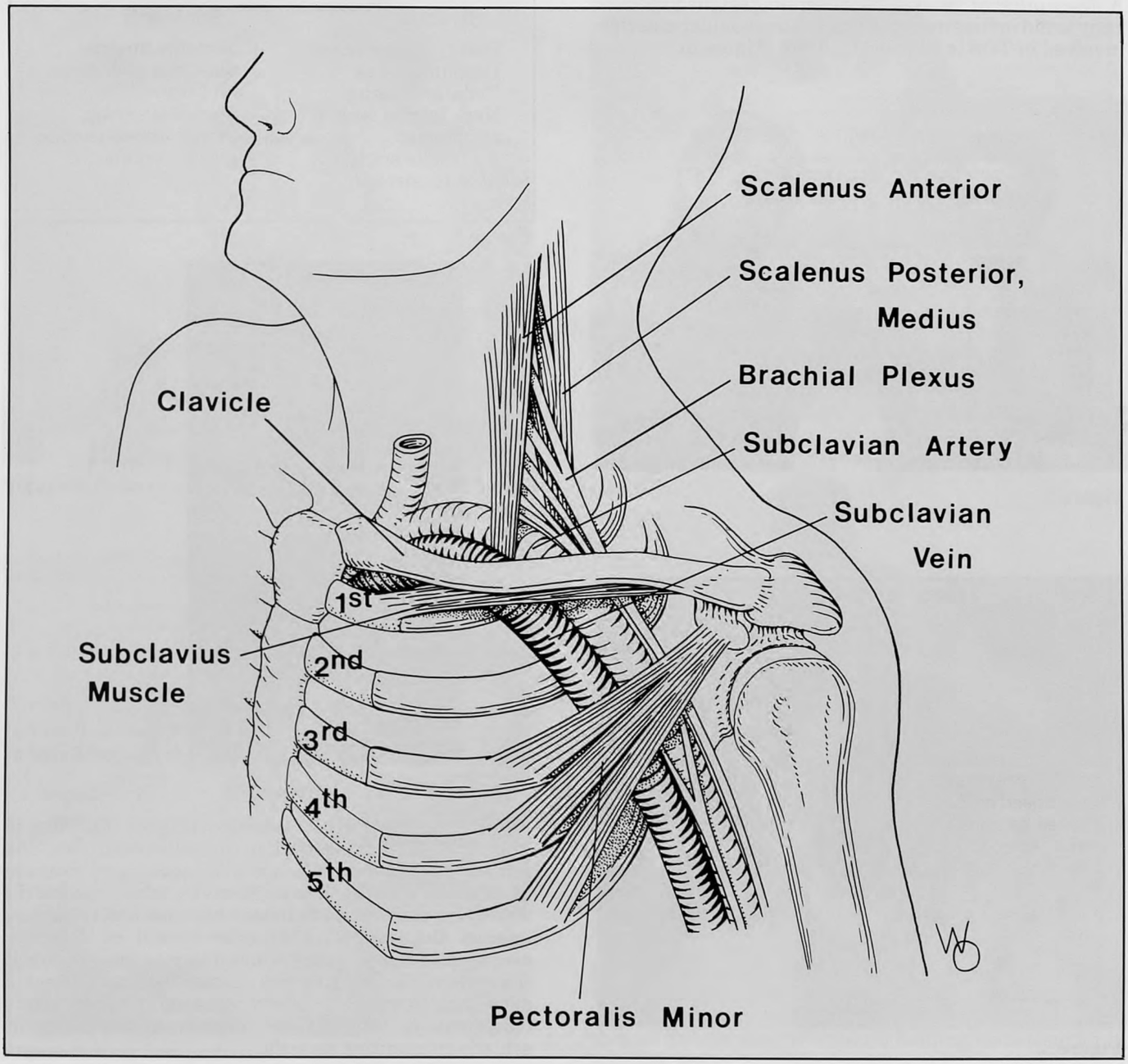
These tests can be helpful in determining whether a patient has TOS, but are not adequate to confirm a positive diagnosis. Therefore, it is important to augment these physical exams with a thorough history of the symptoms and mechanisms that cause the pain. The key to diagnosing TOS is an in-depth history of the pain and the ability to reproduce those symptoms with physical testing. If the physical exam and history suggest TOS, then the patient should undergo additional tests to rule out the possibility of other anomalies. Standard chest and cervical x-rays can be helpful in ruling out obvious bony abnormalities such as cervical ribs and narrowing of intervertebral spaces (12). Cervical myelograms can be helpful in ruling out cervical disc

involvement. Subclavian arteriography has been advocated in patients that reveal vascular symptoms (12). Phlebography studies are indicated in the presence of venous symptoms (12). Ulnar nerve conduction studies have proven helpful in diagnosing TOS. Urshel believes that this test is diagnostic of TOS when the conduction velocity is less than 72m/sec (12). Electromyographic studies can be used to rule out nerve entrapment in the wrist and elbow which can be misdiagnosed as TOS (12). A Doppler ultrasonography of arterial and venous flow with the head and arm in different positions has demonstrated good results in determining TOS (13). All of these tests can be used in combination to diagnose TOS in a patient. However, they are not specific indicators of TOS. These tests suggest TOS by ruling out various other abnormalities that cause symptoms similar to the syndrome in question.

Treatment

Thoracic outlet syndrome can be treated operatively or nonoperatively. Many cases respond well to nonoperative treatment. However, in certain cases where patients fail to respond to physical therapy, or continue to exhibit persistent incapacitating symptoms with an absence of cervical rib disorders or vascular occulusion, operative treatment may be indicated. Surgery may also be indicated when arterial, venous, and neurological deficit progressively worsen (12,14,16). Rehabilitation should be directed at correcting postural problems as well as stretching and strengthening specific neck, upper trapezius, and other suspensory muscles of the shoulder girdle. A period of four to six weeks may be needed in order to achieve significant results from rehabilitation (1).

Education of the athlete is a major factor in the nonoperative treatment of TOS. A clear explanation of each exercise and modality is of prime importance in correcting TOS nonoperatively. It is important that the athlete understand the mechanisms that cause the symptoms related to TOS. This will enable the athlete to understand the reason why some of the exercises are being performed, and why it is important to correct his



posture whether it be sleep, athletic, or job related, so the symptoms can be relieved. With full patient cooperation, conservative treatment can be expected to produce favorable results in 50-80% (4, 6, 8) of the population. In a study conducted by Wood in 1977, it was shown that it took an average of nine months of rehabilitation to relieve the symptoms of TOS (15).

The use of muscle relaxants and anti-inflammatories has been indicated in the treatment of more severe symptoms. Temporary relief of painful muscle spasms can be achieved with the use of deep heat, and ultrasound in combination with muscle stimulation (1). Transcutaneous electrostimulation has also been helpful in relieving painful symptoms (15). Cervical traction has been used to relieve spasms of the neck musculature. However, it may serve to exacerbate the symptoms on occasion (15). In the more severe cases of TOS, immobilization of the upper extremity may be indicated while the athlete is ambulatory (1).

The most important therapeutic modality to aid in correcting posture is the use of exercise to stretch and strengthen the muscles of the neck and shoulder girdle. A description of an exercise program designed specifically to aid in the strengthening of the shoulder muscles involved in TOS is outlined (1, 3, 10) (Figure 5).

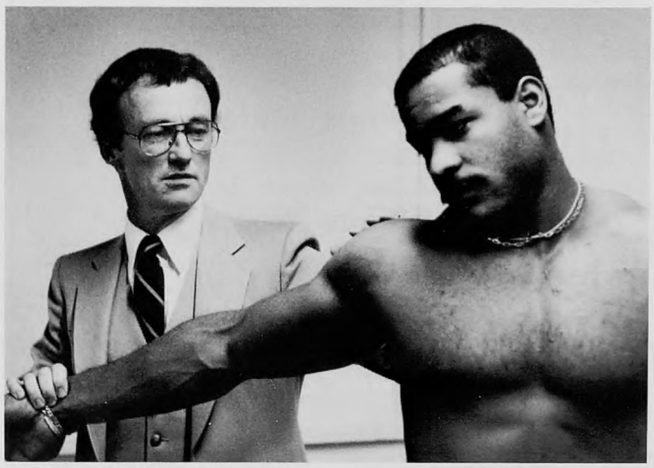


Figure 2.

Figure 3.

Figure 4.

TOS rehabilitation exercise:

Stretch	Strength
Postural awareness	Serratus anterior
Deep breathing	Shoulder abduction
Codman's series	Mid-trapezius
Neck lateral stretch	Shoulder shrugs
Neck twist	Lower trapezius
Pectoralis stretch	Erector spinae
Scalene stretch	

Figure 5.

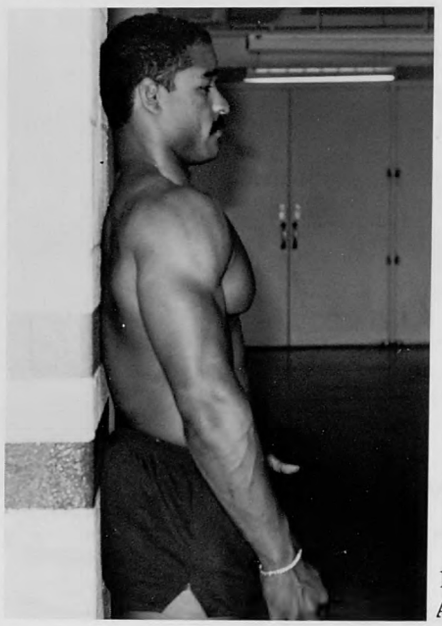


Figure 6. Postural Awareness Exercise

Stretch

Postural Awareness exercise: (Figure 6) This is important to relieve tension in the scalene muscles. The athlete stands with his heels, buttocks and scapula against the wall. He then performs a posterior pelvic tilt while also attempting to flatten his neck and shoulders against the wall. This exercise should be done for several minutes as many times a day as possible until the athlete is aware of correct posture. This awareness is necessary in order to insure successful conservative treatment of TOS. Correct posture is necessary in athletic competition as well.

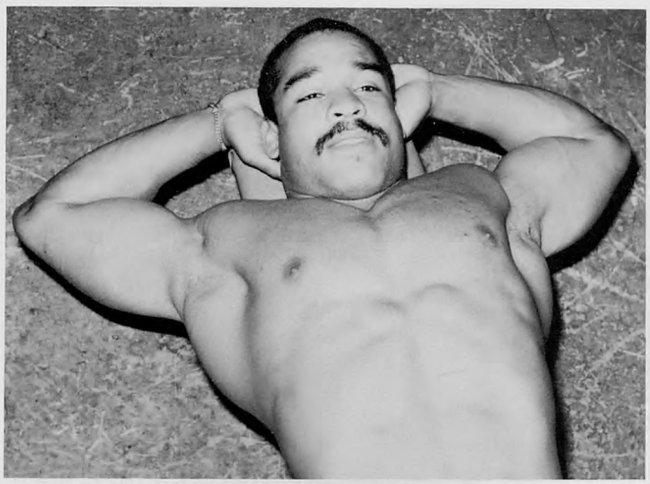


Figure 7. Deep Breathing Exercise

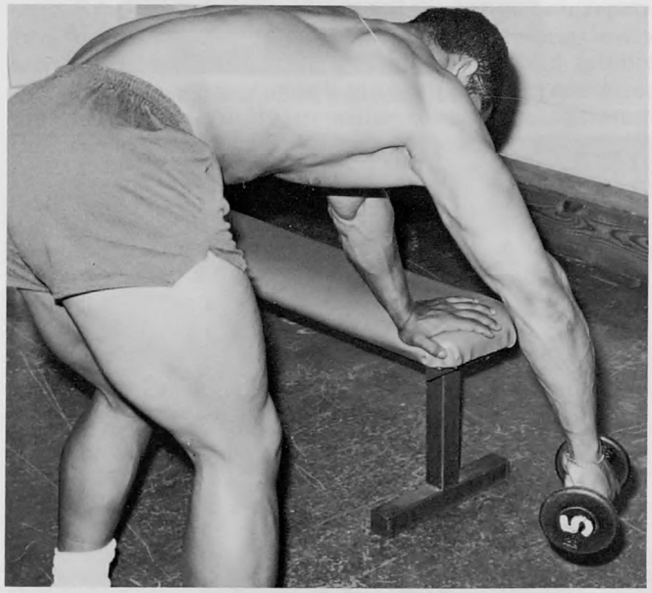


Figure 8. Codman's Series

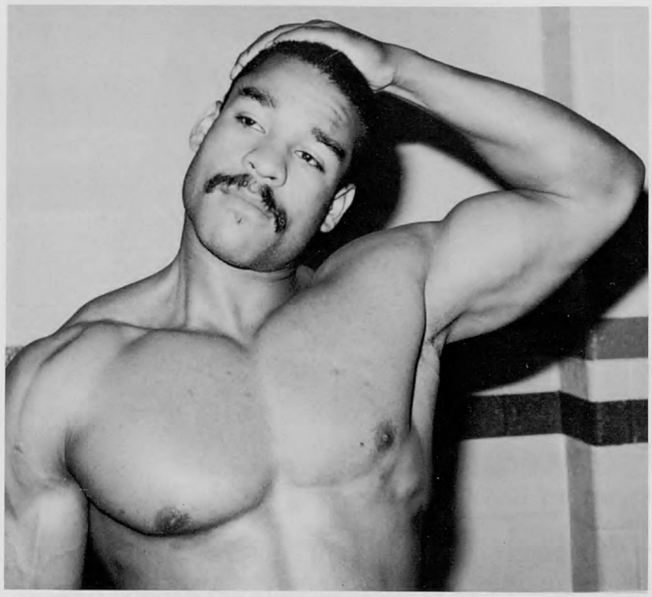


Figure 9. Neck Lateral Stretch

Deep breathing exercises: (Figure 7) The athlete is supine with the hands clasped behind the neck. To start the exercise, the elbows are brought together so they touch in front of the face. As the athlete inhales, the elbows are slowly drawn apart and lateral to the head until they touch the surface upon which the athlete is lying. The athlete then exhales as the elbows are brought back to the starting position. At least two sets of ten repetitions of this exercise should be performed.

Codman's Series: (Figure 8) This pendulum exercise should be carried out slowly. The athlete leans over at the waist and allows his arms to relax and hang freely. He then traces small circles, that slowly increase in size, in both clockwise and counterclockwise directions. Twenty-five revolutions, with or without weight, should be performed.

Neck lateral stretch: (Figure 9) The athlete stands erect with the arms at the sides. Manually he laterally flexes the neck until the ear approximates the shoulder without shrugging the shoulders. This is done for two sets of fifteen repetitions.

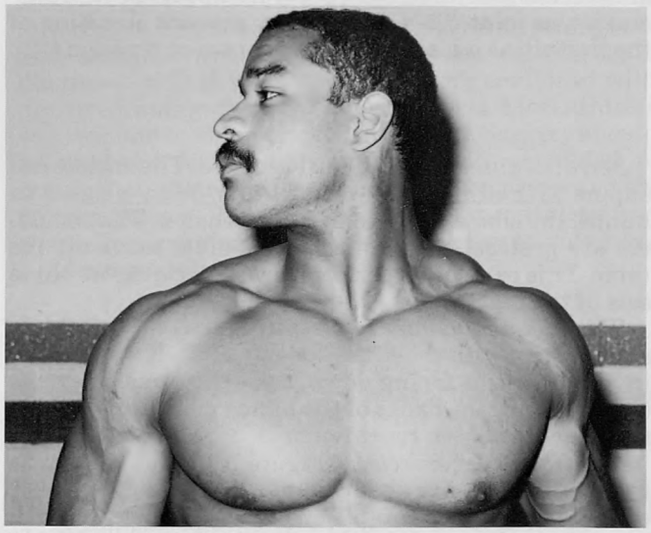


Figure 10. Neck Twist

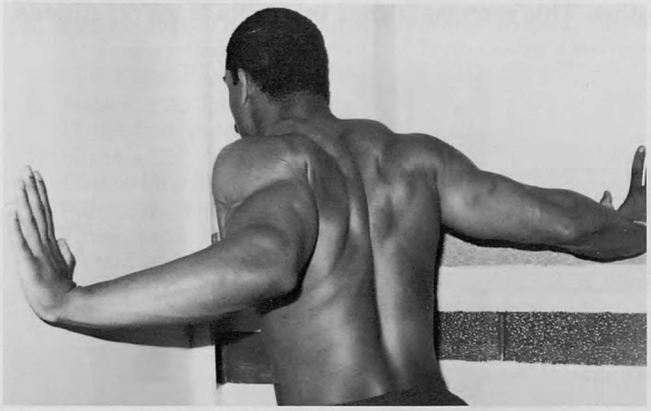


Figure 11. Pectoralis Stretching

Neck twist: (Figure 10) The athlete stands erect and attempts to touch the chin to the shoulder by rotating the head without shrugging the shoulders. This is also performed for two sets of fifteen repetitions.

Pectoralis stretching: (Figure 11) The athlete stands facing a corner of a room, leaning forward with the feet firmly planted. With the hands at shoulder level on the wall, the athlete brings the chest forward toward the corner. This is done five times, holding each time for a count of seven.

Figure 12. Scalene Stretch

Scalene stretch: (Figure 12) As the athlete is supine, the athletic trainer applies a gentle lateral neck flexion stretch away from the affected side. The affected shoulder is stabilized with pressure about the acromioclavicular joint. This stretch may prevent elevation of the first rib as a result of muscle spasm or tenstion (12).

Strength

Serratus anterior exercise: (Figure 13) The athlete lies supine with arms in forward flexion. With weights in hands, the elbows remain in full extension. The shoulders are protracted so points of shoulder move off the table. This exercise is performed with weights for three sets of ten repetitions.

Shoulder abduction exercises: (Figure 14) The athlete stands erect with the arms abducted 90°. With weights in hands, palms facing down, raise the arms sideways (abduct) until the backs of the hands meet. This is done for three sets of ten repetitions.

Mid-trapezius exercise: (Figure 15) The athlete is prone, the arms are abducted to 90°, elbows flexed 90° over the edge of the table. Weights are held in each hand. The athlete extends the elbows with arms coming off the table so that the scapulae approximate each other. This exercise is done three sets of ten repetitions.

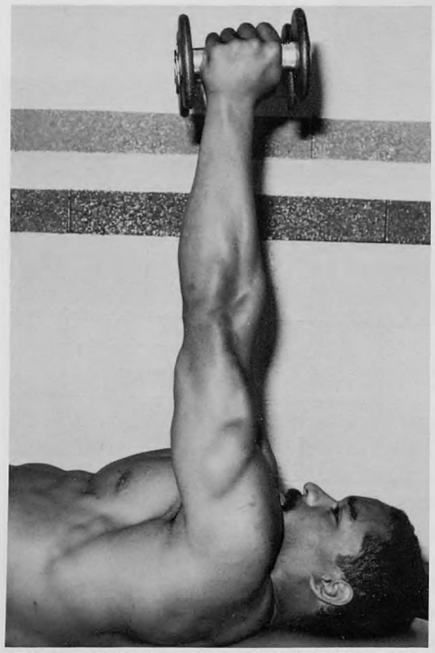


Figure 13. Serratus Anterior Exercise

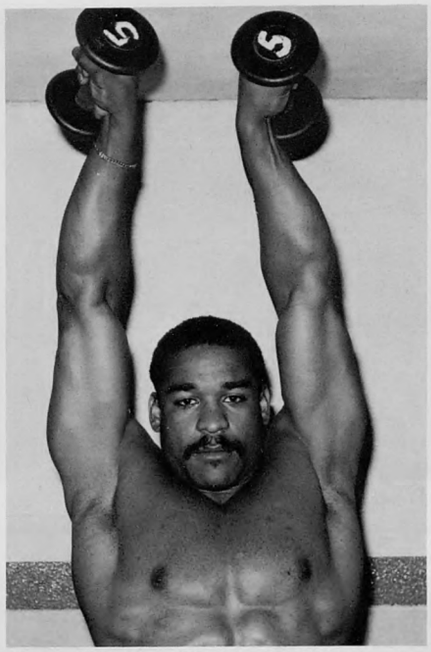


Figure 14. Shoulder Abduction Exercise

Figure 15. Mid Trapezius Exercise

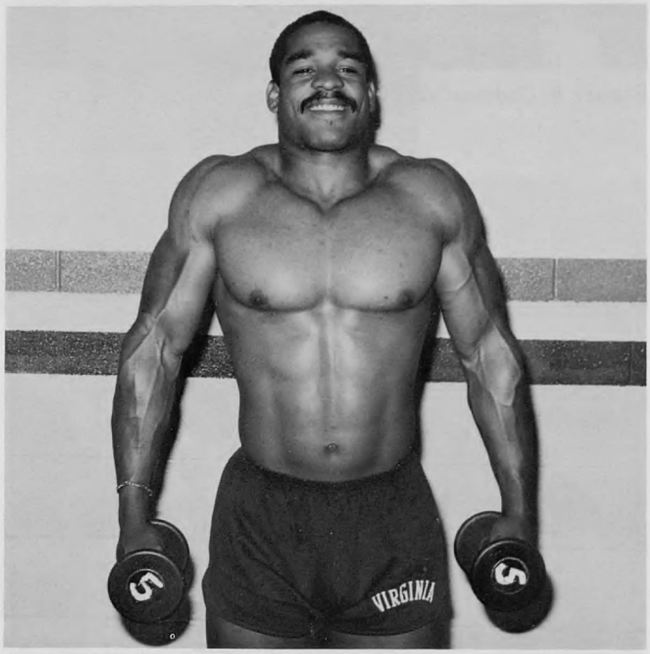


Figure 16. Shoulder Shrug

Shoulder shrug: (Figure 16) This exercise develops the upper trapezius muscle. Stand erect with arms at the sides, holding a light weight in each hand. The athlete

shrugs (elevates) the shoulders upward and forward, then backward in a rotation motion. This exercise should be done for three sets of ten repetitions for a total of thirty times. Muscle tone rather than strength is the objective.

Lower trapezius exercise: (Figure 17) The athlete is prone, the arms are extended over the head. The forearms and elbows are lifted upward in a hyperflexion position. This is done two sets of fifteen repetitions.

Erector spinae exercise: (Figure 18) The athlete lies prone with a small pillow under the abdomen. The arms are down by the sides of the body. The athlete then hyperextends the back by lifting the head, chest and shoulders off the table. This exercise is also performed two sets of fifteen repetitions. Initially, the athlete will need to start without weights and progressively move up to 1-2.5 lb. weights as strength increases, and/or when pain subsides. Ideally, the resistive exercises are performed five sets of ten repetitions. Perhaps the athlete will have to start at two sets and work up to five sets. The stretching exercises need to be done two times with fifteen repetitions each time, holding each repetition for five to seven seconds. They are to be done slowly so that the athlete gets both isometric and istonic effects. Both the strength and stretching exercises should be done daily in order to achieve optimum results. If after four to six weeks the symptoms still persist and the rehabilitation is not relieving the problem, the athlete should be referred to a physician for further diagnostic testing and treatment. Exercises that exacerbate symptoms should be modified or discontinued.

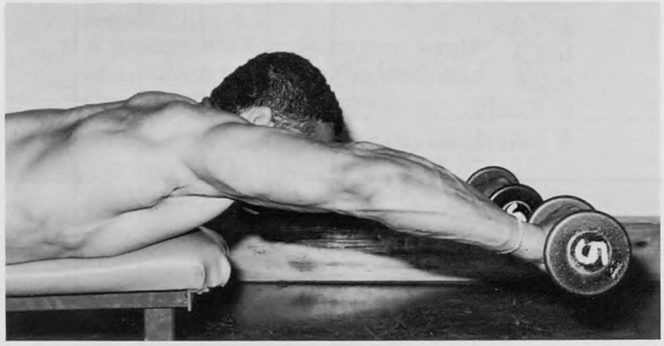


Figure 17. Lower Trapezius Exercise

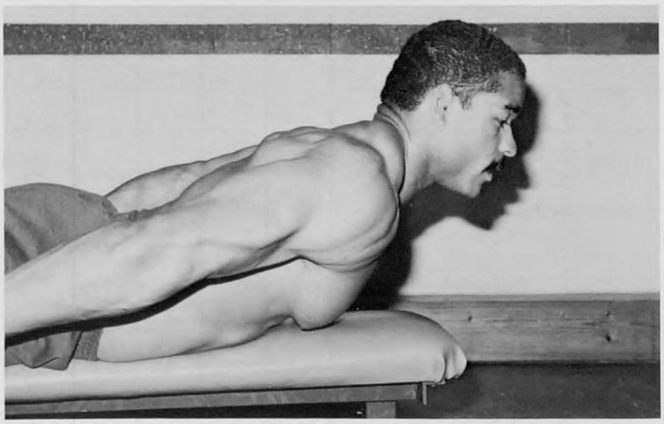


Figure 18. Erector Spinae Exercise

As the first rib may compress the neurovascular bundle between it and the clavicle, it has been suggested that mobilizing the sternoclavicular and acromioclavicular joints may be of benefit. It is also advocated that mobilizing the scapula and the first and second thoracic ribs may be of benefit in reducing symptoms (13).

Activities of Daily Living

For the rehabilitation program to be as successful as possible, the athlete has to become aware of adjustments necessary for its success. Postural awareness is important. He must maintain erect posture, avoiding the slouched shoulder, forward head position. However, the strict military posture may increase symptoms. The athlete must also avoid positions where the arms are positioned overhead. Certain weight training exercises that produce symptoms should also be avoided (13). An increase in stress levels, activities requiring heavy breathing, or sitting without the arm being supported may also result in symtomology (13). These are common sense items the athlete must be aware of.

Final Comments

Although thoracic outlet syndrome is not common in athletics, the athletic trainer should consider it in his differential diagnosis of athletes presenting arm, hand, and shoulder symptoms (2). The key to making a diagnosis of TOS is a thorough history combined with positive findings from the objective tests. Most athletes will respond to nonoperative treatment. Surgery should be reserved for those who have not responded to rehabilitation and whose symptoms are progressively getting worse. Proper education of the athlete and carefully supervised exercises are the key to obtaining good nonoperative results.

References

1. Britt LP: Nonoperative Treatment of the Thoracic Outlet Syndrome Symptoms. *Clin. Orthop* 51:45-48, 1967.
2. Coccia MR: Thoracic Outlet Syndrome. *AFP* 29(2): 121-126, Feb. 1984.
3. Dale WA, Lewis MR: Management of Thoracic Outlet Syndrome. *Ann. Surgery* 1975: 181: 575-585.
4. Haggart GE: Value of Conservative Management in Cervicobrachial Pain. *J A M A* 137:508, 1948.
5. Nelems JMB: Thoracic Outlet Syndrome. *General Thoracic Surgery Course, University of Toronto and American Coll. Chest Physicians,* May 29, 30, 1980.
6. Nelson PA: Treatment of Patients with Cervicodorsal Outlet Syndrome. *J A M A* 163: 1570-1576, 1957.
7. Nichols HM: Anatomic Structures of the Thoracic Outlet. *Clin Orthop* 51: 17-25, 1967.
8. Peet RW: Thoracic Outlet Syndrome: Evaluation of Therapeutic Exercise Programs. *Staff meeting of the Mayo Clinic.* 31:9:281, 1956.
9. Riddel HD: Thoracic Outlet Syndrome: Thoracic and Vascular Aspects. *Clin Orthop* 51: 53-62, 1967.

continued on page 314

ANSWERS TO PREVIOUS CEU CREDIT QUIZ
"Knee Rehabilitation Following Anterior Cruciate Ligament"

1.	e	6.	b
2.	a	7.	b
3.	c	8.	d
4.	c	9.	e
5.	a	10.	c

CEU Credit Quiz

THORACIC OUTLET COMPRESSION SYNDROME

Fred R. Lutz, Jr., MS, ATC
Joe H. Gieck, EdD, ATC, PT

As an organization accredited for continuing medical education, the Hahnemann Medical College and Hospital certifies that this continuing education offering meets the criteria for .3 hours of prescribed CEU credit in the program of the National Athletic Trainers' Association, Inc., provided the test is used and completed as designed.

To participate in this program, read the material carefully and answer the questions in the test. Mark the answers you select by placing an X in the proper square. Then tear out the test sheet, fill in your name, address and other information, and mail with $12 for processing to: Hahnemann University, School of Continuing Education, Broad and Vine, Philadelphia, PA 19102.

The NATA National Office will be notified of all members with passing scores over 70%. CEU credit will be issued to each member's record at that time. Participation is confidential.

Questions		a	b	c	d	e
1. Throracic outlet syndrome is caused by compression involving the a. brachial plexus. b. subclavian artery. c. subclavian vein. d. a and b above e. all of the above						
2. The superior thoracic outlet is bordered by the 1. first thoracic rib laterally. 2. clavicle anteriorly. 3. spine and scapula posteriorly. 4. subclavian muscle medially.	a. 1,2,3 b. 1,3 c. 2,4 d. 4 only e. 1,2,3,4					
3. The subclavian artery may be visibly pulsating within the supraclavicular fossa when the shoulder is a. depressed. b. elevated. c. both a and b above d. none of the above						
4. Which of the following statements is/are true regarding the cervical rib? 1. They are equally as common in males and females. 2. Most commonly they are found on the right side. 3. One may rule out the presence of a cervical rib if it is not seen on x-ray. 4. It can cause compression of the subclavian artery.	a. 1,2,3 b. 1,3 c. 2,4 d. 4 only e. 1,2,3,4					
5. Common symptoms of compression of the brachial plexus include 1. coldness. 2. numbness. 3. forearm claudication. 4. hyperesthesia with pin-prick stimulation over the ulnar nerve distribution.	a. 1,2,3 b. 1,3 c. 2,4 d. 4 only e. 1,2,3,4					

Questions		a	b	c	d	e
6. TOS may be misdiagnosed as 1. angina pectoris. 2. Raynaud's phenomenon. 3. carpal tunnel syndrome. 4. herniated cervical disc	a. 1,2,3 b. 1,3 c. 2,4 d. 4 only e. 1,2,3,4					
7. In which of the following tests is the arm held in full flexion and abduction while the neck is extended?	a. the Adson maneuver b. Allen's maneuver c. the "Claudication test" d. a and b above e. all of the above					
8. Which of the following studies provides a specific indication of TOS?	a. subclavian arteriography b. phlebography c. electromyographic studies d. all of the above e. NONE of the above					
9. With full patient cooperation, conservative treatment can be expected to produce favorable results in at least 50% of patients with TOS.	a. True b. False					
10. Cervical traction is *not* indicated for the treatment of TOS.	a. True b. False					
11. Which of the following statements is/are true regarding the postural awareness exercise? 1. The heels should be one inch from the wall. 2. It is important for the relief of tension in the scalene muscles. 3. It is performed for three sets of ten repetitions. 4. A posterior tilt is performed while attempting to flatten the neck and shoulders against the wall.	a. 1,2,3 b. 1,3 c. 2,4 d. 4 only e. 1,2,3,4					
12. The objective of performing the shoulder shrug exercise is muscle a. stretch. b. strength. c. tone.						

FOR CREDIT, form must reach Hahnemann University by March 15, 1987

Name _____

Institution or Team _____

Address _____

City _____ State _____ Zip _____

Social Security Number _____

Check one

☐ certified certification number _____

☐ associate membership number _____

Please indicate below the level at which you are now working.

_____ High School _____ University

_____ Junior College _____ Sports Medicine Clinic

_____ College

Other (please specify) _____

Mail with $12 fee to:
Hahnemann University
School of Continuing Education
Broad and Vine
Philadelphia, PA 19102

If you are interested in submitting an article to be used in the Journal quiz please contact Don Kaverman. All authors of published articles will receive 1.0 CEU.

The Grief Response and Injury:
A Special Challenge for Athletes and Athletic Trainers

Peggy Pedersen, ATC, MS

The role of the athletic trainer in dealing with an injured athlete may include facilitation of grief work. By understanding the grief response and the importance of good communication skills, the athletic trainer can help the injured athlete to meet and face in a healthful manner the many cognitive, emotional and behavioral challenges that arise.

Of the many challenges that an athlete faces, one of the most difficult tests may be that of coping and recovering from an injury. Any physical impairment which prohibits active involvement in an athlete's sport, whether temporary or permanent, is cognitively, emotionally and behaviorally challenging (14).

On the cognitive level, the athlete must understand the nature of the injury, treatment protocol and prognosis for recovery. Emotionally, feelings of anxiety, uncertainty, blame, guilt, anger, hopelessness and loss of control must be worked through. In the absence of activity, behaviors that continue to promote personal growth and development must be implemented.

These adjustments are many and often the injured athlete seeks and welcomes assistance in meeting these challenges. The athletic trainer is in an excellent position to help facilitate the inevitable grief response following injury.

The Grief Response

Inherent in any irreversible loss is grief. McDaniel (12) states that grief is a process that involves separating from a significant dream which has been lost. A grief response or grief reaction is a whole syndrome of feelings that occur as a result of that separation. Although death is often used as the prototype of loss, grief is not an emotion reserved for death. The concepts and principles used in discussing grief are generally applicable to all types of loss (4). It is important to note that a grief response is not a static state or an absolute predictable series of events or emotional responses.

The literature is imbued with descriptive models of the grief response. Kubler-Ross (10) identified a five stage grief process of denial, anger, bargaining, depression, and acceptance. Bowlby (3) classified the grief reaction into the stage of protest, state of hopelessness and stage of reorganization. Brown and Stoudemine (4) presented a three phase model compiled from the works of Lindermann (11), Bowlby (2, 3), Parkes (13) and Greenblatt (6). For the purpose of this discussion, the three phase model of Brown and Stoudemine (4) will be reviewed.

Phase I in the grief reaction can be characterized by a sudden shock-like state. Initially an athlete may totally deny an injury. Other feelings soon manifest themselves such as a sense of being lost, dazed, stunned, helpless, immobilized or disorganized. Physical responses can include crying, tightness of the throat and chest, sighing respirations, abdominal emptiness and nausea.

Intense preoccupation with the injury and the resulting loss is typical of Phase II. Insomnia, fatigue, anorexia, and crying spells are commonly experienced as the athlete attempts to examine and re-examine unresolved anger, guilt or conflicts associated with the loss. Memories of the incident are often evidenced in dreams. Social isolation and introversion typify the second phase response.

The theme of Phase III is reorganization. The athlete has a resurgence of interests and return to activities. Social contacts are re-established and memories of past events involving elements of the loss can now be pleasurable.

Facilitating Grief Work

Grief work is the process of dealing with all the emotions one may encounter following a significant loss. It includes reconciliation of the validity of the loss, complete understanding of its ramifications and the often painful ordeal of detachment from the loss (4). Grief work is necessary for positive readjustment after loss. Grief that is openly and completely expressed is more likely to result in healthy readjustment (5). Health care workers may enable grief work by acting as facilitators. Through the use of appropriate verbal and nonverbal cues, facilitators help to make the grief process less difficult. Sharing with the bereaved thoughts, feelings or behaviors they might expect to experience, along with the assurance of the normalcy of these reactions, can be very helpful (16).

Research by Ben-Sira (1) suggests that readjustment to loss is independent of the severity of the loss, but seems contingent upon one's coping capabilities. He further states that one's ability to cope is largely a matter of personal perception of stressors. Facilitators may serve a vital role in expediting open expression of grief while at the same time helping to keep a realistic perspective on the loss and the events following the loss.

Facilitator Skills

The health care worker seeking to facilitate grief work must understand the basic concepts involved in a grief response and possess good interpersonal communication skills. Inherent in promoting open communication throughout the grief reaction is the assurance of non-judgemental listening in a non-threatening environment with the guarantee of confidentiality. Empathy and good listening skills cannot be overemphasized. "One of the most effective and direct ways in which we can

Ms. Pedersen is Head Athletic Trainer and Instructor of Physical Education at the University of Wisconsin-Eau Claire.

communicate empathy for another human being is in the way we listen to that person." (17). A facilitator must have the ability to comprehend the entire message the sender is attempting to convey and at the same time withhold judgement and criticism. Often this passive/supportive role is the most difficult aspect of facilitation, especially for those individuals that tend to be action/plan oriented like an athletic trainer. The following excerpt from Hospice Horizons (7) provides an excellent summary of fundamental facilitation skills.

Be Aware: Grief is a normal and necessary process.

Be There: Learn to be with a person, not to solve the problem.

Be Sensitive: Allow the pain. Learn to enter it, not to try to take it away.

Be Human: Allow expression of feelings (guilt, anger, sorrow, depression) without judgement.

Be Ready: To listen when the story is told over and over again.

Be Patient: Remember that the process of mourning takes time (7).

The Athletic Trainer as Facilitator

The athletic trainer is often in an ideal position to facilitate grief work associated with injury. The trainer not only sees the athlete on a regular basis, but is aware of the injury situation, psychological make-up of the athlete and the athlete's coping skills. Trust, confidentiality, non-judgemental listening and empathy are all traits the athletic trainer should already have established with all athletes and thus much of the communicative ground work has already been laid (8, 9).

In helping an athlete meet the cognitive, emotional and behavioral challenges an injury may present, an athletic trainer must have a warm heart and a cool head (9). Significant loss often affects the whole family and all family members' needs must be taken into consideration when assisting the process of grief work (16). In athletics, the family is the team. Thus, coaches, teammates, team physicians and athletic trainers all may be participants in the grief work. By working closely with all parties involved, the athletic trainer can help orchestrate a healthy grieving process for everyone.

One of the first tasks of the athletic trainer following an injury and the subsequent evaluation and initial management of that trauma, should be to clearly and patiently explain all facets of the injury to the athlete, his/her parents and the coaches. Treatment regimens, recovery rates and future playing potential are areas that should be openly and honestly addressed. Often the team or family physician will share in this task. This initial information can do much to alleviate feelings of fear, uncertainty, frustration and hopelessness that an athlete many times experiences. The injury situation is put into proper perspective.

Next, the athletic trainer should extend an unconditional invitation to the athlete to talk about the injury situation. This act reaches out to the athlete and gives the athlete permission to begin expression of the many emotions he/she may have been repressing or denying. The athletic trainer should be mentally prepared for the barrage of emotions that facilitation may elicit.

Denial and anger expressed by an injured athlete are commonly misunderstood. Denial is often a product of social influence. Individuals who hold up well and take loss in stride are often praised, when in reality, "holding up well" is an expression of denial. The pressure on the athlete to mask any negative feelings ("Don't bring down your teammates. Fire up.") is often tremendous. Coaches, teammates, and athletic trainers will treat an athlete differently after injury, oftentimes quickly expressing sympathy and then avoiding all mention of the athlete's sport as though it no longer exists in the mind of the injured athlete. Frequently the thing the athlete wants most is to engage or be included in dialogues about sport. Denial practiced by coaches, teammates, and athletic trainers can make it much more difficult for an athlete to openly express feelings. Athletic trainers can be guilty of encouraging such spartan behavior if they feel uncomfortable or inadequate in dealing with the athlete's true emotions regarding the injury. The athletic trainer involved in facilitation must be willing and able to deal with athlete's emotions as they naturally occur.

Anger is an emotion that is very typically vented during a grief response and is also typically misunderstood. Expressions of anger can be directed at athletic trainers, coaches, teammates and family members. Anger can be vented verbally, or in many cases the anger is acted out by breaking training rules or being disruptive at practice or in the classroom. Statements made in anger must be taken for what they are: demonstrations of hurt and rage from a significant loss. They should not be interpreted as personal insults resulting in shouting matches or as evidence of poor character. Athletes who choose to act our their anger through dangerous, harmful, or illegal means must be counseled by a concerned individual, not blatently told to shape up and then ignored.

Bargaining between player and athletic trainer also frequently takes place during the course of an injury and the subsequent grief response. The injured athlete wants to make a deal. If the loss seems too great, the athlete will attempt to soften the blow by guaranteeing good behavior or extra rehabilitation work in hopes of being able to compete or practice as soon as possible. This is a difficult time for the athletic trainer as emotions often run high. Sound decisions must be made based on objective information, and the health of the athlete must, as always, be foremost in the decision making process.

As the emotional shock-like state ends, the athlete tends to move into a state of isolation and withdrawal. At this time, the athletic trainer can best serve as an empathetic listener, allowing the athlete the needed solitude. The athletic trainer should avoid the pitfall of trying to cheer up the athlete or encourage him or her to hurry up and get over the depressive state. Again, the facilitator must realize and accept that it is alright for the athlete to be sad or disappointed or depressed. These feelings are valid and very real. Quiet support and time will best help the athlete through this difficult period.

Finally, the time will come when the athlete realizes that the injury is real and the loss (whether missing a few days of practice or an entire season) is permanent. The athletic trainer can help avoid compounding the loss by making appropriate contacts to keep the athlete involved in aspects of his/her sport that are not affected by the injury. Do not alienate the athlete from the team (family). Some suggestions for maintaining team contact include inviting the sidelined athlete to attend practices, team meetings and contests, scout area teams, or keep statistics. Some injured athletes are capable of offering playing tips and support to inexperienced substitutes forced into action (15). These activities can do much to maintain the family unit (team) inclusive of the injured athlete. An injured athlete may reject all contact with the team outside of actually playing again, but it is important to make the invitation to stay

involved. The invitation must be sincere and the tasks performed by the sidelined athlete must not be looked upon as demeaning or degrading. Finally, the athletic trainer can assist the athlete by recognizing and acknowledging accomplishments of the athlete outside of his/her athletic endeavors. This can do much to keep the loss of the athlete's sport participation in perspective and encourage the development of new "family ties" (18).

Conclusion

Injury to an athlete often results in many cognitive, emotional and behavioral challenges associated with grief work. An educated, sensitive athletic trainer is in an excellent position to facilitate open and healthful expression of emotions following loss. This ultimately can lead to complete physical, psychological and emotional well-being for the athlete.

References

1. Ben-Sira Z: Loss, stress and readjustment: the structure of coping with bereavement and disability. *Social Science and Medicine* 17(21): 1619-1632, 1983.
2. Bowlby J: Pathological mourning and childhood mourning. *J Am Psychoanal Assoc* 11: 500-541, 1963.
3. Bowlby J: Process of mourning. *International Journal of Psychoanalysis* 42: 315-340, 1961.
4. Brown TJ, Stoudemine AG: Normal and pathological grief. *JAMA* 250(3): 378-382, 1983.
5. Coping with grief. *Lancet* 1 (8228): 1036, 1981.
6. Greenblatt M: The grieving spouse. Am J Psychiatry 135: 43-47, 1978.
7. Helping a friend in grief. *Hospice Horizons* 1(3):1, 1984.
8. Kane B: Trainer counseling to avoid three face-saving maneuvers. *Athletic Training* 18 (3): 171-174, 1984.
9. Kane B: Trainer in a counseling role. *Athletic Training* 17 (3): 167-8, 1982.
10. Kubler-Ross E: *On Death and Dying*. London, MacMillan LTD, 1969.
11. Lindemann E: Symptomatology and management of acute grief. *Am J Psychiatry* 101: 141-148, 1944.
12. McDaniel CG: Facilitate, don't thwart, the grieving process. *JAMA* 247 (6)736-737, 1982.
13. Parkes CM: The first year of bereavement. *Psychiatry* 33: 444-467, 1970.
14. Sargent JA: The sick child and the family. *The Journal of Pediatrics* 102 (6): 982-987, 1983.
15. Sciera J: Helping athletes cope with emotional pain. *The First Aider* 53 (1): 12-13, 1983.
16. Schulman JL, Rehm JL: Assisting the bereaved. *The Journal of Pediatrics* 102 (6): 992-998, 1983.
17. Tubbs SL, Moss S: *Human Communication*. 2nd edition. New York, Random House, Inc. 1977 p. 146.
18. Wehlage DF: Managing the emotional reaction to loss in athletics. *Athletic Training* 15: (3) 144-146, 1980. ⊕

CEU - Thoracic Outlet *from page 309*

10. Roy S, Irvin R: *Sportsmedicine. Prevention, Evaluation, Management, and Rehabilitation.* N.J. Prentice Hall Inc., 189-191, 1983.
11. Sessions RT: Recurrent Thoracic Outlet Syndrome. *Southern Medical Journal* 75 (12): 1453-1461, 1982.
12. Simonet MD et al.: Diagnosis and Treatment of Thoracic Outlet Syndrome. *Minnesota Medicine* Jan.
13. Smith KF: The Thoracic Outlet Syndrome: A Protocol of Treatment. *The Journal of Orthopaedic Sports Physical Therapy* 1 (2) Fall, 1979. 89-99.
14. Strukel JR, Garrick JG: Thoracic Outlet Compression in Athletes. A report of four cases. *Am. Journal of Sports Medicine* 6: 35-39, 1978.
15. Tyson RR, Kaplon GF: Modern Concepts of Diagnosis and Treatment of the Thoracic Outlet Syndrome. *Orthop. Clinic of North America* 6: 507, 1975.
16. Urschel HC: Objective Diagnosis and Current Treatment of Thoracic Outlet Syndrome. *Ann Thoracic Surgery* 12:6:608, 1971. ⊕

NATIONAL ATHLETIC TRAINERS' ASSOCIATION

N A A T

* 1950 *

A Comparison of Two Progressive Weight Training Techniques on Knee Extensor Strength

Bert H. Jacobson, EdD

Forty-five college-age males were randomly divided into three equal groups to compare the effects of two types of isotonic progressive weight training on the strength of a pre-selected joint movement. One group was assigned a commonly employed weight training program involving a minimum of three sets of six repetitions at a progressively altered increment of 80%-85% 1MR. A second group employed a relatively new mode of weight training labeled manual resistance (MR). MR involved only one set at 60%-65% 1MR executed to near failure not only in the concentric phase but also in the eccentric phase of isotonic lifting. The resistance phase (eccentric) was further supplemented with an additional load in the form of manual application in conjunction with the current weight placed on the apparatus. A third group served as a control. Results indicated a significant gain ($p < .05$) in strength by the MSPIR group and the MR group over that of the control group. However, no significant difference in strength gain between the two experimental groups was demonstrated. If one set of MR is as beneficial in producing strength gains as a program involving multiple sets, this technique could save a great deal of time in strength development.

The quest to enhance physical performance has led to very specific and multifaceted modes of training. Through constant search, researchers have improved the methods and techniques used to enhance fitness levels and athletic prowess (1, 12, 16, 24). Unfortunately, isotonic strength development techniques, unlike cardiovascular development, have not shared the same scientifically based specificity and are subject to a wide variety of speculation with regard to specific sets, repetitions and rest periods. Although strength is a highly valued commodity in sports and activity, virtually no two strength programs employ identical systems of strength development due to lack of knowledge regarding specific work loads, intensity, sets, repetitions, and rest durations.

It is believed that muscular strength is perhaps the most important of all factors for a better-than-average proficiency in sports (5, 6, 9, 10, 19). Virtually every major college, professional, and even high school athletic organization devotes some of its preparation time to weight training. Indeed, most major colleges and professional teams now employ professional, full-time strength and conditioning coaches. Unfortunately, athletes are not afforded the luxury of unlimited time devoted to weight training. The typical athlete's day is compounded by meetings, practice, film sessions, and school work. Subsequently, the time allowed for weight training is condensed to the point that rarely a total or full-body work-out ensues. Typically, most programs employ split work-outs by dividing one total work-out into two separate work-outs done on alternate days. This adds to the time problem by demanding a minimum of four days per week in the weight room so that each muscle group may be worked twice.

Strength gains normally occur through inducement of tension of the skeletal muscle (11). This inducement of tension must be greater than normal daily-incurred stress in order to increase strength (20). This higher level of stress is commonly referred to as the overload principle and is the universally accepted method for muscle strength development (2, 17, 23).

The overload principle may take the form of any of the following applications: isometric, isotonic, or isokinetic. All of these modes have been proven to increase strength but the most popular method, due to its versatility and high rate of strength increases, is the isotonic mode of training (1). This investigation employed isotonic weight training since a vast amount of available research supports the fact that isotonic resistance exercises will significantly increase muscular strength over other forms of training (7, 15, 25, 26).

Recently, a new mode of isotonic resistance training has evolved using only one set of repetitions to the point of absolute failure in the concentric phase and near failure in the eccentric phase in an isotonic exercise (22). Simply stated, this suggests additional resistance applied by a partner during the stronger eccentric phase and partner assistance subsequent to failure to complete the concentric phase. Thus, the exercise is continued past concentric failure to the point in which the subject can no longer resist (concentrically) the existing weight. This implies greater fiber recruitment and fatigue in the exercised muscle group. Traditionally, several sets are required for each muscle group and only fatigue or failure in the concentric phase is common with multiple set isotonic work.

Method

This study involved two forms of progressive isotonic resistance training techniques. One commonly employed and proven method incorporated three sets of six to eight repetitions at load increments of 80% 1 maximum repetition (1MR). According to Berger (3, 4, 5) this specific amount of sets, repetitions, and percentage will significantly increase strength. The other method, called manual resistance (MR), employs a single set of eight

Dr. Jacobson is an Assistant Professor in charge of biomechanics, kinesiology, anatomy, and mechanical analysis of human motion at Oklahoma State University, Stillwater, Oklahoma. Prior to his appointment he spent seven years as assistant football coach and strength and conditioning coordinator at Oklahoma State University and the USFL.

to twelve repetitions to complete failure in both the concentric and eccentric phase of the exercise (21). If shown to significantly increase muscle strength, the latter of these two methods, which requires only one set (22) and less than half the time of the first system, would be extremely advantageous to the time-conscious coach or athlete.

The manual resistance (MR) technique has only been in use since the seventies when Riley (21) introduced the system as an extended phase of weight training for the athletes at Pennsylvania State University. However, the manual resistance (MR) system has yet to be tested and compared to the multiple set progressive isotonic resistance (MSPIR) technique commonly used. Unlike that of the multiple set progressive isotonic resistance (MSPIR), manual resistance (MR) employes a partner to supply added force in addition to the weight by pushing on the bar or weight training apparatus during the eccentric phase of the exercise. This added (partner) resistance must be adequately applied so that the subject is brought down in the eccentric phase within 3-4 seconds. During the 3-4 seconds of the eccentric phase the subject must exert maximal effort. Subsequently the partner releases the existing weight (normally about 60%-65% 1 maximum repetition [1 MR]) so that the subject moves the weight independently during the concentric phase. As the exercise nears completion the partner must assist the subject through the last 3-4 concentric contractions to assure the desired eccentric failure. An important criterion of the manual resistance (MR) technique is that concentric muscle failure should occur between the subject's sixth and eighth repetition and eccentric muscle failure between his eighth and twelth repetition. Theoretically, increased muscular stress demands the use of a greater percentage of muscle fibers (18); that is, adaptation to the stress is proportional to the number of muscle fibers recruited to fatigue. Manual resistance (MR) insures greater muscle fiber recruitment since the exercise is continued beyond concentric failure and into the initial stages of eccentric failure.

The purpose of this study was to compare post-test means of strength gain of the multiple set progressive isotonic resistance (MSPIR) training group to the post-test means of manual resistance (MR) training, and to determine if there was significant difference in strength between the two groups after the training period.

Both isometric and isotonic strength was measured and compared before and after the treatment period. Isometric strength was measured with a cable tensiometer and labeled TEN. Research has established that the mean maximum isometric torque of knee extensors is greater at 60 degrees of knee flexion than at either 30 or 45 degrees (14). However, during isokinetic extension, the greatest amount of torque generated by the knee extensors is at 45 degrees of flexion (13). Since isotonic strength was the desirable outcome of this study, the experimenter selected an angle of 45 degrees as a constant for isometric tensiometer (TEN) testing.

The subject was positioned so that his knee joint advanced to a predetermined location on the testing apparatus, allowing the subject's knee to reach a 45 degree angle. By determining the angle of each subject's knee with a goniometer, a 45 degree angle could be maintained consistently throughout each trial. All subjects completed three trials with 120 second rest periods between each trial. The resultant data on the cable tensiometer gauge was read and recorded after each trial.

A Nautilus® Leg Extension machine was utilized for isotonic (ISOT) strength measurements. The backrest was adjusted for each subject so that the knee joint reached a specific location on the testing apparatus. This position was recorded for each subject so that the corresponding position could be used for all testing and training sessions.

By following McArdle's (11) directions, the subject's single maximum isotonic strength was established. A suitable starting weight, close to but below the subject's estimated maximum lifting capacity, was selected. If one repetition was completed, the experimenter added weight to the apparatus until the subject reached his maximum capacity. Both legs were tested but only the dominant leg was recorded.

Procedure

Forty-five college-aged males were randomly divided into three equal groups, two serving as experimental groups and one as a control. All subjects were individuals who had limited (1-2 years) weight training experience and who were willing to abide by the provisions of the experiment.

Training consisted of three times per week on alternate days for a duration of ten weeks. A Nautilus® Leg Extension machine was used in both the exercise prescription and measurement of knee extension.

Pre- and post-strength was measured by two devices: A cable tensiometer measured isometric strength at a specific joint angle, and a Nautilus® Leg Extension machine was used to measure isotonic strength. However, smaller weights, other than those already present on the machine, were added so that the subjects could add or delete the weight in 2.5 lb. increments.

All tests were recorded on a pre-test and post-test format at a ten-week training period interval. The subjects were also tested at two week intervals for maximum isotonic strength gains, so that the subjects could establish new maximum strength levels in order to exercise within their specific percentages.

The group of subjects labeled "MR" (manual resistance) were to execute the manual resistance training program. Following the suggested manual resistance (MR) training criteria, the subjects performed only one set of the exercise. Each subject utilized a 60% to 65% weight load based on his individual 1 maximum repetition (1MR) and adjusted his percentage load every two weeks as progressive strength gains demanded in order to adhere to a newly established 1 maximum repetition (1MR). As the subjects progressively increased their maximum strength loads, the training loads also increased to maintain their 60% to 65% training load during all workout sessions. All assisted eccentric phases of the lift were performed at a constant rate of 3 to 4 seconds with the subject's calculated percent of load.

The multiple set progressive isotonic resistance (MSPIR) group performed three sets of six repetitions on the Nautilus® Leg Extension machine. Each of the subjects calculated his workload of 80% to 85% of his 1 maximum repetition (1MR) prior to the initial training session. In order to perform the multiple set progressive isotonic resistance (MSPIR) training technique correctly, each subject had to be able to execute a minimum of two sets for the required six repetitions. It was suggested that the subject reach concentric muscle failure on the fourth, fifth, or sixth repetition. If the subject did not fail within the specified number of repetitions on the third set, then he was to increase his training load. All subjects executed all three sets of the prescribed exercise with a 90 second rest interval between sets.

TABLE I
Total Group Responses - Pre- and Post-Test

Variable	N	X	S.D.	MIN.	MAX.
Pre ISOT	45	61.01	14.39	35.0	95.0
Post ISOT (lbs)	45	75.83	18.66	37.0	120.0
Pre TEN	45	67.311	9.77	50.0	91
Post TEN (F.U.)	45	70.88	9.90	52.0	92

TABLE II
Means For ISOT Strength Test By Groups (lbs)

GROUP	N	PRE	POST	CHANGE
MR	15	61.17	80.67	19.50
MSPIR	15	61.67	85.83	24.16
C	15	61.53	61.00	-.53

TABLE III
Means For TEN. Strength Test By Groups (F.U.)

GROUP	N	PRE	POST	CHANGE
MR	15	67.60	72.73	5.13
MSPIR	15	67.07	72.20	5.13
C	15	67.27	67.73	.46

TABLE IV
Analysis of Co-Variance By Group Post-Test

Variable	Sum of Squares	DF	Mean Square	F-Value
Post-ISOT	5165.039	2	2582.520	*51.625
Post-TEN	218.198	2	109.099	*10.482

*significant at the .05 level

TABLE V
Matrix T-Analysis for Post-Test ISOT

	MR	MSPIR	C
MR		p=.0770	p=.0001*
MSPIR	p=.0770		p=.0001*
C	p=.0001*	p=.0001*	

*significant at the .05 level

TABLE VI
Matrix T-Analysis for Post-Test TEN

	MR	MSPIR	C
MR		p=.9762	p=.0003*
MSPIR	p=.9762		p=.0003*
C	p=.0003*	p=.0003*	

*significant at the .05 level

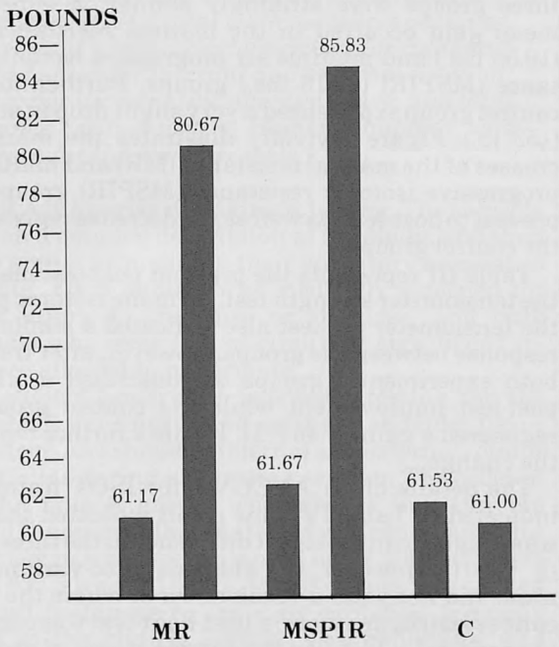


Figure 1. Pre- and Post-Test Means For ISOT Test

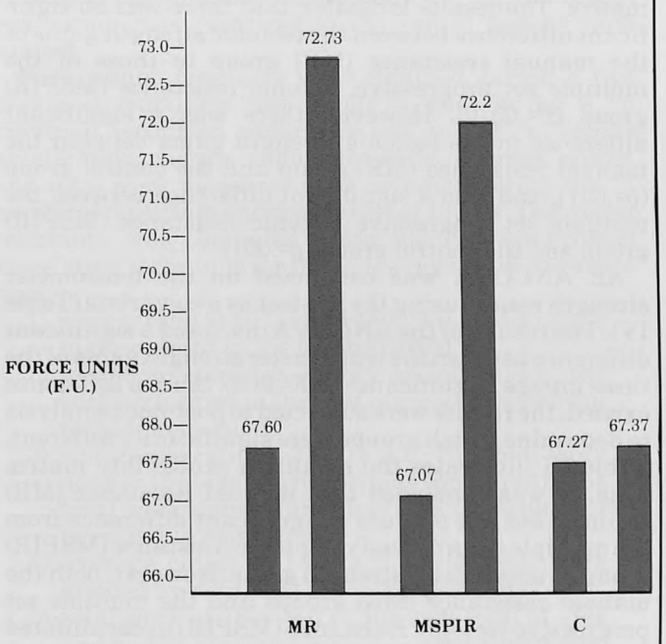


Figure 2. Pre- and Post-Test Means for TENS Test

Results

Analyses of covariance (ANCOVA) were calculated on both variables for each of the three groups. Isotonic (ISOT) strength was measured in pounds, and isometric strength (TEN) in force units (FU). The .05 level of significance was chosen as the standard of confidence.

Means, standard deviation, and maximum and minimum scores for each group's pre- and post-test on each variable are displayed in Table I. Table II and III present pre- and post-test means for each variable (ISOT, TEN), as well as the differences between and pre- and post-tests for each group. Figures 1-2 illustrate the differences between pre- and post-tests for each group.

Table II displays the pre- and post-test means for the isotonic strength test conducted on the Nautilus® Leg Extension machine. Although the pre-test means for all three groups were strikingly similar, a substantial mean gain occurred in the manual resistance (MR) (19.50 lbs.) and multiple set progressive isotonic resistance (MSPIR) (24.16 lbs.) groups. Furthermore, the control group experienced a very slight drop in strength (-.53 lb.). Figure 1 vividly illustrates the marked increases of the manual resistance (MR) and multiple set progressive isotonic resistance (MSPIR) groups from pre-test to post-test, as well as the decrease registered by the control group.

Table III represents the pre- and post-test means for the tensiometer strength test. As in the isotonic pre-test, the tensiometer pre-test also indicated a similar mean response between the groups. However, after treatment both experimental groups demonstrated a 5.13 F.U. post-test improvement while the control group only registered a gain of .46 F.U. Figure 2 further represents the change.

The details of an ANCOVA for ISOT training are indicated in Table IV. This result indicated that there was a significant post-test difference in the three groups ($P < .001$). However, the analysis of co-variance technique did not yield a break-down of where the significance existed; therefore, a post-hoc t-test was conducted to specifically identify the combinations of group and variable results. Table V presents the results of an augmented t-test analysis in the form of a probability matrix. The results indicated that there was no significant difference between the isotonic strength gains of the manual resistance (MR) group to those of the multiple set progressive isotonic resistance (MSPIR) group ($P=.0070$). However, there was a significant difference in the isotonic strength gains between the manual resistance (MR) group and the control group ($p=.001$), and also a significant difference between the multiple set progressive isotonic resistance (MSPIR) group and the control group ($p=.001$).

An ANCOVA was conducted on the tensiometer strength results using the pre-test as a co-variate (Table IV). The results of the ANCOVA disclosed a significant difference between the tensiometer strength gains of the three groups (significance of $F=.000$). Since a difference existed, the results were subjected to post-hoc t-analysis to determine which groups were significantly different. Table VI illustrates the results in probability matrix form. It was concluded that manual resistance (MR) training did not produce a significant difference from the multiple set progressive isotonic resistance (MSPIR) group in tensiometer strength gains. However, both the manual resistance (MR) groups and the multiple set progressive isotonic resistance (MSPIR) group differed significantly from the control group in tensiometer strength gains ($p > .05$).

Conclusions and Recommendations

Although weight training has become a popular method of increasing the potential for physical performance and to reduce severity of injuries, the quantity of time needed to support a quality program frequently inhibits full work-outs and total emphasis of all joints.

Traditionally all isotonic exercises have employed multiple sets as the training mode. The disadvantage of this training mode is that it is extremely time consuming in the event that several muscle groups are to be exercised. Manual resistance (MR), which utilizes a single set for each exercise, can be performed in less than half the time of the traditional multiple-set exercise. The results of this study indicated that manual resistance (MR) training produced nearly identical results as the multiple set progressive isotonic resistance (MSPIR) training. Consequently, strength gains through manual resistance (MR) training are achievable at the same rate as the time consuming multiple set training techniques in a fraction of the time. This discovery could be beneficial to those individuals involved in organized sports who have but a short period of time to train. Coaches and trainers could greatly benefit from utilizing manual resistance (MR) training during the regular season to save time. One problem, however, that may occur is the participant's motivation to train at this high level of intensity. Manual resistance (MR) training is extremely strenuous and intense exercise; therefore, the participant must be willing to cope with this intensity during each training bout.

It should be noted that further studies are needed to determine the effect of manual resistance on trained athletes, and to resolve if experienced lifters could equally benefit from the technique. Furthermore, manual resistance (MR) may be utilized in the physical rehabilitation area. Use of manual resistance (MR) as a rehabilitation technique may be desirable; however, further research is needed before it can be recommended. Additionally, it should be noted that manual resistance (MR) may be utilized in those circumstances and situations where sophisticated and highly expensive equipment is unaffordable.

References

1. Allen TE, Byrd RJ, Smith DP: Hemodynamic Consequences of Circuit Weight Training. *Research Quarterly* 47: 229-306, 1976.
2. Benford G: Developing Running Speed in Athletics through Strength Training. *National Strength Coaches Association Journal* 2(4): 24-26, 1980.
3. Berger RA: Effects of Varied Weight Training and Various Dynamic Training Programs. *Research Quarterly* 33:637, 1962.
4. Berger RA: Comparison Between Static Training and Various Dynamic Training Programs. *Research Quarterly* 33:637, 1962.
5. Berger RA: Optimum Repetitions for the Development of Strength. *Research Quarterly* 33: 334, 1962.
6. DeVries HA: *Physiology of Exercise for Physical Education and Athletics.* Dubuque, Iowa: Wm C Brown Co. 1974.
7. Gettman LR, Ayres JJ, Pollock ML, Jackson A: The Effect of Circuit Training on Strength, Cardiorespiratory Function, and Body Composition of Adult Men. *Medicine and Science in Sports* 10: 171-176, 1978.
8. Jacobson B: *Strength Training For Football: The Oklahoma State Way.* West Point, NY: Leisure Press. 1981.
9. Karpovich PV: *Physiology of Muscular Activity.* Philadelphia, PA: WB Saunders Co. 1973

contined on page 390

Reliability of Isokinetic Measures

David H. Perrin, PhD, ATC

Isokinetic resistance is frequently used to strength profile healthy athletes and to evaluate the status of injured athletes involved in rehabilitation programs. The purpose of this investigation was to determine the reliability of peak torque, torque acceleration energy, endurance ratio, average power, and total work measures obtained with a Cybex isokinetic dynamometer. Fifteen college students underwent a test - retest procedure for right and left knee flexion and extension, shoulder flexion and extension, and shoulder internal and external rotation. Highest reliability coefficients were found for peak torque, torque acceleration energy, average power, and total work measures. Lower coefficients were observed for the endurance ratio measure. Higher reliability was generally observed for the knee extension/flexion test procedure than for the shoulder tests.

Since the use of isokinetic exercise by Hislop and Perrine (5), Moffroid et al. (10), and Thistle et al. (15), the procedure has received increasing interest in sports medicine research and clinical practice. Its usefulness in research has included examination of the relationship of muscle strength to fiber type and metabolic enzyme activity (16), the effects of training and performance on muscular strength and endurance (7), the influence of limb speed on torque production (12), and the relationship of peak torque to age, sex, performance, and body weight (9, 13). In the clinical setting, isokinetic exercise is used to evaluate the effectiveness of physical rehabilitation and to provide progressive resistance exercise therapy (3, 4).

Most clinicians assume that isokinetic dynamometers provide reliable measures of strength, power, and endurance. While some research has proven the reliability of torque measures (1, 6, 10, 11), little attention has been devoted to the reliability of power and endurance measures.

The development of a computer[1] interface with the Cybex apparatus has enabled the precise and rapid isokinetic measurement of peak torque, angle of occurrence of peak torque, average power, total work, torque acceleration energy, and endurance ratio (14). Barbee and Landis (2) assessed the reliability of some of these computer obtained measurements and reported coefficients of r = .91 to .97 for peak torque, r = .86 to .95 for power, r = .85 to .97 for total work, and r = .13 to .27 for torque acceleration energy.

The purpose of this investigation was to examine the reliability of peak torque, torque acceleration energy, endurance ratio, average power, and total work measures obtained with a Cybex isokinetic dynamometer interfaced with a Cybex Data Reduction Computer.

Methodology

Fifteen male college students participated as subjects in the study (mean age = 20.53 yrs, weight = 73.56 kg, height = 177.30 cm). Each subject received information regarding the testing protocol and was informed of the comparitively low risk of isokinetic testing. The subjects were given a detailed description of the study, and then asked to sign a form giving their voluntary consent to participate. Each subject was medically screened for previous injury to the knee or shoulder, and only individuals who were free of clinically significant injuries were allowed to participate.

Each subject underwent isokinetic testing for the right and left knee flexor and extensor, shoulder flexor and extensor, and shoulder internal and external rotator muscle groups during one testing session. The order of testing for muscle groups was selected in a random order and the order of the side tested was randomized for each subject in a counter-balanced order. Subjects were tested at 60°/s and at 180°/s. The slow speed was tested first in all instances to replicate protocols typically followed in the clinical setting. Test reliability was determined by repeating the complete test protocol one week following initial testing. The testing order of muscle group and side of the body during the repeat evaluation was identical to the initial test of each subject.

Peak torque measures were obtained during a five maximal repetition test at 60°/s and during a 25 maximal repetition endurance test at 180°/s. Torque acceleration energy, endurance ratio, average power, and total work measures were obtained during the 25 maximal repetition endurance test at 180°/s. Test-retest reliability was computed using the Pearson-Product correlation technique for the following isokinetic measures:

1) peak torque at 60°/s and 180°/s (i.e., the single highest point in the torque curve)
2) torque acceleration energy at 180°/s (i.e., the cork performed in the first one-eighth second of torque production)
3) endurance ratio at 180°/s (i.e., the total work done in the last five repetitions compared to the total work done in the first five repetitions of twenty-five repetitions)
4) average power at 180°/s (i.e., the total work divided by actual total contraction time)
5) total work at 180°/s (i.e., the sum total of area under all the torque curves in the test repetitions)

Dr Perrin is Director of Graduate Athletic Training Education and Assistant Professor, Department of Health and Physical Education, University of Virginia, Charlottesville, Virginia.

[1]Cybex Data Reduction Computer, Cybex, A Division of Lumex, Inc.

Table 1
Test Protocol

APPARATUS PREPARATION
AND SUBJECT ORIENTATION

WARM-UP AT 60°/s
3 SUBMAXIMAL REPETITIONS
3 MAXIMAL REPETITIONS

1 MINUTE REST

5 MAXIMAL REPETITIONS
AT 60°/s

2 MINUTE REST

WARM-UP 180°/s
3 SUBMAXIMAL REPETITIONS
3 MAXIMAL REPETITIONS

1 MINUTE REST

25 MAXIMAL REPETITIONS
AT 180°/s

MINIMUM OF 2 MINUTES
REST PRIOR TO TESTING OF
BILATERAL MOVEMENT OR OTHER JOINT

Table 3
Test-Retest Reliability for the Sample Repetitions During the Endurance Ratio Measurement

Movement Tested	First Five r	Last Five r
Knee Extension	.88	.78
Knee Flexion	.89	.85
Shoulder Extension	.83	.85
Shoulder Flexion	.77	.60
Shoulder Internal Rotation	.80	.75
Shoulder External Rotation	.91	.69

Table 2
Test - Retest Reliability Coefficients

Movement	Peak Torque		Endurance Ratio		TAE		Average Power		Total Work	
	left r	right r	left r	right r	left r	right r	left r	right r	left r	right r
Knee Extension 60°/s	.84	.85								
Knee Extension 180°/s	.93	.87	.41	.62	.83	.86	.94	.90	.91	.91
Knee Flexion 60°/s	.83	.92								
Knee Flexion 180°/s	.88	.89	.45	.21	.79	.70	.95	.90	.94	.96
Shoulder Extension 60°/s	.95	.92								
Shoulder Extension 180°/s	.85	.87	.63	.62	.85	.93	.88	.88	.87	.87
Shoulder Flexion 60°/s	.84	.91								
Shoulder Flexion 180°/s	.75	.77	.28	.14	.73	.85	.78	.73	.72	.79
Shoulder Internal Rotation 60°/s	.86	.92								
Shoulder Internal Rotation 180°/s	.74	.84	.57	.19	.82	.80	.81	.90	.80	.92
Shoulder External Rotation 60°/s	.91	.93								
Shoulder External Rotation 180°/s	.91	.88	.80	.64	.93	.84	.81	.87	.83	.89

Table 4
Range of Test-Retest Reliability Coefficients for Each Isokinetic Procedure

	Peak Torque r	TAE r	Endurance Ratio r	Average Power r	Total Work r
Knee Extension and Flexion	.83-.93	.70-.86	.21-.62	.90-.95	.91-.96
Shoulder Extension and Flexion	.75-.95	.73-.93	.14-.63	.73-.88	.72-.87
Shoulder Internal and External Rotation	.74-.93	.80-.93	.19-.80	.81-.90	.80-.92

Bilateral strength was measured with a Cybex II Isokinetic Dynamometer equipped with an Upper-Body Exercise and Testing Table (U.B.X.T.). The Cybex II dual channel recorder and dynamometer were interfaced with the Cybex Data Reduction Computer (C.D.R.C.) for analysis of test results. The Cybex II and C.D.R.C. were calibrated prior to the period of testing.

Subjects were stabilized with straps during testing, and the joint's axis of rotation was aligned with the input shaft of the dynamometer. To provide gravity correction during knee testing, the gravitational moment of the Cybex arm, shank, and the leg (including shoe) was determined by the C.D.R.C. (17). The length of Cybex accessories and the position of pads was noted to ensure replication during re-testing. The gravity correction obtained during the initial test was entered into the C.D.R.C. during the re-test procedure.

Each subject was verbally oriented to the fixed speed, accommodating resistance concept of isokinetic testing. After setting the apparatus for the appropriate joint, each subject followed a consistent test protocol (8) (Table 1). Verbal encouragement was provided during the test procedure to facilitate maximal effort.

Results

The lowest reliability coefficients in this investigation were observed for the endurance ratio measures, and ranged from r = .14 for right shoulder flexion to r = .80 for left shoulder external rotation (Table 2). Endurance ratio is a calculation of two total work samples. To determine if a difference existed in reliability between the first and the last sample of repetitions, reliability coefficients were computed separately for the total work performed in the first sample and in the last sample repetitions (Table 3). Reliability coefficients ranged from r = .77 to .91 for the first samples and r = .60 to .85 for the last samples.

Higher reliability coefficients were observed for peak torque, torque acceleration energy (TAE), average power, and total work. Peak torque reliability coefficients ranged from r = .74 for left shoulder internal rotation at 180°/s to r = .95 for left shoulder extension at 60°/s (Table 2). Coefficients for TAE ranged from r = .70 for right knee flexion to r = .93 for right shoulder extension and left shoulder external rotation (Table 2). The reliability coefficients for average power ranged from r = .73 for right shoulder flexion to r = .95 for left knee flexion, and the coefficients for total work ranged from r = .72 for left shoulder flexion to r = .96 for right knee flexion (Table 2).

Table 4 presents the range of reliability coefficients for each isokinetic measure obtained during the knee extension and flexion, shoulder extension and flexion, and shoulder internal and external rotation test procedures. The highest reliability coefficients were observed for the knee extension and flexion procedure. The highest coefficients obtained during the knee extension and flexion test procedure were for average power and total work and ranged from r = .90 to .95 for average power and r = .91 to .96 for total work.

Discussion and Conclusions

Isokinetic muscular strength, power, and endurance capacity are frequently evaluated to determine the effectiveness of physical rehabilitation. As such, the importance of establishing the reliability of isokinetic measurments is important. This investigation examined the reliability of isokinetic measures obtained with a Cybex isokinetic dynamometer interfaced with a Cybex Data Reduction Computer.

Results indicated the reliability coefficients for knee extension peak torque at 60°/s and 180°/s ranged from r = .84 to .93. These were slightly lower than reported by Johnson and Siegal (6) Reliability coefficients for power and total work values obtained at a 180°/s for knee flexion and extension ranged from r = .90 to .95. These values were slighty higher than reported by Barbee and Landis (2). TAE reliability for knee extension and flexion at 180°/s was slightly lower than reported by Barbee and Landis (2) and ranged from r = .70 to.86.

In general, this investigation found slightly lower reliability coefficients for measures obtained during shoulder extension and flexion, and shoulder internal and external rotation than knee extension and flexion. This finding may be due to the greater range of motion that is required when testing upper as compared to lower extremity isokinetic strength. It seems that the greater the range of motion required of the testing procedure, the greater the possibility of variable involvement of accessory muscle groups. Individual variation in this methodological error could have contributed to the difference in reliability of measurement between the upper and lower body.

The lowest reliability coefficients were observed for the endurance ratio measures. Unfortunately, no previous data are available for comparison of these findings. It is unclear why endurance ratio reliability was low since this measure is actually calculated from two total work measures. As previously mentioned, reliability for total work was quite high. Examination of Table 3 indicates lower reliability of total work performed in the last sample repetitions in five of six measures. This observation would seem to indicate that the breakdown in endurance ratio reliability is more related to total work in the last sample rather than first sample repetitions. Perhaps the subjects were inclined to reduce their intensity and pace their effort during the endurance retest session because of the unpleasant nature of the test.

The findings of the present investigation warrant the following conclusions:

1) Lowest reliability coefficients were observed for the endurance ratio measure. As such, clinicians should view this measure with some degree of skepticism when assessing endurance capacity of a muscle group with instrumentation similar to that used in the present investigation.
2) Highest reliability coefficients were observed for the peak torque, torque acceleration energy, average power, and total work measures. While some degree of variance exists within each isokinetic measure, it appears that clinicians can assume good reliability of instrumentation for assessment of peak torque, TAE, average power, and total work.
3) A comparison of reliability measures for the knee extension/flexion, shoulder extension/flexion, and shoulder internal/external rotation tests reveals generally higher coefficients for the knee test.

References

1. Alexander J, Molnar G: Muscular strength in children: preliminary report on objective standards. *Archives of Physical Medicine and Rehabilitation* 54: 424-427, 1973.
2. Barbee J, Landis D: Reliability of cybex computer measures (abstract). *Physical Therapy* 64(5): 737, 1984.

continued on page 394

Psychological and Organizational Factors Related to Burnout in Athletic Trainers

Susan A. Capel, PhD

This study investigated the relationship of five selected psychological and organizational variables with burnout in athletic trainers. Trainers (n = 332) from the Western United States completed self-report measures of burnout, role conflict, role ambiguity, locus of control and demographic variables. Regression analyses indicated that role conflict, role ambiguity, locus of control, number of hours in direct contact with the athletes, and number of athletes in the athletic trainer's direct care were significantly related to total burnout, frequency and intensity of burnout and emotional exhaustion, depersonalization and personal accomplishment subscales. Role conflict explained the most variance on all burnout scores except personal accomplishment, which was best explained by role ambiguity. Overall, however, absolute levels of burnout were found to be low. Theoretical and practical implications of this study are discussed.

A study undertaken to determine psychological and organizational factors related to burnout in athletic trainers found burnout levels to be low among the sample in the study. These results were contrary to results reported recently in *Athletic Training* by Campbell, Miller, and Robinson (4). However, the psychological and organizational variables of role conflict, role ambiguity, locus of control, number of athletes in the athletic trainer's direct care, and number of hours in direct contact with the athletes contributed significantly to the variance in total burnout, burnout frequency and intensity, emotional exhaustion, depersonalization and personal accomplishment subscales of burnout.

Although it has probably been with us for a long time, burnout was first identified by Freudenberger in 1974 (9). Maslach (19) and her colleagues (23, 24) gave further impetus to the study of burnout. Freudenberger adopted a case study approach, but Maslach initiated more experimental, social-psychological grounded research, focusing more on individual-environmental interaction.

Despite the proliferation in burnout literature since these studies, a consolidated theoretical base and functional definition have not been achieved. Numerous anecdotal references and descriptive studies have been undertaken, and burnout has remained virtually an atheoretical construct with little empirical backbone. Articles by Vergamini (38), Gieck, Brown and Shank (12) and Gieck (11) contain anecdotal reports of burnout in athletic trainers. References to burnout in athletic trainers cited in these three articles are not supported by empirical research. These articles cannot, therefore, be used as empirical evidence of burnout in athletic trainers in other studies.

Definitions of Burnout

In order to understand burnout, and the factors mediating its occurrence, an operational definition is needed. Although the term burnout is intuitively accepted, there is considerable confusion over its definition. Definitions fall into three distinct categories: 1) those specifying the symptom pattern of burnout (8,9), 2) those relating burnout to stress (15, 37), and 3) those including references to both stress and symptoms (6,20).

Research has indicated that burnout is a consequence of the stress response. A definition linking burnout to stress is therefore the most relevant in initiating a study of burnout in athletic trainers. The most widely accepted definition of stress is that of Selye (36), who states that stress is the nonspecific response of the body to any demand made upon it. Even though a certain amount of stress is needed to promote physical growth, and is therefore beneficial, stress is usually associated with being damaging to the body.

In definitions of burnout based on stress, the work situation may be perceived and appraised as threatening. This in turn causes an emotional response of stress (5,25). Work-related stress has been specifically related to burnout in many definitions (15,26). The definition of burnout used in the present study was that proposed by Daley (6). He defined burnout as a reaction to job-related stress that varies in nature with the intensity and duration of the stress itself. This may result in workers becoming emotionally detached from their jobs and may ultimately lead them to leave their jobs altogether. By using this definition of burnout, an interactional approach, compatible with the stress-related approach to studying burnout, is adopted.

Both situational and personal factors are associated with stress. Likewise, individuals respond to similar stress in different ways, and the consequences of stress are manifested in various ways. Evidence from burnout research indicates physical exhaustion, lowered job productivity, depersonalization, and emotional exhaustion among the symptoms associated with stress and burnout (20,30). It should be pointed out that medical conditions alone are not an indication that burnout exists. The causes of medical conditions are numerous and explanations for the existence of these conditions may not relate to the job or burnout itself.

Investigators have been unable to agree on the causes

Dr. Capel was Assistant Professor, Department of Physical Education and Human Movement Studies, University of Oregon, Eugene, Oregon 97403, at the time of her study. She is currently at Bedford College of Higher Education, Bedford, England.

of burnout. A few studies have focused on both individual and organizational causes of burnout (2,10,27). However, much of the research has focused on either individual factors, including personality (7,28), psychological factors (31) and other individual demographic traits (22), or organizational factors (1,31).

These studies indicate that while individual factors related to burnout may determine the onset and the severity of the burnout, the likelihood and incidence of burnout will probably be determined by focusing on other factors (21). An interactional approach to the study of burnout is essential. The nature of the individual, the environment surrounding the individual and the interpersonal relationships within the social structure must be considered as contributors to the burnout problem.

The literature review revealed evidence that certain factors may be important in determining burnout in athletic trainers. Role conflict and role ambiguity have been found to be correlated with burnout (13,31,35). Role conflict is defined as the degree of perceived conflict between expected role behaviors. Role ambiguity is defined as the lack of clear information regarding expectations associated with a particular role, the methods of fulfilling a known role expectation and/or the consequences of role performance (14). Locus of control was correlated with burnout in several studies (7,8). Locus of control is defined as people's general perception of the contingent relationship between their behavior and events which follow their behavior. People with an external locus of control believe that events are only occasionally contingent on their own actions, often occurring because of fate or the interaction of powerful others. People with an internal locus of control believe that events are almost always contingent on their own actions (33). Maslach and Pines (24) and Pines (31) found staff-client ratio to be correlated with burnout. Further, personal communication with several athletic trainers who considered themselves burned out, indicated that long hours in direct contact with the athletes may be correlated with burnout.

Although burnout has been identified in a large number of helping professions including teachers (7,28), and coaches (3,39), very little systematic research has been undertaken on athletic trainers as a group. The purpose of this study was, therefore, to investigate the relationship of the five psychological and organizational variables identified above to burnout in athletic trainers.

Method

Subjects

The sample included 332 full-time and part-time (employed at least 20 hours per week) athletic trainers certified by the National Athletic Trainers Association (NATA). These athletic trainers were employed in the 13 western and southwestern states of Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming.

Measures

The Athletic Trainers Questionnaire used in this study consisted of four parts: 1) The Maslach Burnout Inventory (MBI), 2) a role conflict and a role ambiguity scale, 3) a locus of control scale, and 4) a demographic data sheet.

The Maslach Burnout Inventory (MBI, 23) was used to measure burnout. This is the most widely used and accepted instrument to test burnout in various populations within the helping professions. Internal consistency, test-retest reliability and validity of the instrument have been well established and documented (23). The MBI contains a two scale format, which determines both the frequency and intensity of feelings of burnout. In addition to the frequency and intensity scales, the 22 questions in the instrument provide information on three subscales of burnout: 1) Emotional Exhaustion, which describes an individual's feelings of being emotionally overextended and exhausted by work, 2) Depersonalization, which describes the respondent's feelings toward the clients with whom he or she works, and 3) Personal Accomplishment, which describes a person's feelings of accomplishment and competence on the job (23).

The role questionnaire developed by Rizzo, House and Lirtzman (32) was used to measure role conflict and role ambiguity. This is the most widely used scale for measuring these parameters. This questionnaire's reliability and validity have been well established and documented (34,35).

The Rotter Internal-External Locus of Control Scale (33) was used to measure locus of control. This scale is a widely used measure in both psychological research in general (18) and in stress research in particular (16, 17). Reliability and validity of the instrument have been established and documented (7, 18).

A brief questionnaire was developed to collect demographic and organizational data including the number of athletes in the athletic trainer's direct care and number of hours per week in direct contact with the athletes.

Procedures

The Athletic Trainers Questionnaire (ATQ) was mailed to all certified athletic trainers (n = 900) in 13 western and southwestern states. A follow-up postcard was mailed to all those who did not respond to the first mailing. Five hundred and fifty one (61%) were returned following the initial mailing. Three hundred and thirty two (60%) of those returned were from full-time or part-time athletic trainers and were therefore included in this study.

Analyses

Data were analyzed using a number of descriptive and inferential statistical techniques. Specifically, descriptive analyses provided means and standard deviations for all independent variables. Multiple regression was used to analyze the influence that role conflict, role ambiguity, locus of control, number of athletes in the athletic trainer's direct care, and number of hours per week in direct contact with athletes had on total burnout. Multivariate multiple regression analyses were used to determine the influence of these five independent variables on (a) frequency and intensity of burnout, and (b) emotional exhaustion, depersonalization and personal accomplishment. Canonical correlation analyses were used when a significant multivariate F was obtained. From these analyses it was possible to determine how much of the variance in burnout was accounted for by these five variables. In addition, the contribution of each of these variables to the variance explained in the burnout measures was determined. Finally, analyses of variance were used to determine if selected demographic variables influenced burnout. These specific variables were age, sex, highest level of education completed, marital status, number of years at present work setting, total number of years as a certified

athletic trainer, place of employment, head or assistant athletic trainer, and number of other athletic trainers employed at the same work place.

Results

Descriptive Analyses of Psychological, Organizational and Burnout Variables

Role conflict and role ambiguity scores were generally low, as indicated by the means for the sample being 3.0 and 5.2 for role conflict and role ambiguity, respectively. The possible range of scores for both scales was 1 to 7. A score of 7 indicated a high level of role conflict, but a score of 1 represented a high level of role ambiguity. Thus, for both variables, athletic trainers rated themselves further toward the lower end of the scales.

Locus of control scores ranged from 1 to 24, with higher scores indicating an external locus of control, and lower scores indicating an internal locus of control. The average score for the locus of control measure was 9.5, which indicated that most athletic trainers in this sample tended toward an internal locus of control. Specifically, 78% of the sample had an internal locus of control, and 22% had an external locus of control. In summary, the psychological background of the athletic trainers in this sample indicated that they generally experienced low role conflict, low role ambiguity, and had an internal locus of control.

Data on the organizational variables indicated that the average number of athletes in the athletic trainer's direct care was 263, with a minimum of zero and a maximum of 1000 athletes. Of these, 27% of the athletic trainers had 100 or less athletes in their direct care, 27% had between 101 and 200 athletes, 18% from 201 to 300 athletes and 28% had over 300 athletes in their direct care.

The average number of hours in direct contact with the athletes each week was 41.3 hours, but there was a range from 3 hours to 90 hours. The data showed that 57% of the athletic trainers were in direct contact with the athletes for 40 hours or less per week and an additional 35% from 41 to 60 hours per week. Only 8% were in direct contact with the athletes for more than 60 hours per week. Table 1 shows descriptive data for the five psychological and organizational variables included in this study.

Table 1

Psychological and Organizational Variables Profile: Means, standard deviations and range (n = 332).

Variable	Mean	SD	Low	High
Role conflict	3.0	1.1	1.0	6.6
Role ambiguity	5.2	1.1	1.2	7.0
Locus of control	9.5	3.9	1.0	20.0
Number of athletes in the athletic trainer's direct care	263.0	217.0	0.0	1000.0
Number of hours per week in direct contact with the athletes	41.3	16.0	3.0	90.0

Analyses of the demographic variables indicated that there was a great deal of variability. A general profile of the athletic trainers in this sample reveals that they were most likely to be male (63%), were generally young ($\underline{M}$ = 31.3 years), and were married (52%) or single (44%). Over half the athletic trainers (64%) had completed a master's degree, and 34% had completed a bachelor's degree. There were more full-time (59%) than part-time (41%) athletic trainers, and more head athletic trainers (76%) than assistant athletic trainers (24%). This follows from the fact that 44% of the sample indicated that they were the only athletic trainer employed at the work place.

Generally, the athletic trainers in this sample had been employed at their present position for a short time ($\underline{M}$ = 4.6 years), and had been certified for an average of 6.4 years. A slightly higher percentage of athletic trainers were employed in high schools (23%) and Division I colleges or universities (21%). The results of these analyses can be seen in more detail in Table 2.

Table 2

Frequency (percent) of the Demographic Variables

Variable	Percent	Variable	Percent
Age 23 to 29 years	53	Years at present position	
30 to 39 years	36	less than 5	74
40 to 49 years	8	6 to 10	16
50 to 59 years	3	more than 10	10
Sex Male	63	Years as Certified A.T.	
Female	37	less than 5 years	56
		6 to 10 years	29
		more than 10 years	15
Highest level of Education		Place of employment	
BA/BS	34	High School	23
MA/MS	64	Junior/Comm Coll.	15
PhD/EdD	2	Div 1 Coll/Univ.	21
		Div II/III Coll/Univ.	10
Martial Status		Other 4 yr Coll.	6
Single	44	Private club	17
Married	52	Other	8
Divorced	4		
		Number of other Athletic Trainers employed	
Type of Position			
Full-time	59	0	45
Part-time	41	1 to 5	52
		6 to 10	3
Head ath. trainer	76		
Assist. ath. trainer	24		

Analyses of burnout scores among the athletic trainers in this sample indicated that burnout was generally low. The possible range of scores for total burnout was from zero to 7, with 7 indicating a high level of burnout. Scores of zero, 1 or 2 indicated a low level of burnout, scores of 3, 4 or 5 a medium level of burnout, and scores of 6 or 7 a high level of burnout. The mean for the sample was 3.33, with 66% of the athletic trainers experiencing a medium level of burnout and 34% experiencing a low level of burnout. None of the athletic trainers in this sample were experiencing a high level of burnout. The intensity subscale and the subscales of emotional exhaustion, depersonalization and personal accomplishment were scored in the same way as total burnout. The means for these scales were 3.85, 2.84, 1.95, and 5.20 respectively. The personal accomplishment subscale is scored in reverse, with low scores indicating low personal accomplishment. As expected, low personal accomplishment is associated with a higher level of burnout. This indicates that the

intensity and personal accomplishment scores were in the medium range and the emotional exhaustion and depersonalization scores were in the low range.

For burnout frequency, the possible scores ranged from zero to 6, with a score of zero, 1 or 2 indicating a low frequency of burnout, 3 or 4 indicating a medium frequency of burnout and 5 or 6 a high frequency of burnout. The mean for frequency was 2.82, which indicates that generally a low frequency of burnout was experienced by the athletic trainers in this sample. The means for total burnout and all the burnout subscales can be seen in Table 3. The athletic trainers in the sample generally experienced higher levels of emotional exhaustion than depersonalization, although both were lower than average.

Table 3

Means and Standard Deviation for Total Burnout and Burnout Subscales (n = 332)

Variable	Mean	SD
Total burnout	3.33	0.69
Burnout frequency	2.82	0.64
Burnout intensity	3.85	0.87
Emotional exhaustion	2.84	1.18
Depersonalization	1.95	1.28
Personal accomplishment	5.20	0.67

Scores on the subscales also showed that there were low levels of burnout in this sample. No one in the sample experienced a high frequency of burnout, only 1% experienced high intensity of burnout, 3% experienced high emotional exhaustion, 2% experienced high depersonalization and no one experienced low personal accomplishment. All of these results indicate that the sample generally did not experience a high level of burnout. A full summary of these scores can be seen in Table 4.

Table 4

Percent of Athletic Trainers Experiencing High, Medium and Low Scores on Total Burnout and Burnout Subscales of Frequency and Intensity, Emotional Exhaustion, Depersonalization and Personal Accomplishment, and Frequency and Intensity of these Subscales (n = 332).

Variable	Low	Medium	High
Total Burnout	34	66	0
Burnout Frequency	64	36	0
Burnout Intensity	16	83	1
Emotional Exhaustion	55	45	0
Depersonalization	78	22	0
Personal Accomplishment	1	88	11

Statistical Analyses

Results of the multiple regression analysis to determine the predictive influence of the five independent variables on total burnout indicated that four factors, 1) role conflict, 2) number of hours, 3) locus of control and 4) role ambiguity, collectively predicted burnout. Number of athletes was not found to be a significant predictor. These four variables predicted 24% of the variance in burnout (R^2) with role conflict contributing the most to this prediction (beta = .427). These findings indicated that the higher the role conflict, the greater the number of hours in direct contact with the athletes each week, an external locus of control, and the higher the role ambiguity, the higher the level of burnout.

Two multivariate multiple regression analyses were conducted. In the first, the five psychological and organizational variables predicted burnout frequency and intensity. Follow-up analyses indicated that 21% of the total variance in burnout frequency and intensity was predicted by a combination of all five of the variables. Role conflict contributed the most to the overall relationship. These results indicated that higher role conflict and role ambiguity, an external locus of control, a greater number of athletes and greater number of hours, significantly contributed to the relationship with burnout frequency and intensity.

The second multivariate multiple regression analysis indicated that emotional exhaustion, depersonalization and personal accomplishment were predicted by three of the psychological and organizational variables. Twenty-one percent of the variance in emotional exhaustion, depersonalization and personal accomplishment were accounted for by role conflict, role ambiguity and locus of control. These results indicated that high role conflict, high role ambiguity and an external locus of control are associated with higher emotional exhaustion, higher depersonalization and lower personal accomplishment (all of which indicate higher burnout).

Of all of the demographic variables investigated with regard to their relationship to burnout, there were only 6 out of 54 analyses that indicated a significant relationship. Place of employment was found to be significant in three of these analyses. Specifically, results indicated that the highest frequency of burnout was experienced by athletic trainers in Division II and III colleges and universities, followed by Division I colleges and universities, and high schools in that order.

The highest emotional exhaustion levels were experienced by athletic trainers employed at Division I colleges and universities, followed by those at Division II and III colleges and universities, then high schools. Lowest personal accomplishment was experienced by athletic trainers employed at Division II and III colleges and universities, followed by those employed in high schools then Division I colleges and universities.

Men experienced significantly higher levels of depersonalization than women, although no other significant differences were found in this sample between gender and burnout. Higher levels of emotional exhaus-

Table 5

Significant Results From the Analyses of Variance

Independent Variable	Dependent Variable	F	F
Gender	Depersonalization	5.647	0.018
Number of years at present position	Emotional Exhaustion	3.647	0.003
Total number of years as a Certified A.T.	Emotional Exhaustion	2.194	0.055
Place of Employment	Burnout Frequency	2.155	0.038
Place of Employment	Emotional Exhaustion	2.016	0.053
Place of Employment	Personal Accomplishment	2.381	0.022

tion were experienced by athletic trainers who had been working at their present job from 6 to 10 years, followed by those who had been at their present job from 3 to 5 years. Finally, highest emotional exhaustion levels were experienced by athletic trainers who had been certified from 11 to 15 years. Table 5 shows the significant analyses.

Discussion

The relationship of various psychological and organizational variables to burnout in athletic trainers was examined in this study. Results showed that total burnout, burnout frequency and intensity, emotional exhaustion, depersonalization, and personal accomplishment were significantly predicted by several of these variables.

One of the major findings of this study was athletic trainers generally experienced lower burnout than other human service professionals. Average scores for total burnout, frequency and intensity of burnout, emotional exhaustion and depersonalization were lower among athletic trainers than those found for other helping professions. Personal accomplishment scores were higher among athletic trainers than for other helping professions. Very few athletic trainers reported high levels of burnout as measured by total burnout or any of the subscales. Of this sample, 45% were the sole athletic trainer employed at the work place, and 76% were the head athletic trainer, which could help explain lower levels of burnout. Both individuals working alone and head athletic trainers have great autonomy in their work. These have both been related to low levels of burnout (31).

Lower burnout in this sample of athletic trainers supports findings of low burnout levels in coaches (3,39). Similar possible reasons for this may include (a) both athletic trainers and coaches generally have a "time-out" from their jobs in the "off season," (b) direct contact with the athletes is only part of their total job responsibilities, and (c) both groups have more opportunities for positive feedback than other human service professions, e.g., when the injured athlete returns to competition, or a player successfully executes a move that he or she has been practicing for a long period of time.

A second major finding indicated that higher frequency and intensity of burnout resulted from high role conflict, high role ambiguity, an external locus of control, greater number of athletes, and greater number of hours. Higher emotional exhaustion, higher depersonalization and lower personal accomplishment also resulted from high role conflict, high role ambiguity and an external locus of control. Total burnout was predicted by role conflict, number of hours, locus of control and role ambiguity. Overall, total burnout and all the burnout subscales, except personal accomplishment were best predicted by role conflict. Personal accomplishment was best predicted by role ambiguity. These results support previous research on factors found to be related to higher levels of burnout (2,7,35).

Implications of this Study

Several practical implications emerge from this study. To decrease the incidence of burnout among athletic trainers role conflict and role ambiguity must be reduced. Cooperation among athletic trainers, administrators, coaches and athletes is needed to reduce role conflict and role ambiguity. To reduce role conflict and role ambiguity some potential strategies may include establishing job descriptions specific to the individual situation, training in conflict resolution skills, establishing clear lines of authority within the organization so that the athletic trainer knows to whom he or she is directly responsible, involving athletic trainers in the development of realistic individual and organizational goals and objectives, and improving communications between the athletic trainer, coach and athletic director so that each understands the other's role and responsibilities. Evaluation procedures should be utilized to determine if the strategies implemented to reduce role conflict and role ambiguity are effective.

Persons with an internal locus of control experienced less burnout than persons with an external locus of control among this sample. Thus, to help the individual feel in control of his or her own actions, and consequently help reduce burnout, a situation should be established in the training room where the individual has input on decisions on matters which are of concern. These decisions could include administrative and organizational decisions, as well as professional decisions directly related to the treatment of the athletes.

Other results indicated that reducing the number of athletes in the athletic trainer's direct care and reducing the number of hours per week in direct contact with the athletes could result in lower burnout. These are two areas in which changes in programs may be made relatively easily, as long as finances are made available to do so.

Athletic trainers should become familiar with the stress process and its symptoms in general, as well as burnout in particular. They should try to reduce the risk of burnout by determining ways of reducing role conflict and role ambiguity in their jobs. Further, persons administering athletic training programs should become familiar with antecedents of burnout and develop strategies to prevent burnout through their staff development activities and curricula.

Several theoretical implications are also apparent from the results of this study. Findings indicate that although the five factors investigated are significant in explaining burnout they explain less than 25% of the variance in burnout. Thus, many other causal factors are also important. In order to predict the incidence of burnout among athletic trainers more precisely, these other factors must be considered. Personal and situational variables such as leadership style, organizational structure, administrative influence, communication, and personality characteristics may be included here. Other directions for future research include reducing variability in work environments, by conducting a study with a more homogenous sample, or interviewing athletic trainers who have "dropped out" of the profession, to more accurately determine their reasons for leaving the profession.

Conclusion

Burnout does exist among athletic trainers, although in this sample the burnout scores were only average. Any degree of burnout demands the immediate attention of both organizations and individuals. Organizational and personal factors are both causes and consequences of burnout. In addition, organizations are also a major means of avoiding and/or treating burnout. While the emphasis for both the organization and the individual should be on identifying the causes and thereby avoiding burnout, it is equally important to identify burned out individuals and immediately implement strategies to counteract the burnout. The results of this study, in concert with the existing body of knowledge on burnout, provide information for immediate application. It is therefore paramount for both the organization and the individual to exercise their responsibility for acting upon the information that is available.

References

1. Armstrong KL: An exploratory study of the interrelationships between worker characteristics, organizational structure, management process and worker alienation from clients (How to avoid burn-out). Doctoral Dissertation, University of California, Berkeley, California, 1977. *Dissertation Abstracts International.* August 39 (2-B), 670B, 1978.
2. Berkeley Planning Associates: *Evaluation of child abuse and neglect demonstration projects, 1974-1977, Volume IX.* Project management and worker burnout. U.S. Department of Commerce (NTIS No. PB-278 446), 1977.
3. Caccese T, Mayerberg C: Gender differences in perceived burnout of college coaches. *Journal of Sport Psychology* 6:(3), pp. 279-28, 1984.
4. Campbell D, Miller M, Robinson W: The prevalence of burnout among athletic trainers. *Athletic Training* 10:(2), pp. 110-113, 1985.
5. Cardinell C: Burnout? Mid-life crisis? Lets understand ourselves. *Contemporary Education* 52:(2), pp. 103-108, 1981.
6. Daley MR: Burnout: Smouldering problem in protective services. *Social Work* 24:(5), pp. 375-379, 1979.
7. Fielding M: Personality and situational correlates of teacher stress and burnout. Doctoral Dissertation, University of Oregon, 1982. *Dissertation Abstracts International* 43/02A, 1982.
8. Forney D, Wallace-Schutzman F, Wiggers T: Burnout among career development professionals: Preliminary findings and implications. *Personnel and Guidance Journal* 60:(7), pp. 435-439, 1982.
9. Freudenberger HJ: Staff burn-out. *Journal of Social Issue* 30:(1), pp. 159-165, 1974.
10. Gann ML: The role of personality factors and job characteristics in burnout: A study of social service workers. Doctoral Dissertation, University of California-Berkeley, 1979. *Dissertation Abstracts International* 34 (07B), 8000351, 3366, 1979.
11. Gieck J: Stress management and the athletic trainer. *Athletic Training* 19:(2), pp. 115-119, 1984.
12. Gieck J, Brown R, Shank R: The burnout syndrome among athletic trainers. *Athletic Training* 17:(1), pp. 36-40, 1982.
13. Kahn R: Job burnout: Prevention and remedies. *Public Welfare* 36:(2), pp. 61-63, 1978.
14. Kahn R, Wolfe D, Quinn D, Snoek R, Rosenthal J: *Organizational stress: Studies in role conflict and role ambiguity.* New York: John Wiley and Sons, Inc., 1964.
15. Kamis E: *An epidemiological approach to staff burnout.* Montreal, Quebec, Canada: Paper presented at the annual convention of the American Psychological Association. (ERIC Documents Reproduction Service No. ED 203 253) 1980.
16. Lefcourt HM: *Internal versus external control of reinforcement revisited: Recent developments.* Unpublished manuscript (Research Report No. 27), University of Waterloo, 1971.
17. Lefcourt HM: Locus of control and the response to averse events. *Canadian Psychological Review 17*: pp. 202-209, 1976.
18. MacDonald AP, Jr.: Internal-external locus of control. In JP Robinson & PR Shaver (Eds.), *Measures of social psychological attitudes.* Ann Arbor, MI: Institute for Social Research, University of Michigan, 1973.
19. Maslach C: Burned-out. *Human Behavior* 5:(9), pp. 16-22, 1976.
20. Maslach C: The client role in staff burnout. *Journal of Social Issues* 34:(4), pp. 111-124, 1978.
21. Maslach C: *Burnout: The cost of caring.* Englewood Cliffs, NJ: Prentice-Hall, Inc., 1982.
22. Maslach C, Jackson S: Burned-out cops and their families. *Psychology Today* 12:(12), pp. 59-62, 1979.
23. Maslach C, Jackson S: *Maslach burnout inventory.* Palo Alto, CA: Consulting Psychologists Press, Inc., 1981.
24. Maslach C, Pines A: The burnout syndrome in the day care setting. *Child Care Quarterly* 6: pp. 100-113, 1977.
25. Mattingly MA: Sources of stress and burn-out in professional child care work. *Child Care Quarterly* 6: pp. 127-137, 1977.
26. McCullough PM: *Employee performance and state mental health manpower development.* Atlanta, GA: Southern Regional Education Board. (ERIC Documents Reproduction Service No. ED 197 112), 1980.
27. Metz P: An exploratory study of professional burnout and renewal among educators. Doctoral Dissertation University of Colorado-Boulder, 1979. *Dissertation Abstracts International* 40(080A), 8002998, 4308, 1979.
28. Nagy S: The relationship of type A personalities, workaholism, perceptions of the school climate, and years of teaching experience to burnout of elementary and junior high school teachers in northwest Oregon school district. Unpublished doctoral dissertation, University of Oregon, Eugene, OR, 1982.
29. Pedhazur EJ: *Multiple regression in behavioral research.* New York: Holt, Rinehart and Winston, 1982.
30. Perlman B, Hartman EA: Burnout: Summary and future research. *Human Relations* 35:(4), pp. 283-305, 1982.
31. Pines A: Changing organizations: Is a work environment without burnout an impossible goal? In WS Paine (Ed.), *Job stress and burnout.* Beverley Hills, CA: Sage Publications, 1982.
32. Rizzo J, House R, Lirtzman S: Role conflict and role ambiguity in complex organizations. *Administrative Science Quarterly* 15: pp. 150-163, 1970.
33. Rotter JB: Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs* 80: 1966.
34. Schuler RS, Aldag R, Brief J: Role conflict and ambiguity: A scale analysis. *Organizational and Human Performance* 20: pp. 268-291, 1979.
35. Schwab RL: The relationship of role conflict, role ambiguity, teacher background variables and perceived burnout among teachers. Doctoral Dissertation, University of Connecticut, 1981. *Dissertation Abstracts International* 41(09-A)2, 3823-a, 1981.
36. Selye H: General adaptation syndrome and diseases of adaptation. *Journal of Clinical Endocrinology* 6: pp. 7-230, 1946.
37. Veninga RL, Spradley JP: *The work/stress connection: How to cope with job burnout.* Boston: Little Brown, 1981.
38. Vergamini G: Professional burnout: Implications for athletic training. *Athletic Training* 16:(3), pp. 197-198, 1981.
39. Wilson V, Bird E: *Teacher-coach burnout.* Presentation made at the North West District AAHPERD convention, July, Eugene, OR, 1984. ⊕

Hydrostatic Weighing for the Athletic Trainer

Loren Cordain, PhD
Richard W. Latin, PhD

This report presents a practical, economical approach to obtaining body composition measures by the hydrostatic weighing method. The rationale and theory for quantifying human fat/leanness as well as the deleterious effects that excess depot fat has on athletic performance and health are presented. Finally, a step by step description of constructing the hydrostatic weighing system, the data acquisition process, and sample calculations are provided.

The purpose of this paper is to present a detailed, description of the hydrostatic weighing technique (HW) (8) for determining body density (Db) so that an athletic trainer, or other such individual, could construct a system to quantify human body composition. For the purpose of this paper, body composition will be defined as the distribution of fat and non-fat tissue.

The quantification of body composition provides useful information to athletic trainers and others interested in athletic performance, since this entity may be hindered by either insufficient or excessive fat tissue (1). Frequently, athletic trainers are called upon to help wrestlers, dancers, and other athletes lose weight. Without knowledge of the individual's body composition, such a regimen of weight reduction may have deleterious effects (3). Rapid weight loss by already lean and muscular athletes results in degradation of both fat and non-fat tissues (7). Since strength is an important attribute for success in most athletic endeavors, it becomes obvious that the reduction of non-fat tissue (which includes muscle) may lead to decreased performance levels. In addition, degradation of non-fat tissue is potentially harmful to kidney function because of the high blood levels of urea, ammonia, and purines that result from muscle catabolism (7). Rapid weight loss may also cause depletion of glycogen reserves and electrolytes in addition to altering the pH of the blood (3). Any or all of these conditions may severely limit or decrease athletic performance (1). Therefore, a judicious weight reduction program should include body composition determination to help circumvent many of these metabolic shortcomings induced by a poorly planned program.

The quantification of body composition is also useful to athletic trainers so that they may assist an athlete in maximizing his/her performance levels. High body weight does not necessarily connote high percent body fat (PBF). Many times athletes are asked to lose weight which is not necessary if their PBF were originally considered. Sometimes, the converse of this situation is true; a seemingly lean individual may have a higher PBF than what may be optimal. Therefore, in order to make an accurate assessment of an individual's optimal body weight, it is essential that body composition be determined. If an individual has surplus body fat, a reduction of this extra fat tissue may result in many beneficial effects regarding athletic performance. Loss of excessive fat tissue may result in an increased strength to body weight ratio, a decreased possibility of tendon, ligament and connective tissue injury because of the decreased loads brought about by weight reduction, an increased range of motion of effected joints, and an increased maximal consumption and circulatory efficiency (1).

The most common, least expensive, and simplest means of assessing body composition is the measurement of various skinfolds or anthropometric measurements. However, this technique is less accurate than others currently available (2). Hydrostatic weighing is the next common technique used, and it is probably the most accurate and practical laboratory method, considering overall expenses (2). This technique is highly accurate, relatively inexpensive to develop and simple to perform.

Theory

The theoretical basis for hydrostatic weighing is attributed to Archimedes, an ancient Greek mathematician and inventor. The Archimedean Principle states that an object immersed in a fluid loses an amount of weight equivalent to the weight of the fluid which is displaced. When this weight is corrected for the density of that fluid, it is equal to the volume of that object.

Density is defined as:

$$D = \frac{M}{V}$$

where: D = density
M = mass
V = volume

Since M, is easily determined by weighing an individual on a scale on land, it becomes obvious that hydrostatic weighing (HW) indirectly determines an individual's volume.

During hydrostatic weighing the lungs must be as nearly deflated as possible with a maximal expiration. A correction is then made for the air that remains in the lungs (residual volume). The final embellished equation

Dr. Cordain is with the Department of HPER, Colorado State University, Fort Collins, Colorado 80521.
Dr. Latin is with the School of HPER, University of Nebraska at Omaha, Omaha, Nebraska 68182.

for Db, based on the Archimedean Principle becomes (5):

$$D_b = \frac{M_1}{\frac{M_1 - M_2}{D_2} - RV}$$

where: D_b = body density (g/ml)
M_1 = body weight (g)
M_2 = true hydrostatic weight (g)
D_2 = density of water (g/ml)
RV = residual volume (ml)

Percent body fat is arrived at through mathematical equations which calculate relative fat amounts from Db. These equations were derived from known densities of human fat and non-fat tissue. Fat tissue has a density of 0.90 g/ml, while non-fat tissue has a density of 1.10 g/ml(9). Perhaps the most commonly used equation for this purpose is the one developed by Siri (9). This equation is:

$$PBF = ((4.95/Db) - 4.50) \times 100$$

Instructions for Hydrostatic Weighing

From a practical standpoint, a detailed step by step approach to the hydrostatic weighing technique is probably more useful to the athletic trainer than is the derivation of equations used in the theoretical elucidation of this method. Represented in Table 1 is a complete list of equipment for making a hydrostatic weighing system. Figure 1 depicts the schematic arrangement for this system, while Figure 2 shows the dimensions of the PVC frame. Presented in Table 2 are the computational equations necessary for obtaining the various parameters of body composition. Displayed in Table 3 are relative fat percentages for men and women in various sports.

The following is a detailed description of the hydrostatic weighing procedure which represents a modification of a system reported by Katch, Michael, and Horvath (8):

1) Build the system as shown in Figure 1.
2) Before attaching the chain with the PVC frame to the scale, make sure the scale is zeroed (if not, adjust the set screw on the scale until dial reads zero).
3) Attach the chain and PVC frame to the scale, making sure the distance from the bottom of the PVC frame to the surface of the water is about 18 inches.
4) Record the water temperature in degrees Centigrade to the whole degree.
5) Record the weight of the chains and the PVC frame (tare weight) as it sits in the water, attached to the scale before the subject is in position.
6) Record the subject's height, land weight, age, and sex.
7) Ask the subject to lie prone on the PVC frame with his head just out of the water and his hands grasping the front bar of the PVC frame. Ask the subject to gently lower his head and shoulders under the water until he is *completely* submerged, while simultaneously blowing out as much air as he can from his lungs. It is imperative that the subject empty his lungs of as much air as he possibly can while under the water. Make sure that the subject is as motionless and calm as possible while under the water, and stays under the water for as long as possible (usually 2-5 seconds).
8) *How to read the scale:* As the subject submerges and gradually blows more air out, the scale will progressively read more weight. Be sure that subject has completely exhaled before reading the scale. Often times the scale needle will oscillate between a high and low value. If this is the case, you should choose the value exactly midway between these two values. It is helpful sometimes to steady the scale with your hand to help damper the oscillations. The scale needle may stay at one value for a short time period during the series of oscillations; this value is often closer to the true hydrostatic weight than is a midpoint value between the oscillations. One revolution of the scale needle equals three kilograms; two revolutions equals six kilograms; and three revolutions equals nine kilograms. These three, six, and nine kilogram revolutions are marked on the bar at the bottom of the scale. Be certain that you note on this bar how many revolutions have occurred. Reading the scale is as much an art as it is a science, and accurate readings will be ± 50 grams. Note that the scale reads in 10 gram units.

Example Calculations

The following data were collected from a hydrostatic weighing procedure:

Name:	John Smith
Age:	30
Height (in.):	71
Weight (lbs.):	170
Water temperature (C°):	28
Tare weight (g):	1350
Last three hydrostatic weights (g):	4200
	4000
	4100

Computations:

(1) Convert height (in) to height (cm) (x 2.54).

H(cm) = 71 x 2.54 = 180.34

(2) Convert weight (lbs) to weight (g) (x 454).

W(g) = 170 x 454 = 77180

(3) Determine Dw from Equation 1.

Dw = 1.00389 - 0.000278 (28)
*Dw = 0.996106

* Note: Carry Dw values to at least 6 decimal places.

(4) Determine RV from appropriate equation 2.

male RV(1) = 0.019(180.34) + 0.0115(30) - 2.24.
male RV(1) = 1.53

Convert RV(1) to RV(ml) (x 1000)

RV(ml) = 1530

(5) Determine the mean of the last three hydrostatic weights.

(4200 + 4000 + 4100)/ 3 = 4100 g

(6) Determine the true hydrostatic weight.

4100 = 1350 = 2750 g

(7) Determine Db

$$Db = \frac{77180}{\frac{77180 - 2750}{.996106} - 1530}$$

Db = 1.0545 g/ml

* Note: Carry Db values to at least 4 decimal places.

(8) Determine PBF.

PBF = ((4.95/1.0545) - 4.50) x 100

PBF = 19.41%

(9) Determine LBW.

FW = 170 x .1941 = 32.99 lbs

LBW = 170 - 32.99 = 137.01 lbs

Conclusion

Although more sophisticated HW systems exist, the methodology described in this paper will allow the athletic trainer to make accurate body composition determinations. Based on the limitations of this technique, the accuracy will be of a degree desired for classification, diagnosis, and/or screening. Greater control of some of the technique components would be required for its use as a research tool. These controls would primarily include: the actual measurement of RV by nitrogen wash-out, oxygen dilution or some other laboratory technique (preferably performed while the subject is submerged), and the application of devices that would stabilize the platform and thus dampen scale oscillations. However, when these variables are controlled, hydrostatic weighing is considered the standard of comparison for all other body composition determination techniques (10).

Table 1
ITEMS AND COST

ITEM	VENDOR	PRICE
1) Chatillon Autopsy Scale Model 1309 1309 HDD	John Chatillon & Sons Inc., 83-30 Kew Gardens Road, Kew Gardens, NY 11415	$395.00
2) 22 feet of ½ inch diameter polyvinyl-chloride (PVC) pipe	Any hardware store	cheap
3) Four plastic "T" connectors for PVC pipe	Any hardware store	cheap
4) Four plastic "L" connectors for PVC pipe	Any hardware store	cheap
5) PVC cement	Any hardware store	cheap
6) 20 feet of small gauge galvanized chain	Any hardware store	cheap
7) Five two-inch diameter keyrings	Any hardware store	cheap
8) One six-foot length of a 2 x 4 wooden plank	Any hardware store	cheap
9) One large eyelet bolt	Any hardware store	cheap
10) Two large "C" clamps	Any hardware store	cheap
11) One centigrade thermometer	Any scientific supply house	cheap
	Approximate total	= $450.00

Comment

A chair constructed of PVC tubing may be substituted for the platform. Since it appears less scale oscillations occur with a chair, the practitioner may prefer its use. In addition, variations of this technique are limited only by the creativity of the practitioner. A tripod may be used to support the scale and platform so that large submersion tanks (i.e., whirlpools, Hubbard tanks, hot tubs, etc.) may be substituted for a swimming pool.

Table 2
Computational Equations

1. Water density (Dw,g/ml)=1.00389-0.000278(C°) for water temperature 20-40 degrees Centigrade
2. Residual volume (RV, 1)
   Males (4) RV(1) = 0.019 Hcm + 0.0115 A - 2.24
   Females (6) RV(1) = 0.032 Hcm + 0.009 A-3.90

   where: Hcm = height in centimeters and A = age in years
3. Body density (5) (Db, g/ml): $Db = \frac{M_1}{\frac{M_1 - M_2}{D_w} - RV}$

   where: M_1 = body weight on land (g)
   M_2 = true hydrostatic weight (g)
   D_w = density of water (g/ml)
   RV = residual volume (ml)
4. Percent body fat (9) PBF, %): PBF = ((4.95/Db) - 4.50) x 100
5. Lean body weight (2) (LBW, lbs): LBW = BW-FW

   where: BW = body weight (lbs)
   FW = fat weight (lbs) or BW x PBF (decimal)

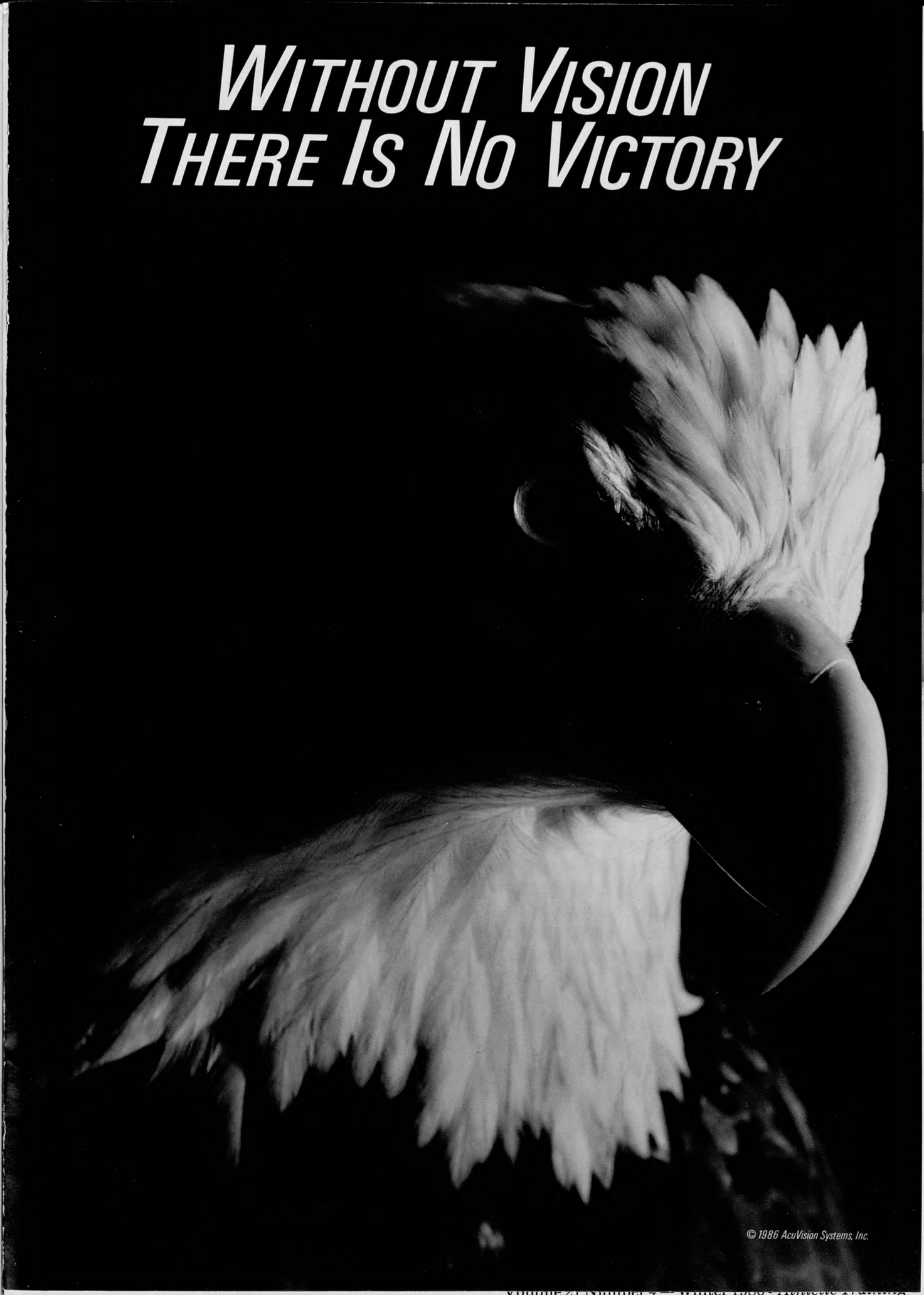
Table 3
Relative Fat Values for Athletes and Non-Athletes (10)

GROUP	RELATIVE FAT (PBF)	
	FEMALES	MALES
Long Distance Runner	6-12	4-9
Gymnast	6-10	4-8
Wrestler	-	4-8
Basketball Player	15-20	8-12
Football Player		
Back	-	5-12
Lineman	-	10-16
Dancer	8-15	8-15
Baseball Player	-	8-20
Normal Population (by age)		
15	20	12
20	25	15
30	30	19
50	35	26

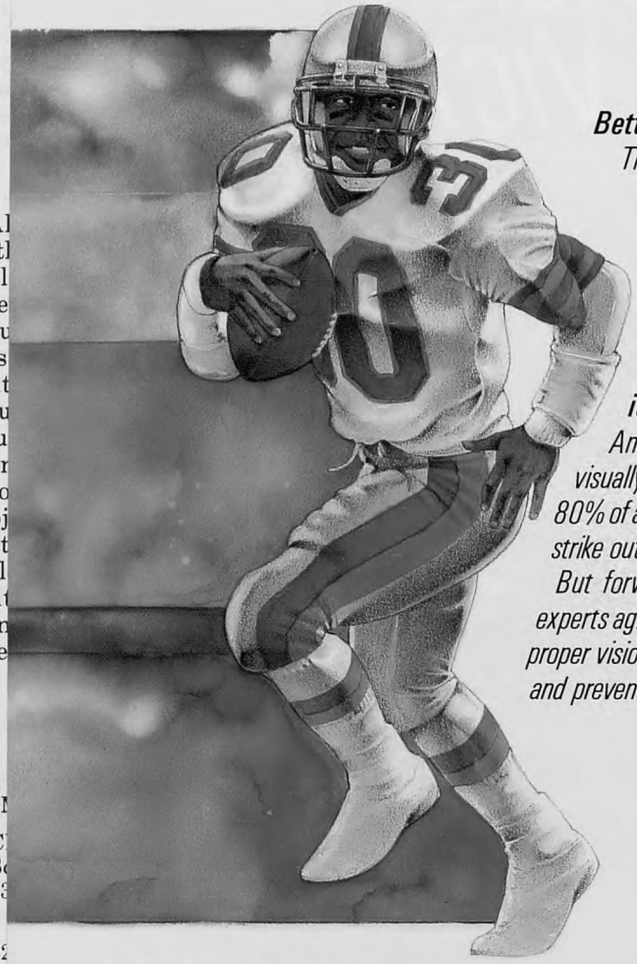
References

1. Astrand PO, Rodahl K: *Textbook of Work Physiology.* New York, McGraw-Hill Book Company 1977 pp. 508-517.

continued on page 368


WITHOUT VISION
THERE IS NO VICTORY
© 1986 AcuVision Systems, Inc.

INTRODUCING



Better performance is now in sight

The grace and precision of an eagle; the seemingly effortless ability to perform with maximum efficiency over and over again.

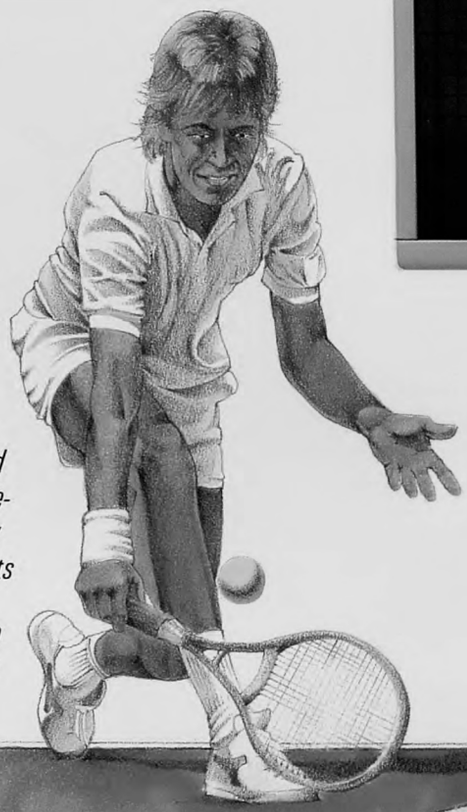
Those are the qualities that make the superb athlete; the winner with the consistent edge over the competition.

Like the eagle, all truly exceptional athletes not only rely on strength, stamina and speed to perform, but on vision.

Vision: The ability to take what you see, interpret it and translate it into action.

An athlete cannot be truly fit unless he's visually fit, as vision errors account for up to 80% of all common athletic blunders: fumbles... strike outs... fouls... penalties.

But forward-thinking coaches, athletes and experts agree: Vision is a learned skill. And proper vision training can enhance performance and prevent mistakes.



AcuVision 1000: The first complete fitness system for the eyes.

Vision training, once a subject few people understood and many ignored, is becoming increasingly important to top performance. A recent study at the University of Maryland proved that visual performance increased significantly using an AcuVision visual training program.

The AcuVision 1000 is a sophisticated, fully-integrated program that trains the visual system by using state-of-the-art computer technology to track performance, identify strengths and weaknesses and adjust future workouts for maximum improvement.

The AcuVision 1000 uses a unique system of 120 touch-sensitive lights and an intensive series of visual exercises to teach and hone the essential visual skills. As the user becomes more proficient with the machine, the challenge becomes greater. The speed of the flashing lights increases and the patterns they create across the grid become more complex.

Each series of exercises takes just 10-15 minutes per workout, training the athlete to

ACUVISION

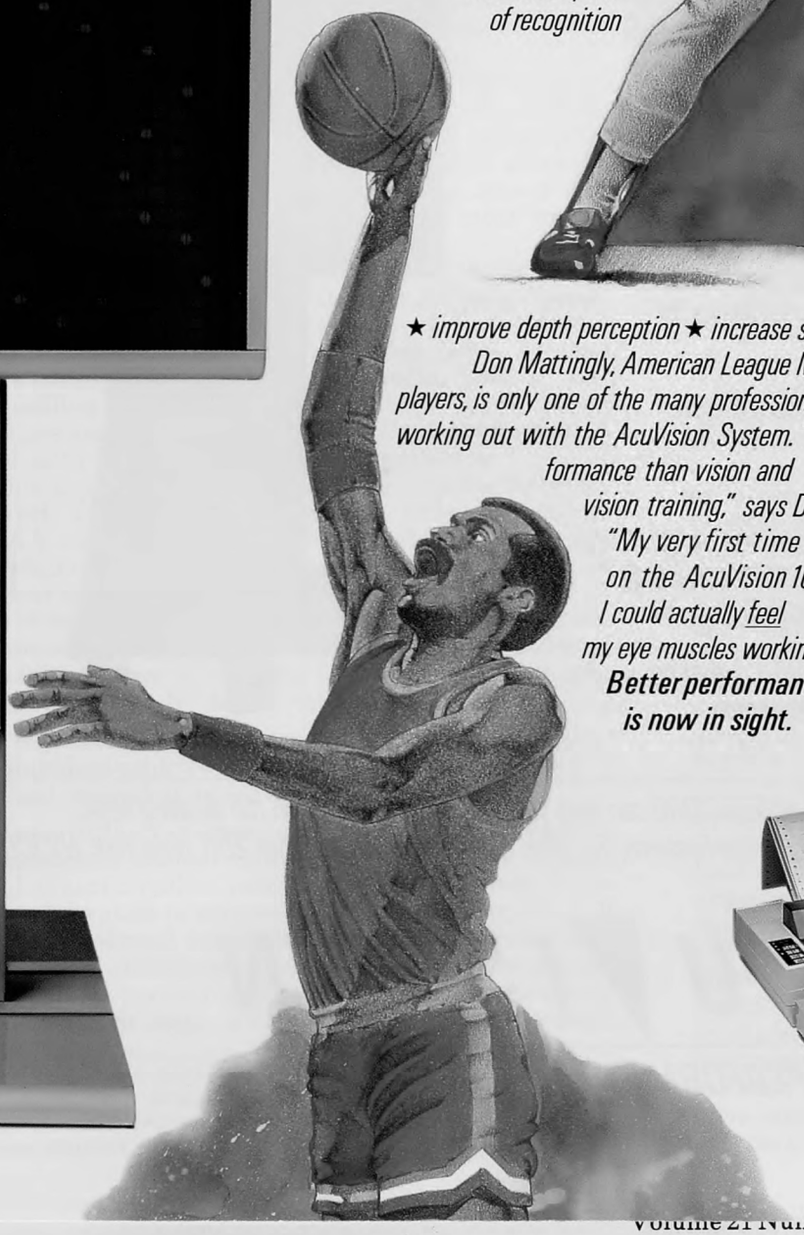
focus quickly, interpret what he sees and respond with lightning speed. Importantly, the AcuVision 1000 is so easy for the athlete to use, no supervision is required.

Electronic monitoring and computer printouts provide a record of performance in each key area, pin-pointing strengths and weaknesses. Different software programs make the AcuVision 1000 workout adaptable to a variety of sports needs for year-round use by all athletic teams.

Every AcuVision 1000 program can be adjusted by the trainer or coach as the user becomes more proficient. Or, athletes themselves can custom tailor programs to suit their individual needs.

The last frontier to better physical training has been conquered.

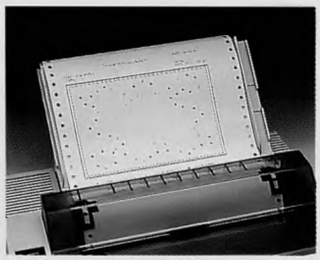
The AcuVision 1000 will improve an athlete's ability to: ★ concentrate and track moving objects ★ enhance peripheral vision ★ increase speed of recognition



★ improve depth perception ★ increase speed, time and accuracy of response.

Don Mattingly, American League MVP 1985 and one of baseball's premier players, is only one of the many professional and collegiate athletes now actively working out with the AcuVision System. "Nothing is more important to my performance than vision and vision training," says Don. "My very first time on the AcuVision 1000 I could actually feel my eye muscles working."

Better performance is now in sight.



State-of-the-art technology tracks performance, pinpoints strengths and weaknesses, and adjusts future workouts for maximum improvement.

Schering Symposium

Drug Testing: What Are The Rules?

A. Dean Pickett, Esq.

Edited by Don Kaverman, ATC

This paper surveys some of the common elements of drug screening programs with particular reference to NCAA and American Council on Education guidelines. The rights of student athletes are also discussed. General legal principles that would form the basis for legal scrutiny of drug testing programs are reviewed.

The use of performance enhancing drugs by American athletes has been characterized in the following manner by a leading author and practitioner in sports medicine: "By far, the most serious problem confronting health professionals involved in the day-to-day care of athletes is the use of drugs, that is to say, materials which are taken with the hope of improving the athlete's performance in an athletic event."(1). Similarly, although not taken for performance enhancement, the usage of so called "recreational" drugs among athletes poses, in many sports, an unacceptable risk to the athlete and other competitors. "Stimulants are the most widely abused drugs in the sports field."(1)

In response to increased awareness of the extent of drug usage, the National Collegiate Athletic Association, various athletic conferences, and educational institutions have over the past three years adopted increasingly stringent drug screening, testing and counselling programs designed, in most cases, not as punitive measures but as measures for the protection of the health and well-being of student athletes.

This paper will survey some of the common elements of such drug screening programs, with reference to NCAA and American Council on Education recommendations. As introductory matter, the rights of student athletes will also be discussed.

It is extremely important that any educational institution, whether in the public school or collegiate setting, carefully adhere to the first suggested guideline promulgated by the NCAA on February 1, 1984:

> "A member institution considering drug screening of student-athletes should involve the institutions's legal counsel at an early stage, ..."

Because of the variations among the rights of various categories of student athletes, determined by 1) their level of participation, public school or collegiate, 2) the laws of the state in which they play and are enrolled, 3) differing internal institutional rules, 4) differing conference and athletic association rules, and 5) the special problems of privacy and medical privilege that vary from state to state, it is essential that the general guidelines discussed here not be implemented without appropriate legal advice from the particular institution's own attorneys.

Mr. Pickett is a partner in the Flagstaff, Arizona law firm of Mangum, Wall, Stoops and Warden, and serves as general counsel to Northern Arizona University and several Arizona school districts.

Nature of the Right to Play

Because many of the determinations as to whether any student's activities are a right or a privilege hinge upon interpretations under the United States or state constitutions, it is necessary to first examine the effect of these principals in the athletic setting. Again, here, this is an area where legal counsel needs to be consulted because of the impact not only of the U.S. Constitution as interpreted in different ways by different courts, but also the impact, if any, of each individual state's constitution. This discussion also does not touch upon provisions of state statutes which may further define whether athletic participation is a right or a privilege.

The starting point for any constitutional analysis is the Fourteenth Amendment of the U.S. Constitution, which provides that no person may be deprived of life, liberty or property without due process of law. The way in which this provision impacts upon education in general, and athletic participation in particular, arises when a determination must be made as to whether participation in athletics constitutes a "property" right, and if it is found that it does, whether the educational institution has, in any deprivation of this property right, first given the participant sufficient due process.

In the public school setting the most recent and apparently significant decision came in the case of *Spring Branch Independent School District v. Stamos*, 695 S.W.2d 556 (1985) appeal dismissed _____ U.S. _____, 106 S.Ct.1170, 89 L.Ed.2d. 290 (1986). The case involved a "no pass - no play" rule which generally required that students maintain a "70" average in all classes to be eligible for participation in extra-curricular activities. The Texas Supreme Court found that "a student's right to participate in extra-curricular activities **per se** does **not** rise to the level of a fundamental right under our Constitution. In view of the rule's objective to promote improved classroom performance by students, we find the rule rationally related to the legitimate state interest in providing a quality education to Texas' public school students. . . . The federal courts have made it clear that the Federal Constitution's due process guarantees do not protect a student's interest in

participating in extra-curricular activities. ... We are in agreement, therefore, with the overwhelming majority of jurisdictions that students do not posess a constitutionally protected interest in their participation in extra-curricular activities." Of course, the no pass-no play rule was upheld. The dismissal of the appeal to the U.S. Supreme Court carries with it the effect of U.S. Supreme Court precedent in this area. *See, Hicks, v. Miranda,* 422 U.S. 332 (1975).

This same result, that students, at least in the public school setting, do not have a property interest in athletic participation specifically or extra-curricular participation in general, has apparently been the rule followed in, at a minimum, 47 other court opinions affecting 30 jurisdictions. *See, Bailey v. Truby,* 321 S.E.2d 302 (W.Va. 1984); *Adamek v. Pennsylvania Interscholastic Athletic Association, Inc.,* 426 A.2d 1206 (Pa. 1981).

In contrast to this, apparently eleven courts in at least nine jurisdictions have held to the contrary, though the *Stamos* opinion, quoted above, may cast doubt on many of these, especially those arising in the public school context. *See, Bailey v. Truby,* above, and *Regents of University of Minnesota v. NCAA,* 422 F. Supp. 1158 (D.Minn. 1976).

While the lack of a property interest in public school athletic participation is clearer now than ever before, the different parameters of collegiate participation, including potential career preparation and scholarship assistance, do argue that perhaps additional due process rights may be present. Because some of the sanctions in existing collegiate drug testing programs do include a removal from both participation and scholarship assistance, it is necessary to remember that generally a college scholarship is construed as a contractual right, thus rising to the status of a property interest protected by the Constitution from deprivation without due process. This argues in favor of according a due process hearing (the parameters of which should be designed by each institution) prior to deprivation of scholarship assistance for an athlete. *See,* generally *Colorado Seminary v. NCAA,* 417 F. Supp. 885 (D. Colo. 1976).

This also argues strongly in favor of careful definition of the terms of a scholarship program for athletes, both in the documents which describe the program in general and in the documents which the student athlete (and perhaps parents) would be asked to review and sign. A due process right can be limited by the terms of the right itself, in this case, the scholarship documents. Thus, any right to due process, no greater than the right created in the documents, could be limited in accordance with the terms of those documents. For example, scholarship documents could provide that scholarship assistance would be terminated in accordance with the terms of an institution's drug education and testing program, and the provisions of such a program could be incorporated by reference into the scholarship documents and furnished to the participant (and parents if appropriate).

Again, because of the varying court opinions, and possible impact of both state constitutions and statutes, an institution's own legal counsel must be consulted prior to instituting such changes.

Impact of NCAA Rules

The concept of drug testing in intercollegiate athletics has been addressed in detail, though not finally, by the NCAA. As early as February 1, 1984, in the *NCAA News,* a series of guidelines were published with suggestions for institutions on how to implement their own drug screening policies. The first, identified in the introduction above, was of course to consult legal counsel. The NCAA guidelines will be discussed below in analysis of the American Council on Education guidelines.

The NCAA Council of Presidents took further and more decisive action in the spring of 1986 in adoption of resolution number 30 concerning drug testing. Amendments to the NCAA constitution and bylaws, as well as executive regulations, implemented specific drug testing programs for NCAA championship or certified post-season football contests; but carefully examined, these new rules go further. One of the most significant aspects is the lengthy list of drugs banned by the NCAA (See Appendix "A"). The new legislation from the NCAA first requires that any student athlete, annually and prior to participation in competition of any kind, must sign a statement, which requires that the athlete consent to "be tested for the use of drugs prohibited by NCAA legislation." Further, staff members of athletic departments of member institutions who have knowledge of the use of a banned drug in post-season play and fail to follow their own institution's procedures for dealing with drug abuse must be subject to disciplinary action.

The specific prohibition in post-season play is found in bylaw 5-2, as follows:

> "(a) A student-athlete who is found to have utilized (in preparation for or participation in an NCAA championship or certified post-season football contest) a substance on the list of banned drugs set forth in executive regulation 1-7-(b) [Appendix "A" to this article] shall not be eligible for further participation in post-season competition. Subject to the ineligibility provisions of the following paragraph, the certifying institution may appeal to the Eligibility Committee for restoration of the student-athlete's eligibility if the institution concludes the circumstances warrant restoration.
>
> (b) A student-athlete who tests "positive" in accordance with the testing methods authorized by the executive committee shall remain ineligible for post-season competition for a minimum of ninety (90) days after the test date. If the student-athlete tests "positive" after being restored to eligibility, he or she shall be charged with the loss of one season of post-season eligibility in all sports and shall remain ineligible for post-season competition at least through the succeeding academic year.
>
> (c) The executive committee shall adopt a list of banned drugs, shall authorize methods for drug testing of student-athletes who compete in NCAA championships and certified post-season football contests, and, in conjunction with the Council, may provide guidelines for drug testing of student-athletes by member institutions during the regular season."

Thus, to date, the NCAA has mandated drug testing and penalties involving ineligibility in post-season competition. They have pointed the way toward guidance during the regular season as well.

Of course, particular athletic conference rules, as well as institutional rules must be consulted on matters pertaining to student eligibility and sanctions, before adopting without question any existing suggested policies.

Drug Testing in the Courts

The concept of drug testing in athletics has not yet reached the point in litigation where any definitive

precedent has been established. In a related area, however, urine testing as a means of identifying students using drugs or alcohol, without regard to athletic participation, has been ruled to be violative of a student's Fourth Amendment rights. The case has not yet been finally adjudicated, but should be watched in this area. *See, Odenheim v. Carlstadt-East Rutherford Regional School District,* _____ N.J. Super. _____, _____ A.2d _____, (N.J. Super. Ct. Ch. Div. December 9, 1985), appeal filed No. A-2659-85T1 (N.J. Super. Ct. App. Div. filed February 13, 1986). The court there held that a school board policy adding urine testing for drug or alcohol use as an integral part of an annual physical examination, required of all students in the New Jersey school system, was violative of students' privacy rights, and further constituted a search in violation of the Fourth Amendment of the U.S. Constitution prohibiting unreasonable searches and seizures.

Again, the case is **not** precedent for a conclusion that such testing may not be imposed upon athletes, and further did not involve matters of consent. It should be watched, however, for future developments. It does not undercut the established legal precedent that, in general, student eligibility for athletic participation may be conditioned on the enforcement of reasonable rules, especially in the public school setting, such as rules involving tobacco or alcohol use during the athletic season. *See, e.g. Bunger v. Iowa High School Athletic Association,* 197 N.W.2d 555 (Iowa 1972). Such rules would generally qualify as training rules, routinely upheld. *Braesch v. DePasquale,* 265 N.W.2d 842 (Neb. 1978).

Drug testing in the employment setting has begun to receive focus in the courts of this country. This suggests that caution should be exercised in carrying out a drug testing program. One quite recent case demonstrates this. In *Jones v. McKenzie,* 628 F. Supp. 1500 (D.D.C. 1986) a school bus attendant (not a driver) was terminated from employement on the basis of a single unconfirmed positive urinalysis test using the EMIT CANNABINOID URINE ASA manufactured by the Syva Company. After finding that, under the circumstances of her employment, she possessed a constitutionally protected property interest in her job, the court analyzed the facts surrounding her testing, finding among other things that the school employers had ignored the test manufacturer's clear label warning that "positive results should be confirmed by an alternate method . . . ." Although the school employer had immediately done a manual retesting (as opposed to the first testing, done by computer) the court found that this was not an alternate testing method (interestingly, the employee had submitted to two voluntary tests immediately thereafter which were negative). The court held that her termination from employment was arbitrary and capricious, thus violating her due process rights. The court further found that a failure to provide her any kind of hearing prior to termination of employment also violated due process rights. Finally, the court found that she had a reasonable expectation of privacy from a search by mandatory urine testing for drugs, and thus the compelled urine testing constituted a search in violation of the Fourth Amendment to the U.S. Constituition. This was in part because the employer had no particularized reason to believe that the employee used, possessed, or was under the influence of drugs.

While the court opinion in *Jones* is not the final word on drug testing, it does indicate a direction that certain courts will take, and provide guidance which is useful in the drug testing areas for athletes. It especially argues for 1) obtaining fully informed consent from the athletes involved prior to undertaking both participation in athletics and in drug testing, and 2) the value of providing some form of limited due process prior to terminating participation or scholarship assistance. These points will be discussed below.

Suggestions for the Design of a Drug Testing Program

Because this issue has not yet been refined by court opinions that specifically address the administration of drug tests upon student athletes, the specific design of a drug testing program should be done with an abundance of caution, knowing that imposition of sanctions against students could give rise to a wide variety of bases for litigation against the educational institution. Nevertheless, as drug testing programs have developed, efforts have been made to try to collect information on existing programs, most recently by the prestigious American Council on Education. The Council's eleven (11) recommended guidelines, issued and authored by its general counsel in draft form on February 12, 1986, provide useful starting points, when read in light of a particular institutions' own legal parameters and necessities, for the design and implementation of drug testing program. Each of their guidelines will be set forth below, together with comments by the author concerning its implementation.

1. The purpose of programs for testing intercollegiate athletes for use of drugs should be to prevent use of performance-enhancing drugs that undermine the integrity of athletic competition. It is undesirable to employ drug testing programs as a means of detecting use of recreational drugs, whether their use is legal or illegal, that are not used to enhance performance.

Comment: The emphasis on testing only for performance enhancing drugs (presumably not only anabolic steroids, but also stimulants such as barbiturates, etc.) underlies programs which are targeted specifically to protect individual athletes and other persons participating with them. It is noted, however, that a significant number of drug testing programs, as well as NCAA legislation, now require testing for marijuana, THC, and other recreational drugs which might not be felt to be performance enhancing. The prohibition of use of recreational drugs may be found not so much in a desire to protect athletes but a desire to maintain an image of clean living for young athletes. Again, although final legal results have not been reached in litigation, it would appear that programs aimed at drugs which could harm the individual athlete or other participants, especially if the risk of injury was enhanced because of vigorous athletic participation, would stand the greatest chance of withstanding judicial scrutiny. Programs which attack recreational drugs only on the basis of image may be subject to question.

2. Drug testing programs should be sports-specific. Tests should focus upon drugs whose abuse can reasonably be anticipated because they are used to enhance performance in specific kinds of competition. Testing should also be scheduled to detect use of drugs affecting athletic competition, rather than use of drugs at any time.

Comment: See the above comments in guideline number 1. Again, the more specific a program is, the more likely it is to withstand judicial scrutiny. In a subsequent revision of these guidelines, it is likely that the suggestion to restrict testing to the season of the sport will be revised in light of the reality that many

athletes are in some form of training almost continuously.

3. The drug testing program should incorporate procedures guaranteeing the accurate identification of each individual's test results and provide for additional verification of initial positive test results through extremely reliable test procedures.

Comment: Certainly a majority of drug testing programs implemented to date provide for prompt retesting after an initial positive test result is found. Many characterize the first test as, if positive, presumed to be flawed so that a second test is immediately run. On most campuses, where the test is run for a drug which may be promptly screened, the results are learned in a matter of minutes, and prompt retesting is feasible. For the reasons noted in the court opinion in *Jones v. McKenzie,* above, the second testing after an initial positive test should be done using alternative methods, preferably in a controlled medical laboratory setting. Further, it has been suggested that, unless the period for testing accurately after a specimen is taken is so short as to render this meaningless, the athlete should be permitted to provide a specimen for independent testing at his own expense.

4. The drug testing program should provide students, for whom test results are positive, adequate notice and the right to a hearing prior to any adverse action based on the test. The more severe the potential sanction, the more formal must the hearing procedures be in affording the student the opportunity to present information in his or her defense and to challenge evidence and testimony against him or her before neutral hearing officers. Procedures incorporate a right of review and appeal prior to the imposition of severe sanctions, such as loss of eligibility or rescission of an athletic scholarship.

Comment: Again, the entitlement to a hearing and due process, based on constitutional grounds could arise only if an athlete is found to have a property interest in athletic participation or scholarship assistance. While these questions have, as noted above, been for the most part answered negatively, the reality is that courts are prone to find, if not an outright property interest, some requirement for fairness which, though not always of constitutional dimension, can be most easily met if the athlete has had an opportunity to present his or her side of the story in some form of impartial due process procedure. Many drug testing programs designed to date have provisions for up to three positive test results, with increasingly severe sanctions attached to each, commencing with mandatory counselling, followed by suspension from participation for varying lengths of time, and culminating in release from a program and, if applicable, cancellation of scholarship assistance, most often at the end of the academic year in question. The design of a hearing procedure in such cases is a wise check on the kinds of problems that could arise under such cases as *Jones v. McKenzie,* above.

5. The drug testing program should include procedures protecting the privacy of all athletes. Information disclosed by testing must be restricted to personnel responsible for administering the program. No other release of the information can be authorized without the athlete's written consent or appropriate judicial process.

Comment: The release of information is of vital importance, in light of several legal as well as medical constraints. First, there will be many situations when an effective counselling program will almost require release in certain instances. For example, even though an athlete may be over the age of majority, effective counselling might be most easily achieved by involving parents or a spouse. The release of information may, however, violate the physician-patient privilege, as well as the rights of a student in his educational records, protected by what is commonly known as the "Buckley Amendment", the Family Educational Rights to Privacy Act, 60 U.S.C. Section 1232g. The Buckley Amendment does provide for the release of otherwise privileged records upon consent from the affected student (or if a minor, the student's parents).

On the other hand, the educational institution in many cases will strongly desire not to release the information, for example, if sought by law enforcement personnel or the local press.

It thus appears most effective to accomplish two things in a drug screening program: provide the greatest confidentiality for the records assembled, by assuring in the program that they 1) are "education records" protected by the Buckley Amendment, and 2) to the greatest extent possible under the particular state's physician-patient privilege are matters of the privilege existing between the athlete and a particular physician, perhaps most often the team physician or the director of an institution's health center. Assistance of legal counsel should be obtained to, as much as possible, describe these records in such a manner as to protect them in at least these two ways.

Next, after protecting the records, it will be most useful if the student (and parents if the student is a minor) fully execute a knowing and informed consent to release of the information as appropriate to at least 1) parents and/or spouse, 2) athletic department personnel with a "need to know", hopefully as few as possible, and 3) appropriate counselors, and others as needed. The need for protection of the information, yet disclosure when needed to implement counselling, cannot be overemphasized. Finally, there should be not promise of confidentiality which would violate the particular laws that affect the institution. For example, a blanket promise of confidentiality which could be overcome by a particular state's public information or public records laws could give rise to unneeded litigation. A specific caveat that confidentiality is provided "to the extent allowed by law", or similar wording, would be wise.

6. The drug testing program should include written rules governing each step of the program, including: means of selecting students for testing; scheduling and collection of samples; testing of samples; determination that a test result is positive; means of verification of positive results; communication with students and third parties about positive test results; counselling to be provided; sanctions to be imposed for violations of the drug use policy; applicable hearing/due process procedures; and schedule of penalties imposed for particular violations or cumulative violations.

Comment: This section is self-explanatory. Any written rules should be carefully drafted to cover as many eventualities as possible, and once written, the rules should be very carefully adhered to in all circumstances. Numerous court opinions have held simply that public bodies are required to follow their own rules, and if an educational institution deviates from an established program in a way that jeopardizes a student athlete's participation, litigation could easily result.

7. The drug testing program should require students to give their written consent to the program prior to their participation in any intercollegiate athletic program. There must at this time be full disclosure to athletes of all facts surrounding the program so that each student can give his or her informed consent.

Comment: The student athlete's consent (and the parents if the student is a minor) should be broad and all encompassing, and at a minimum should include 1) acknowledgement of receipt of a copy of the program, 2) written acknowledgement that the student will be bound by the program, 3) written understanding that a failure to sign the consent will result in denial of participation (and, if appropriate, scholarship assistance) but no punitive sanction, and 4) a full acknowledgement of the student's right to confidentiality of the results (to the extent allowed by law) under the physician-patient privilege, if applicable in the particular state, and the Buckley Amendment, as well as a specific written consent and waiver for the release of the information under the parameters discussed under guideline 5 above.

The importance of obtaining this consent prior to implementation of the program as to a particular athlete can not be overemphasized. The consent will, if properly handled, and hopefully witnessed by additional persons, go a long way toward avoiding problems regarding Fourth Amendment search and seizure questions, confidentiality questions, and basic questions of fairness.

8. Any college with a testing program should provide full and complete information about the program to all intercollegiate athletic recruits early in any recruitment process (and certainly before any recruit makes a decision upon any offer from the college) and to all students prior to their enrollment.

Comment: The provision of this information goes hand in hand with obtaining full consent. Difficult issues could arise if students are informed of the potential loss of their participation and scholarship assistance after having been recruited, perhaps after having participated, and certainly after receiving scholarship aid.

9. The information provided to students should at a minimum include the written program itself; a full description of the purposes of the drug testing program; the procedures for collecting samples; procedures upon determination that a test result is positive, including both verification of the result and the hearing procedures; and sanctions to be imposed for the first and subsequent violations of the drug use policy as determined by the testing program. The information should be clear, complete and accurate, and acknowledge the risk that information from the testing program may be accessible to third parties.

Comment: See comments under guidelines 7 and 8, above.

10. The drug testing program should include procedures for training (and regularly monitoring or retraining) college personnel in all aspects of their responsibilities related to the program, including: testing techniques; the need to adhere to the governing rules and procedures; legal rights and responsibilities implicated by the program; the overriding need for confidentiality of information about drug testing results; and who is to be consulted in the event of any questions or controversies that may arise.

Comment: No comment required.

11. Any college with a student athlete drug testing program should also have a policy forbidding any college personnel from providing performance-enhancing drugs or encouraging or otherwise inducing student athletes to use drugs, except as specific drugs may be prescribed by qualified medical personnel for treatment of individual students. The college should also establish and publicize its procedures for handling complaints that staff or faculty has encouraged or induced use of performance-enhancing drugs. Such complaints should be processed by school personnel that are independent of the athletic department and who have full authority to investigate such allegations.

Comment: Although the design of most drug testing programs has been, and properly so, around the concept that the program is designed to protect students, the programs can take on a punitive connotation. Such a connotation would be especially strong if drug testing results were shared outside those with a need to know for counselling and program purposes, for example, if the results reached the hands of the law enforcement personnel. But the best program would probably be one which differentiates between the student athlete who may be using drugs, and the student athlete or his contact who is distributing or selling drugs. One program deals with this problem by providing the following statement in it:

> Although confidentiality of test results will be maintained as prescribed herein, availability of the intercollegiate athletics drug education program shall not preclude the imposition of university disciplinary sanctions, or criminal prosecution, if any student athlete's conduct as a member of the university community or otherwise calls for such proceedings, as, for example, if the student's conduct is disruptive, or the student is engaged in sale or distribution of illegal drugs or controlled substances. In such event, the program will not be available to any such student athlete, and appropriate disciplinary measures will be commenced.

The actual procedural aspects of a drug testing program can most appropriately be designed by each institution as the needs of the program are determined. There are several aspects of many programs, however, which deserve passing mention.

Most existing programs provide for three levels of testing. The first positive test might either be found during a routine pre-participation physical when every athlete in a particular sport is screened, or might occur during a subsequent random test. Most programs with which the author is familiar provide, as noted above, for immediate retesting on the assumption that the first test was flawed in some way. The immediate retesting is then completed under an alternate laboratory procedure.

On confirmation of a positive test during the first testing cycle, athletes are frequently required to participate in a counselling program which, depending upon the program, might or might not include parental or spousal contact. Actual suspension from play, typically, would not occur on a first positive test unless such suspension was medically indicated for the health of the athlete or other participants.

At an appropriate period of time later, which period might be determined by the nature of the drug found during the first positive test, a second test is administered. Again, if it is found positive, an immediate retest under alternate laboratory conditions is completed. If this retest is confirmed positive, many programs provide for a short term suspension from participation together with more stringent counselling requirements. Involvement by additional athletic personnel, counsellors, the parents or spouse is more frequently found after the second positive test result.

On a third positive test, many programs now provide for long term suspension from the program and, if warranted, loss of financial aid.

Generally the refusal by a student athlete to submit to

testing, after having consented to implementation of the program, is viewed as a positive test result and accelerates the level of counselling to the next step.

Conclusion

Again, because the majority of legal issues directly involving drug testing of student athletes have never been tested in the courts, it is impossible to state definitive legal principles that will control the outcome of any litigation arising under such programs. The foregoing discussion contains suggestions from examination of several programs as well as general legal principles that would probably form the basis for analysis by courts today.

Some general comments may serve to focus on the key points at issue, however. First, any program should be very carefully designed and documented prior to its implementation. The more detail that can be drafted into the program, where that detail is carefully followed by school personnel, the less likely it is that a court would find school personnel to be arbitrary or capricious in their implementation of the program.

Second, probably the two key players in the design of a program should be an educational institution's sports physician and its lawyer. The physician's role is vital to assure that there is a medical justification for the aspects of the program which will perhaps form the basis for court challenges in the future, such as the drugs tested, the sports in which the athletes are being tested for those drugs, the custody of specimens, and the like. The lawyer must assist in drafting procedures that do provide fundamental fairness to the student athletes affected by the program. Individual matters of state law, including matters of confidentiality and physician-patient privilege, institutional rules, conference rules and the like will play a large part in the design of a program that will withstand scrutiny in each locale, and for this the need for local counsel is obvious.

Third, the program has a significant likelihood of withstanding any judicial scrutiny if it can truly be implemented for the benefit of the participating student athletes. If the program is viewed by the courts as having originated for a punitive, or a face-saving, rather than a medical purpose, the program will be scrutinized much more carefully as to its impact upon the constitutional rights of participants, and will stand a much greater likelihood of being successfully challenged. Hand in hand with this is the need to maintain confidentiality to the greatest extent possible, and for the institution not to make use of the results of the program itself, or to provide them for the use of law enforcent personnel, but to zealously maintain the integrity of the program for the protection of the student athletes and the protection of athletic competition in general.

Appendix "A"

"Section 7. Drugs. (a) The Executive Committee shall authorize methods for drug testing of student-athletes who compete in NCAA championships and certified postseason football contests. The authorized methods, and any subsequent modifications, shall be published in The NCAA News and copies of the report shall be available, on request, to member institutions. The Executive Committee shall determine those championships and certified postseason football contests for which drug tests shall be made and the procedures to be followed in disclosing its determinations.

"(b) The following is the list of banned drugs:

"(1) Psychomotor stimulants:

amphetamine
ethylamphetamine
benzphetamine
chlorphetermine
cocaine
diethylproplon
dimethylamphetamine
pemoline
phenmetrazine
pipradol
fencamfamin
meclofenoxate
methylamphetamine
methylphenidate
norpseudoephedrine
phendimetrazine
phentermine
prolintane
and related compounds

"(2) Sympathomimetic amines:

chlorprenaline
ephedrine
etafedreine
isoetharine
isoprenaline
methoxyphenamine
methylephedrine
phenylpropanolamine
and related compounds

"(3) Miscellaneous central nervous system stimulants:

amiphenazole
bemigride
caffeine[1]
cropropamide
crolethamide
doxapram
ethamivan
leptazol
nikethamide
picrotoxine
strychnine
and related compounds

"(4) Anabolic steroids:

clostebol
dehydrochlormethyl-testosterone
fluoxymesterone
mesterolone
methenolone
methandienone
nandrolone
norethandrolene
oxandrolone
oxymesterone
oxymetholone
stanozolol
testosterone[2]
and related compounds

"(5) Substances banned for specific sports:

Rifle:
alcohol
atenolol
metoprolol
nadolol
pindolol
propranolol
timolol
and related compounds

"(6) Diuretics:

bendroflumethiazide
benzthiazide
bumetanide
chlorothiazide
chlorthalidone
cyclothiazide
ethacrynic acid
flumethiazide
flurosemide
hydrochlorothiazide
hydroflumethiazide
methyclothiazide
metolazone
polythiazide
quinethazone
spironolactone
triameterene
trichlormethiazide
and related compounds

"(7) Street drugs:

amphetamine
cocaine
heroin
marijuana[3]
methamphetamine
THC (tetrahydro-cannabinol)
others

"Definition of positive depends on the following:
[1] for caffeine—if the concentration in urine exceeds 15 micrograms/ml.
[2] for testosterone—if the ratio of the total concentration of testosterone to that of epitestosterone in the urine exceeds 6.
[3] for marijuana—based on a repeat testing.

"(c) Exceptions for categories (5) and (6) of paragraph (b) of Executive Regulation 1-7 may be made by the Executive Committee for those student-athletes with a documented medical history demonstrating the need for regular use of such a drug."

Reference

1. Percy E: Are athletes playing with drugs? *The American Journal of Sports Medicine* 12(1): 31-38, 1984. ⊕

Duke Simpson Revisited

Mont M. Linkenauger, MEd, ATC, RPT

In his book, *Athletic Injuries, Prevention, Diagnosis* and *Treatment*, Augustus Thorndike (1) said of the Duke Simpson taping for unstable knees, "If this strapping fails to hold a knee from further sprain, no brace or other contrivance will".

Dr. Thorndike's statement as to the effectiveness of the Duke Simpson is still true today in spite of the range of expensive and exotic devices now on the market.

Though the Duke Simpson should never substitute for the effective rehabilitation of the quadriceps and hamstring muscles, it can stabilize the knee joint in every plane including rotation. "This strapping has held several bad cruciate ligament cases through an entire varsity football season", continued Augustus Thorndike.

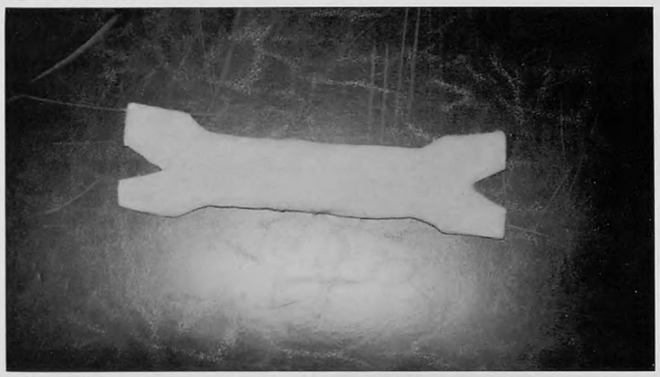


Figure 1. Cut from the felt a strip 3″ wide and long enough to pad the popliteal space and to come within one inch of the patella on each side. Cut ½″ strips from either side and a V in each end leaving the ends 3″ wide and the center strap 2″ wide as shown.

Figure 2. With the leg cleanly shaved and sprayed with adhesive, apply the felt popliteal pad with 2″ white tape. Divide the 2″ tape into 1″ tails and apply one inch above and below the patella as shown. Note: these can be used as a guide for the tape to follow.

This author has employed the Duke Simpson taping for thirty years on all types of unstable knees. Only one reinjury has occurred during that time. To apply the Duke Simpson you need the following:

- ⅜″ Orthopaedic felt
- Adhesive spray
- 1 Roll 2″ white tape
- 1 Roll 1½″ white tape
- 1 Roll 1″ white tape
- 1 Roll 3″ elastic tape

Position: Subject being taped should be seated on the taping table with the knee flexed to 40° and the ankle in dorsi flexion as shown in Figure 2.

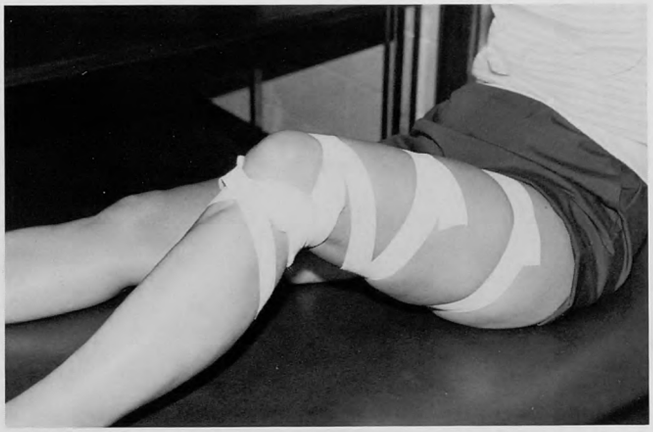


Figure 3. Apply two anchors (using 1½″ white tape), the first, 2/3 up on the thigh, the second at mid thigh.

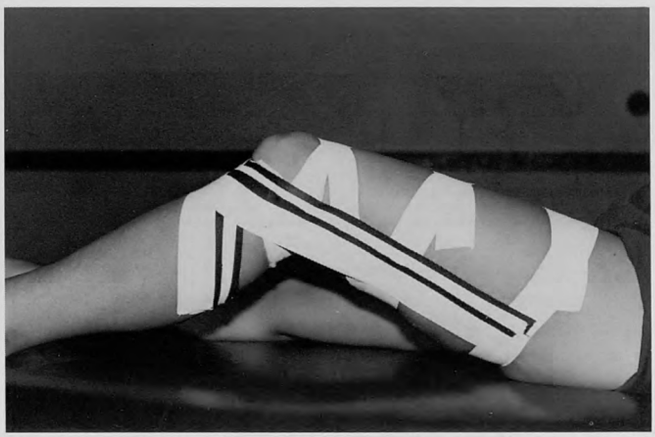


Figure 4. Apply the 1½″ stirrups alternately to support the medial and lateral collateral ligaments respectively, three on each side, using the lower 1″ strips as a guide. Note: two additional anchors should be applied directly over the first two to hold the stirrups in place.

continued on page 339

A university study proves Gatorade® Thirst Quencher outperforms water.

Read the facts.

For more information or additional brochures call this toll free number: **1-800-428-6000.** In Indiana call **317-543-5553.**

FLUID REPLACEMENT FACTS

ly 1″
uing
well
ply a
hree
plied
n the

will
ghts,
ssive
pport

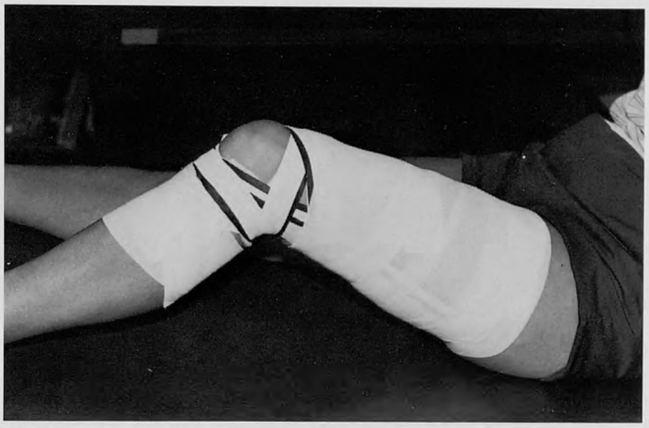


Figure 6. Apply elastic tape to anchor the strapping. Note: the elastic tape is applied from the top downward to avoid rolling up when tight uniforms are pulled on as in football.

Reference

1. Thorndike A: *Athletic Injuries Prevention, Diagnosis and Treatment.* Philadelphia, Lea and Febiger 1948, pp. 206-208. ⊕

Be sure to return your 1987 membership renewal by February 15, 1987

A unive
study pr
Gatora
Thirst Que
outperform

Read the

SPORT DRINKS OUTPERFORM WATER

A recent study conducted by researchers at the University of South Carolina's Exercise Physiology Laboratory indicates that some sport drinks can significantly enhance athletic performance and are absorbed into the bloodstream as fast as water.

The study compared the performances of 19 athletes who drank three types of fluid during two hours of exercise, during a 30-minute recovery period, and during an all-out exercise task that lasted about 30 minutes. The first fluid was a sport drink similar in composition to GATORADE® Thirst Quencher, containing moderate amounts of carbohydrate (6 percent sugar) and small amounts of electrolytes (sodium and potassium). The second drink was a low carbohydrate drink (2.5 percent sugar) that also contained small amounts of electrolytes. The third fluid was a water placebo.

The average time needed to complete the final exercise task was significantly less with the fluid similar in composition to GATORADE® than with water. The low carbohydrate/electrolyte beverage did not significantly enhance performance over water.

During the test, blood samples were taken from each subject at regular intervals to determine the rates of fluid entry into the bloodstream over time. Researchers found no significant differences for rates of fluid entry into the blood among the three fluid types.

For more information or additional brochures call this toll free number: **1-800-428-6000.** In Indiana call **317-543-5553.**

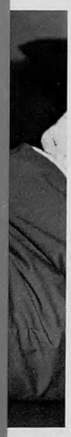
DEBUNKING THE SPORT DRINK MYTH

The data from the University of South Carolina (USC) research project contradict a current opinion among some athletes, coaches and exercise physiologists that plain water is absorbed into the body faster than any other fluid. Doctors Mark Davis, David Lamb and Russell Pate, co-investigators in the research project, say prior research focused only on stomach emptying, while the USC research investigated how quickly fluids actually get into the bloodstream.

"Stomach emptying will tell you how fast a fluid leaves the stomach, but that's only a part of the fluid absorption process," the researchers remarked. "Once the fluid leaves the stomach, it moves into the small intestine, becomes absorbed into the bloodstream, then circulates to the working muscles. Basing all absorption assumptions on gastric emptying is like watching the first 10 yards of a 100-yard dash to predict the finish."

The researchers said that plain, cool water always has been, and will continue to be, an effective fluid replacement beverage. However, during prolonged periods of exercise, rehydration with plain water can result in a drop of blood sugar levels and the forced mobilization of tissue energy stores—resulting in earlier fatigue and reduced endurance.

The findings of this study support previous studies that show certain carbohydrate/electrolyte drinks can contribute to improved athletic performance since they supply energy and may help maintain plasma electrolyte balance. This is especially important for athletes who may dilute their blood sodium level by consuming large amounts of plain water during prolonged exercise.



ly 1"
uing
well
ply a
hree
plied
n the

will
ghts,
ssive
pport

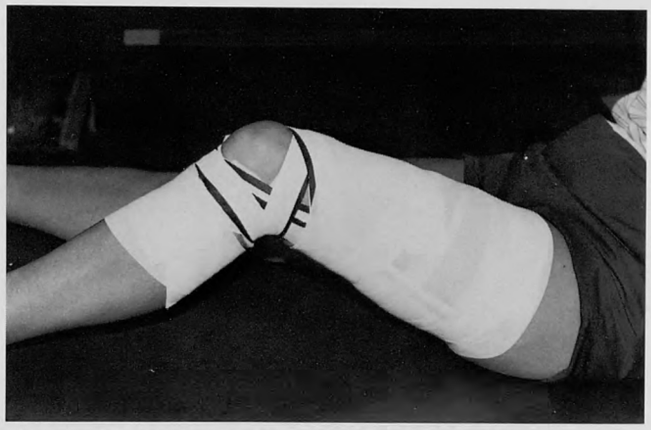


Figure 6. Apply elastic tape to anchor the strapping. Note: the elastic tape is applied from the top downward to avoid rolling up when tight uniforms are pulled on as in football.

Reference

1. Thorndike A: *Athletic Injuries Prevention, Diagnosis and Treatment.* Philadelphia, Lea and Febiger 1948, pp. 206-208. ⊕

Be sure to return your 1987 membership renewal by February 15, 1987

A unive
study pr
Gatora
Thirst Que
outperform

Read the

For more information or additional brochures call this toll free number: **1-800-428-6000.** In Indiana call **317-543-5553.**

COMMON

The following information pertains to a number of misconceptions regarding fluid replacement during exercise. The references cited have been drawn from a comprehensive literature review of information pertaining to this subject area. The references are not all-inclusive; rather they are cited as representative of the type of references and information available.

MYTH I. Sport Drinks Slow Gastric Emptying Which Can Detract From Athletic Performance

In recent years, some exercise scientists have made inferences regarding the efficacy of sport drinks based on gastric emptying studies. Unfortunately, judging the efficacy of sport drinks based solely on their gastric emptying characteristics is an oversimplification of the principles governing fluid absorption and exercise performance.

Gastric emptying can be affected by a number of variables. These include, but are not limited to: volume, caloric density, osmolality, acidity, temperature, and sodium content of the beverage (1, 22). In addition, there is great inter-individual variability in the gastric emptying response. This, coupled with the multitude of variables that influence gastric emptying, makes it difficult to determine with any certainty whether differences in gastric emptying are of physiological significance during exercise.

While some researchers have assumed that the reported delay in gastric emptying will translate into poorer athletic performance, there is no scientific support for that assumption. In fact, there is a growing body of evidence indicating that exercise performance is improved and physiological function maintained when carbohydrates are consumed during exercise (2, 3, 6, 12, 19, 24, 26).

MYTH II. Of All Fluids, Plain Water Empties From The Stomach The Fastest

If rapid gastric emptying was the sole characteristic upon which a fluid replacement beverage was judged, the drink of choice would be a slightly hypotonic saline solution. Such a solution is known to empty from the stomach faster than plain water (1, 7, 18). Even though these solutions empty from the stomach relatively quickly, they are not palatable, contain too much salt and do not supply energy.

MYTH III. Plain Water Is Absorbed Faster Than Any Other Fluid

Research shows that the small intestine absorbs fluid more rapidly from a glucose/sodium solution than from a purely saline solution. The presence of glucose stimulates sodium uptake across the small intestine, an action that significantly increases fluid absorption (8, 14). This is a primary reason why drinks containing carbohydrates and sodium, such as GATORADE® Thirst Quencher, are effective fluid replacement beverages.

REFERENCES

1. Brener, W., T. R. Hendrix and P. R. McHugh. "Regulation of the gastric emptying of glucose," Gastroenterology, 85:76-82, 1983.
2. Brodowicz, G. R., D. R. Lamb, T. S. Bauer and D. F. Connors. "Efficacy of various drink formulations for fluid replenishment during cycling exercise in the heat," Med. Sci. Sports Exerc., 16(2):138, 1984.
3. Costill, D. L., W. F. Kammer and A. Fischer. "Fluid ingestion during distance running," Arch. Environ. Health, 21:520-525, 1970.
4. Costill, D. L. and B. Saltin. "Factors limiting gastric emptying during rest and exercise," J. Appl. Physiol., 37 (5):679-683, 1974.
5. Coyle, E. F. "Gastric emptying rates of selected athletic drinks," Res. Quart., 49:119-124, 1978.
6. Coyle, E. F., J. M. Hagberg, B. F. Hurley, W. H. Martin, A. A. Ehsani and J. O. Holloszy. "Carbohydrate feeding during prolonged strenuous exercise can delay fatigue," J. Appl. Physiol., 55:230-235, 1983.
7. Davenport, H. W. Physiology of the Digestive Tract, 5th edition, Chicago: Yearbook Medical Publishers, 1982.
8. Fordtran, J. S. "Stimulation of active and passive sodium absorption by sugars in the human jejunum," J. Clin. Invest., 55:728-737, 1975.
9. Fordtran, J. S. and B. Saltin. "Gastric emptying and intestinal absorption during prolonged severe exercise," J. Appl. Physiol., 23:331-335, 1967.10.
10. Fordtran, J. S. and T. W. Locklear. "Ionic constituents and osmolality of gastric and small-intestinal fluids after eating," Amer. J. Dig. Diseases, 11(7):503-521, 1966.
11. Fox, E. L., D. K. Mathews, W. Kaufman and R. Bowers. "Effects of football equipment on thermal balance and energy cost during exercise," Res. Quart., 37:332-339, 1966.
12. Francis, K. T. "Effect of water and electrolyte replacement during exercise in the heat on biochemical indices of stress and performance," Aviation Space Environ. Med., 50:115-119, 1979.
13. Frizzell, R. T., G. H. Lang, D. C. Lawrence and R. Lathan. "Hyponatremia and ultramarathon running," JAMA, 255(6):772-774, 1986.
14. Gerson, C. D. "Glucose and intestinal absorption in man," Am. J. Clin. Nutr., 24:1393-1398, 1971.
15. Hecker, A. L. "Digestive, absorptive and metabolic characteristics of glucose polymers, in nutrient utilization during exercise," Columbus: Ross Laboratories, 1983.
16. Hiller, W. B. D., M. L. O'Toole, F. Massimino, R. E. Hiller, and R. H. Laird. "Plasma electrolyte and glucose changes during the Hawaiian Ironman triathlon," Med. Sci. Sports Exerc., 17(4):219, 1985.
17. Hubbard, R. W., B. L. Sandick, W. T. Matthew, R. P. Francesconi, J. B. Sampson, M. J. Dorkot, O. Maller and D. B. Engell. "Voluntary dehydration and alliesthesia for water," J. Appl. Physio., 57(3):868-875, 1984.
18. Hunt, J. N. and J. D. Pathak. "The osmotic effects of some simple molecules and ions on gastric emptying," J. Physiol., 154:254-269, 1960.

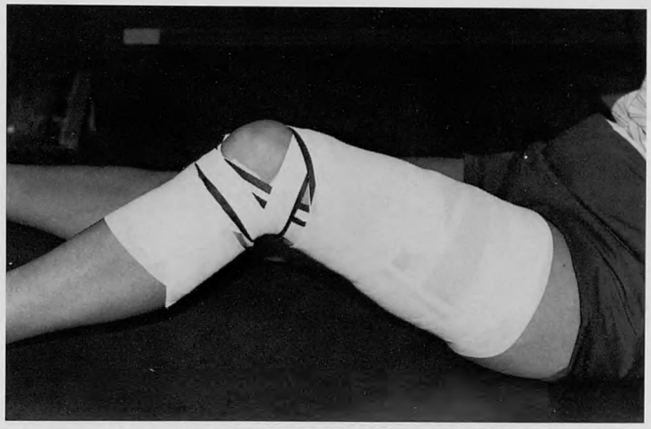


Figure 6. Apply elastic tape to anchor the strapping. Note: the elastic tape is applied from the top downward to avoid rolling up when tight uniforms are pulled on as in football.

Reference

1. Thorndike A: *Athletic Injuries Prevention, Diagnosis and Treatment.* Philadelphia, Lea and Febiger 1948, pp. 206-208. ⊕

Be sure to return your 1987 membership renewal by February 15, 1987

COMMON MYTHS ASSOCIATED WITH FLUID REPLACEMENT BEVERAGES

The following information pertains to a number of misconceptions regarding fluid replacement during exercise. The references cited have been drawn from a comprehensive literature review of information pertaining to this subject area. The references are not all-inclusive; rather they are cited as representative of the type of references and information available.

MYTH I. Sport Drinks Slow Gastric Emptying Which Can Detract From Athletic Performance

In recent years, some exercise scientists have made inferences regarding the efficacy of sport drinks based on gastric emptying studies. Unfortunately, judging the efficacy of sport drinks based solely on their gastric emptying characteristics is an oversimplification of the principles governing fluid absorption and exercise performance.

Gastric emptying can be affected by a number of variables. These include, but are not limited to: volume, caloric density, osmolality, acidity, temperature, and sodium content of the beverage (1, 22). In addition, there is great inter-individual variability in the gastric emptying response. This, coupled with the multitude of variables that influence gastric emptying, makes it difficult to determine with any certainty whether differences in gastric emptying are of physiological significance during exercise.

While some researchers have assumed that the reported delay in gastric emptying will translate into poorer athletic performance, there is no scientific support for that assumption. In fact, there is a growing body of evidence indicating that exercise performance is improved and physiological function maintained when carbohydrates are consumed during exercise (2, 3, 6, 12, 19, 24, 26).

MYTH II. Of All Fluids, Plain Water Empties From The Stomach The Fastest

If rapid gastric emptying was the sole characteristic upon which a fluid replacement beverage was judged, the drink of choice would be a slightly hypotonic saline solution. Such a solution is known to empty from the stomach faster than plain water (1, 7, 18). Even though these solutions empty from the stomach relatively quickly, they are not palatable, contain too much salt and do not supply energy.

MYTH III. Plain Water Is Absorbed Faster Than Any Other Fluid

Research shows that the small intestine absorbs fluid more rapidly from a glucose/sodium solution than from a purely saline solution. The presence of glucose stimulates sodium uptake across the small intestine, an action that significantly increases fluid absorption (8, 14). This is a primary reason why drinks containing carbohydrates and sodium, such as GATORADE® Thirst Quencher, are effective fluid replacement beverages.

MYTH IV. Plain Water Is The Best Fluid Replacement Beverage

Plain water has always been and will always be a good fluid replacement beverage. In fact, water is the primary rehydrating agent found in all fluid replacement beverages. However, water alone supplies neither energy nor electrolytes. Glucose and sodium, the carbohydrate and electrolyte most often found in sport drinks, are effective stimuli for fluid uptake in the small intestine (8, 14). In addition, research indicates that flavored, sweetened beverages encourage more fluid replacement (17). Finally, plain water has no performance benefit since it does not contain carbohydrates.

MYTH V. Beverages Containing More Than 2.5 Percent Carbohydrate Should Be Avoided Or Diluted In Half With Plain Water

Some exercise scientists have offered this advice on the basis of gastric emptying studies that indicate a 2.5 percent carbohydrate fluid empties from the stomach as rapidly as water (4). Such studies did not assess intestinal absorption, exercise performance or other physiological parameters of importance to fluid absorption during physical exercise. There is no evidence to indicate that a drink with 6 percent carbohydrate, such as GATORADE® Thirst Quencher, will compromise athletic performance. In fact, there is ample evidence that indicates that sport drinks, such as GATORADE,® maintain thermoregulatory and circulatory function as well as plain water and provide the additional benefit of improved exercise performance (2, 3, 6, 12, 24, 26).

MYTH VI. Sport Drinks Contain a Lot Of Sugar

The sugar content of commercially available sport drinks ranges from 1 percent to 14 percent. GATORADE® Thirst Quencher, the leading commercially produced sport drink, contains 6 percent sugar, or about 50 percent of the sugar found in regular soft drinks, fruit juices and fruit drinks (25).

Sport drinks such as GATORADE® contain sugar for a very good reason. The glucose found in GATORADE® encourages fluid replacement, stimulates water absorption in the small intestine and supplies energy to the working muscles (8, 14, 17).

MYTH VII. Sport Drinks Contain a Lot Of Salt

A common misconception regarding sport drinks is that they contain a high concentration of salt. In reality, most sport drinks are very low in salt content, when compared to other beverages.

For example, a liter of GATORADE® Thirst Quencher contains 20 percent of the salt found in an equal volume of tomato juice. GATORADE® supplies 20 milliequivalents per liter (mEq/L) of sodium and 3 mEq/L of potassium.

As a comparison, human perspiration contains 40 to 60 mEq/L of sodium and 3 to 5 mEq/L of potassium. The risk of producing an electrolyte imbalance in a normal, healthy adult or child as a result of consuming a beverage similar to GATORADE,® is virtually non-existent.

Research has indicated that drinking plain water during prolonged exercise may produce a dangerous condition known as hyponatremia—also known as water intoxication. Hyponatremia is characterized by low blood sodium levels (13, 20, 23). This condition does not occur frequently, but it is a risk that must be recognized.

MYTH VIII. Glucose Polymers Are a Superior Carbohydrate Source For Sport Drinks

Glucose polymers are composed of individual glucose molecules linked together.

Research has shown that glucose polymers are converted into individual glucose units in the small intestine prior to absorption.

Glucose is glucose. Polymers confer no demonstrable advantage over simple sugars and are indistinguishable in their ability to maintain physiological function during exercise (24).

MYTH IX. Fluid Osmolality Is The Major Determinant Of Gastric Emptying

The osmolality of a fluid is one of a number of variables that can affect gastric emptying; however, a more important determinant is the caloric content of the fluid ingested (1, 21, 22, 27). In other words, as the caloric content of a fluid increases, the stomach slows its rate of emptying, allowing a relatively constant and manageable quantity of nutrients to be introduced into the small intestine.

MYTH X. Sport Drinks Can Contribute To Dehydration, Thermoregulatory and Circulatory Dysfunction

Sport drinks, such as GATORADE® Thirst Quencher, have been shown to improve athletic performance and maintain physiological function. There is substantial evidence that physiological parameters are well maintained when carbohydrate/electrolyte beverages are consumed during exercise (2, 12, 24).

MYTH XI. By Not Drinking During Practice and Competition, Athletes Can Become Accustomed To Dehydration

Unfortunately, this myth has had tragic consequences. Between 1959 and 1962, twelve high school and college football players died from exertional heat stroke (11). Such occurrences are all the more tragic because they are easily preventable.

Withholding fluids during vigorous physical activity can produce dehydration, which can lead to heat exhaustion and heat stroke. Marathon runners, football players and military recruits have died from exertional heat stroke complicated by dehydration (20).

REFERENCES

1. Brener, W., T. R. Hendrix and P. R. McHugh. "Regulation of the gastric emptying of glucose," Gastroenterology, 85:76-82, 1983.
2. Brodowicz, G. R., D. R. Lamb, T. S. Bauer and D. F. Connors. "Efficacy of various drink formulations for fluid replenishment during cycling exercise in the heat," Med. Sci. Sports Exerc., 16(2):138, 1984.
3. Costill, D. L., W. F. Kammer and A. Fischer. "Fluid ingestion during distance running," Arch. Environ. Health, 21:520-525, 1970.
4. Costill, D. L. and B. Saltin. "Factors limiting gastric emptying during rest and exercise," J. Appl. Physiol., 37 (5):679-683, 1974.
5. Coyle, E. F. "Gastric emptying rates of selected athletic drinks," Res. Quart., 49:119-124, 1978.
6. Coyle, E. F., J. M. Hagberg, B. F. Hurley, W. H. Martin, A. A. Ehsani and J. O. Holloszy. "Carbohydrate feeding during prolonged strenuous exercise can delay fatigue," J. Appl. Physiol., 55:230-235, 1983.
7. Davenport, H. W. Physiology of the Digestive Tract, 5th edition, Chicago: Yearbook Medical Publishers, 1982.
8. Fordtran, J. S. "Stimulation of active and passive sodium absorption by sugars in the human jejunum," J. Clin. Invest., 55:728-737, 1975.
9. Fordtran, J. S. and B. Saltin. "Gastric emptying and intestinal absorption during prolonged severe exercise," J. Appl. Physiol., 23:331-335, 1967.10.
10. Fordtran, J. S. and T. W. Locklear. "Ionic constituents and osmolality of gastric and small-intestinal fluids after eating," Amer. J. Dig. Diseases, 11(7):503-521, 1966.
11. Fox, E. L., D. K. Mathews, W. Kaufman and R. Bowers. "Effects of football equipment on thermal balance and energy cost during exercise," Res. Quart., 37:332-339, 1966.
12. Francis, K. T. "Effect of water and electrolyte replacement during exercise in the heat on biochemical indices of stress and performance," Aviation Space Environ. Med., 50:115-119, 1979.
13. Frizzell, R. T., G. H. Lang, D. C. Lawrence and R. Lathan. "Hyponatremia and ultramarathon running," JAMA, 255(6):772-774, 1986.
14. Gerson, C. D. "Glucose and intestinal absorption in man," Am. J. Clin. Nutr., 24:1393-1398, 1971.
15. Hecker, A. L. "Digestive, absorptive and metabolic characteristics of glucose polymers, in nutrient utilization during exercise," Columbus: Ross Laboratories, 1983.
16. Hiller, W. B. D., M. L. O'Toole. F. Massimino, R. E. Hiller, and R. H. Laird. "Plasma electrolyte and glucose changes during the Hawaiian Ironman triathlon," Med. Sci. Sports Exerc., 17(4):219, 1985.
17. Hubbard, R. W., B. L. Sandick, W. T. Matthew, R. P. Francesconi, J. B. Sampson, M. J. Dorkot, O. Maller and D. B. Engell. "Voluntary dehydration and alliesthesia for water," J. Appl. Physio., 57(3):868-875, 1984.
18. Hunt, J. N. and J. D. Pathak. "The osmotic effects of some simple molecules and ions on gastric emptying," J. Physiol., 154:254-269, 1960.

FLUID REPLACEMENT FACTS

SPORT DRINKS OUTPERFORM WATER

A recent study conducted by researchers at the University of South Carolina's Exercise Physiology Laboratory indicates that some sport drinks can significantly enhance athletic performance and are absorbed into the bloodstream as fast as water.

The study compared the performances of 19 athletes who drank three types of fluid during two hours of exercise, during a 30-minute recovery period, and during an all-out exercise task that lasted about 30 minutes. The first fluid was a sport drink similar in composition to GATORADE® Thirst Quencher, containing moderate amounts of carbohydrate (6 percent sugar) and small amounts of electrolytes (sodium and potassium). The second drink was a low carbohydrate drink (2.5 percent sugar) that also contained small amounts of electrolytes. The third fluid was a water placebo.

The average time needed to complete the final exercise task was significantly less with the fluid similar in composition to GATORADE® than with water. The low carbohydrate/electrolyte beverage did not significantly enhance performance over water.

During the test, blood samples were taken from each subject at regular intervals to determine the rates of fluid entry into the bloodstream over time. Researchers found no significant differences for rates of fluid entry into the blood among the three fluid types.

DEBUNKING THE SPORT DRINK MYTH

The data from the University of South Carolina (USC) research project contradict a current opinion among some athletes, coaches and exercise physiologists that plain water is absorbed into the body faster than any other fluid. Doctors Mark Davis, David Lamb and Russell Pate, co-investigators in the research project, say prior research focused only on stomach emptying, while the USC research investigated how quickly fluids actually get into the bloodstream.

"Stomach emptying will tell you how fast a fluid leaves the stomach, but that's only a part of the fluid absorption process," the researchers remarked. "Once the fluid leaves the stomach, it moves into the small intestine, becomes absorbed into the bloodstream, then circulates to the working muscles. Basing all absorption assumptions on gastric emptying is like watching the first 10 yards of a 100-yard dash to predict the finish."

The researchers said that plain, cool water always has been, and will continue to be, an effective fluid replacement beverage. However, during prolonged periods of exercise, rehydration with plain water can result in a drop of blood sugar levels and the forced mobilization of tissue energy stores—resulting in earlier fatigue and reduced endurance.

The findings of this study support previous studies that show certain carbohydrate/electrolyte drinks can contribute to improved athletic performance since they supply energy and may help maintain plasma electrolyte balance. This is especially important for athletes who may dilute their blood sodium level by consuming large amounts of plain water during prolonged exercise.

19. Ivy, J. L., W. Miller, V. Dover, L. G. Goodyear, W. M. Sherman, S. Farrell and H. Williams. "Endurance improved by ingestion of a glucose polymer supplement," Med. Sci. Sports Exerc., 15:466-471, 1983.
20. Knochel, J. P. "Clinical physiology of heat exposure," Clinical Disorders of Fluid and Electrolyte Metabolism, New York: McGraw Hill, 1980.
21. McHugh, P. R. and T. H. Moran. "Calories and gastric emptying: a regulatory capacity with implications for feeding," Am. J. Physiol., 236 (5):R254-260, 1979.22.
22. Minami, H. and R. W. McCallum. "The physiology and pathophysiology of emptying in humans," Gastroenterology, 86:1592-1610, 1984.
23. Noakes, T. D., N. Goodwin, B. L. Rayner, T. Branken and R. K. N. Taylor. "Water intoxication: a possible complication during endurance exercise," Med. Sci. Sports Exerc., 17(3):370-375, 1985.
24. Owen, M.D., K. C. Kregel, P. T. Wall and C. V. Gisolfi. "Effects of carbohydrate ingestion on thermoregulation, gastric emptying and plasma volume during exercise in the heat," Med. Sci. Sports Exerc., 17(4):185, 1985.
25. Pennington, J. A. T. and H. N. Church. Food Values of Portions Commonly Used, 13th edition, New York: Harper and Row, 1980.
26. Sjogaard, G., B. Nielsen, F. Mikkelsen, B. Saltin and E. R. Burke. Physiology in Bicycling, Ithaca: Mouvement Publications, Inc., 1985.
27. Stevens, C., D. L. Costill and B. Maxwell. "Impact of carbohydrate source and osmolality on gastric emptying rates of liquid nutritionals," J. Parenteral and Enteral Nutr., 3:32, 1979.

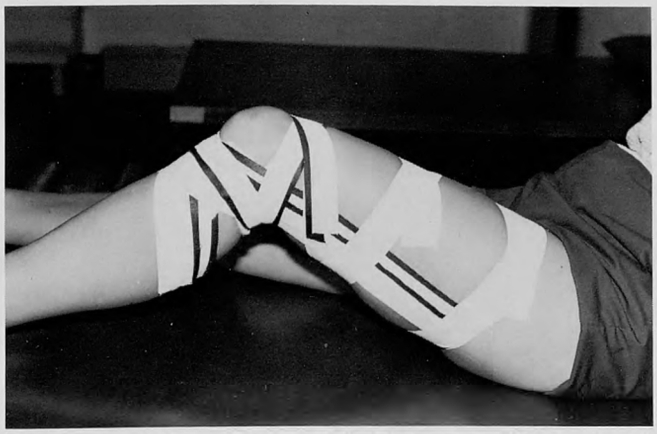


Figure 5. Using the upper 1″ strips as a guide, apply 1″ strips beginning on the stirrups, continuing under the popliteal pad and ending well across the mid-line of the lower leg. Apply a like strip to the other side. Two or three repetitions of these strips should be applied in order to restrict rotation of the tibia on the femur. These are called semi-eights.

When applied correctly, extension of the knee will increase the tension in the stirrups and the semi-eights, making the Duke Simpson more than just a passive device. It becomes an active participant in the support of all the knee ligaments.

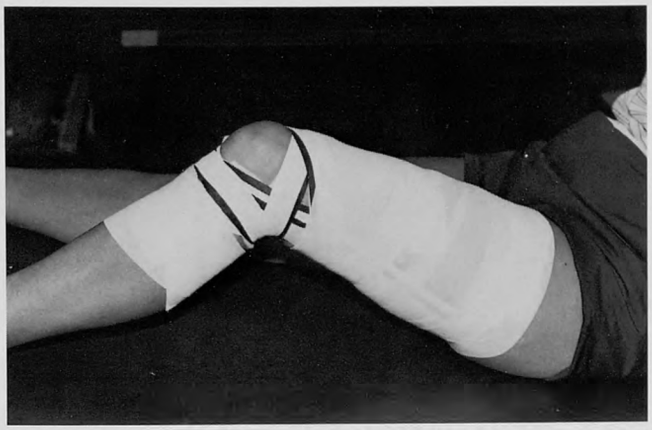


Figure 6. Apply elastic tape to anchor the strapping. Note: the elastic tape is applied from the top downward to avoid rolling up when tight uniforms are pulled on as in football.

Reference

1. Thorndike A: *Athletic Injuries Prevention, Diagnosis and Treatment.* Philadelphia, Lea and Febiger 1948, pp. 206-208. ⊕

Be sure to return your 1987 membership renewal by February 15, 1987

Case Report

Marfan's Syndrome

Thomas V. Gocke, MS, ATC

Each year the athletic trainer prepares for the upcoming season in various fashions. One of the more prominent undertakings prior to the start of practices/games is the administration of physical examinations. Many abnormalities are recognized during this particular time. However, one abnormality that the athletic trainer or physician may not see often is a disease known as Marfan's syndrome. Marfan's syndrome is a disease that causes degeneration of the body's connective tissue. This is seen clinically as retinal degeneration, musculoskeletal and cardiovascular abnormalities. Treatment of Marfan's will range from the use of Beta-blocking agents, to decrease stress on the heart and aorta, to surgical intervention. Surgical repair involves a replacement graft introduced into the heart for the purpose of repairing the aorta and aortic valve. In either event these patients should be restricted from extreme physical activity. Gone undetected, Marfan's syndrome could lead to catastrophic consequences.

A 19 year old male, who had played basketball at both the junior and senior high school levels, was recruited by a major university. On initial physical evaluation he measured approximately 7 feet in height and weighed in excess of 200 pounds. Gross orthopedic evalution revealed very long extremities, long, tapering fingers, a large wing span, hypermobile joints, slight scoliosis, stretch marks about the hips and a pronounced "pigeon" breast.

His past medical history was unremarkable, except between his sophomore and junior years in high school a "heart" murmur was discovered. To date, he has had no complaints of shortness of breath, fatigue, chest pain, abdominal distension, edema of the lower extremities, or heart palpitations. Prior to pre-season drills, he had a routine eye examination and was fitted with contact lenses. During this examination, retinal degeneration and bilateral lens dislocation were detected. At this point Marfan's syndrome was suspected and the team physician suggested chest and pelvic roentgenograms to document the presence of scoliosis and to determine if epiphyseal closure was complete. A cardiology follow-up was also suggested to rule out cardiac-related abnormalities.

The previous diagnosis of heart murmur was confirmed by the examining cardiologist. Electrocardiogram (EKG) and echocardiogram studies revealed signs of a markedly dilated aortic root. Further studies revealed prolapse in the mitral valve and possible prolapse in the tricuspid and aortic valves. There was Doppler evidence of aortic regurgitation.

Discussion

Marfan's syndrome is an affliction that was first described in 1896 by Bernard-Jean Antonin Marfan, a French pediatrician, whose early studies concentrated on skeletal and musculoskeletal abnormalities (i.e., excessive limb growth, large feet, long fingers) associated with the disease. Further research associated abnormalities of the eye and cardiovascular system with Marfan's and, in 1940, Baer et al. and Etter and Glover associated aortic dilation, aortic insufficiency and dissecting aortic aneurysm with Marfan's syndrome (1,2,5,8,9,10,14,15,20).

Today, Marfan's syndrome is defined as a hereditary disorder which primarily concentrates on the body's connective tissue. Pyeritz reports that two-thirds of all Marfan's patients inherit the disease from either one or both parents. The disease shows no prevalence of men over women or blacks over whites. While offspring of Marfan's victims have a 50% chance of developing the disease, 25% of those afflicted with Marfan's syndrome are without any family history of the disease. Furthermore, there are no reported incidences of generation skipping (6,16,17,18,19). This brings up a rather interesting theory as to how the disease is transmitted from parent to child and from generation to generation.

Marfan's syndrome is thought to be primarily autosomal dominant (16,18). Researchers believe that the mutated gene is a new variation in the genome of either the sperm or egg. In sporadic Marfan's syndrome cases, the fathers' ages are found to be older than the average age of fathers in the general population which may support the concept of "accumulating mutations" in spermatogonia in aging males (17,18,19). The mother's role in Marfan's development is less defined. However, either parent can pass on the mutant gene. Marfan's is characterized by disorders of the eye (Ectopia lentis), the musculoskeletal system (connective tissue disorders), and the cardiovascular system (aortic dilatation) (1,2,5,7,8,9,10,14,15,20).

One of the areas of concern is a condition of the eyes known as Ectopia lentis (bilateral subluxating or dislocating lenses) is considered a hallmark sign in the detection of Marfan's (1,2,7,8,18,19). This abnormality is almost always a bilateral occurrence with the lens being smaller than a normal lens. Myopia or near-sightedness is present in varying degrees (2,15,18). The literature reports that myopia may have some association to retinal detachment and, although this may not carry the dangers that musculoskeletal and cardiac abnormalities do, the clinical signs associated with the eyes are likely to be the first clue in early detection of Marfan's syndrome.

The second and most clinically conspicuous sign is seen in the abnormal growth of the musculoskeletal system. While increased height is an obvious finding, the patient will exhibit characteristic changes in other

Mr. Gocke is an Associate Athletic Trainer in the Sports Medicine Unit at Wake Forest University, Winston Salem, NC 27109.

areas of the body. These areas include a wing-span well in excess of the patient's height and elongation of both the metacarpals and metatarsals. This is evident by tapering at the distal phalanx of both the hands and/or feet. These abnormalities are commonly exhibited as Hallucis valgus, hammer toes, and comptodactyly (flexion deformity) of the fifth finger. Steinberg's thumb sign is present in the majority of cases (on opposition, the thumb will cross the hypothenar border and extend well beyond the ulnar margin (1,3,8,9,15). The Marfan's patient exhibits loose-jointed areas throughout the body, specifically the hips, patella, shoulders, fingers and knees (genu recurvatum).

Kyphoscoliosis is a significiant diagnostic sign with Marfan's patients. Marfan's patients kyphoscoliotic curves rarely appear before the ages of 10 to 12 years in females and 12 to 14 years in males (15). This delay may be associated with the onset of puberty and its accompanying growth changes. The presence of kyphoscoliotic curves can lead to asymmetrical chest and rib development. These abnormalities will exhibit themselves as either "pigeon" breast or "funnel" chest deformities.

The third and more life-threatening diagnostic signal is that of cardiovascular abnormality. The heart is a very complex network of cardiac muscle tissue, blood vessels, valves, and electrical impulses, and while all structures are very important to normal heart function, abnormalities of the heart valves and the aorta are of prime concern. Pan et al. report valvular deformity in Marfan's syndrome need not be isolated to a single valve, but is known to cause multivalvular complication (17). Prolapse of the mitral valve is seen in both Marfan's and non-Marfan's patients and by itself, prolapse of the mitral valve is rarely life-threatening. While the mitral valve develops prolapse in approximately 75-85% of all reported cases (13), it is the aortic valve insufficiency and multivalvular abnormalities that are characteristic in Marfan's syndrome (15,16, 17,18).

Aortic valve prolapse is associated with Marfan's syndrome (18). Prolapse of this valve can be related to a number of etiologies but, in this case, it is directly related to aortic root dilatation (4). Aortic valve prolapse shows enlargement of the valve leaflets (1,4,5,8,14,15, 16,17,18,19,20). The efficiency of the aortic valve is compromised and, as the disease progresses, the prolapse can turn into a leaking aortic valve (aortic regurgitation) (15,16,17,18,19,20).

When aortic valve regurgitation occurs, additional stress is placed on the heart — specifically the left ventricle. Aortic valve regurgitation allows small amounts of blood to backflow into the left ventricle following contraction of the left ventricle contraction (1,12,17,18,20). Since this creates an over abundance of blood in this structure, the ventricle must increase in size to accommodate the increased stroke volume. As the left ventricle increases in size, so does the stroke volume produced by contraction. Eventually, the left ventricle is unable to sustain this prolonged increase in stroke volume and this leads to an early onset of heart failure (1,16,20).

As previously mentioned, aortic root dilatation is a prominent cardiac abnormality in Marfan's syndrome (3,5,6,8,9,12,14,15,16,17,18,19). Detection of aortic root dilatation has been seen as early as birth, but usually shows no clinical significance until the twelfth to twentieth years of age (3,15). A rather serious side effect related to aortic dilatation is the presence of a dissecting aortic aneurysm which is directly related to a weakening

or thinning of the connective tissue associated with the aorta. Stedman and Taber define dissecting aortic aneurysm as splitting or dissecting of the arterial wall allowing blood to penetrate between tissue layers. This will lead to destruction of the vessel wall causing the aorta to become necrotic and weak (21,22). If the aortic root becomes too weak to support blood flow, the aorta will rupture. This is more commonly referred to as "acute dissection of an aortic aneurysm," and is the principle cause of sudden death in Marfan's patients (3,5,6,9,12,17).

The best means available to prevent an acute rupture is awareness of the warning signs. The most distinctive sign is an excruciating, penetrating chest pain that originates in the mid to upper back region (3). This feeling of pain will radiate throughout the body depending on the severity. Related signs include: syncope, restlessness, dyspnea, confusion, headache, nausea and vomiting (1,3,5,12,18,19,20).

Treatment

Treatment of the Marfan's patient will vary depending upon the degree of cardiac involvement, the degree of musculoskeletal involvement, the physician's experience with this disease and the patient's willingness to cooperate. It is the consensus of cardiologists consulted by this author that an athlete be barred from vigorous physical activity if there are any cardiac-related symptoms of Marfan's syndrome. This is also supported in studies by Pyeritz and Wappel, Maron et al. and Pyeritz and Conant.

The chance of acute dissecting aortic aneurysm is too great to allow participation in competitive athletics (1,4,6,8,9,12,14,16,17,18,19). When dissecting aortic aneurysm or dilatation is detected at an early stage, conservative treatment can be instituted. Pyeritz and Wappel have suggested that a variety of treatment programs be used to manage the cardiovascular abnormalities associated with Marfan's syndrome. They suggest Beta-blockers be used to reduce the stress on the heart and to regulate blood pressure. Specifically, the Beta-blocker will decrease the strength and frequency of heart contraction which, in turn, will decrease the strain placed on the left ventricle and aorta.

Prior to the mid-1970's surgical treatment of Marfan's patients was almost nonexistent. However, with the development of a Dacron tube graft which can be surgically implanted into the aorta, and by replacing the aortic valve, the outlook for Marfan's patients has changed dramatically (6,18,19). This life-saving technique now reduces the incidence of acute dissecting aortic aneurysm and decreases the inefficiency of the prolonged aortic valve (6,18,19). However, this surgery is performed solely for the purpose of enhancing the "quality of life" and not for the purpose of returning to competitive athletics.

Summary

A case involving a 19 year old male with Marfan's syndrome was detected and investigated through proper medical protocol. Individuals with Marfan's will exhibit retinal degeneration, bilateral lens dislocation, abnormal musculoskeletal changes and cardiovascular irregularities. Ectopia lentis is the "hallmark" symptom when musculoskeletal and cardiovascular manifestations are present.

Treatment for the Marfan's patient will depend upon the degree of advancement of the disease. Treatment includes observation and restriction of activities, the

First choice.

Why do more clinicians choose the Sonicator® than any other therapeutic ultrasound unit?

Perhaps it's because Mettler uses the most advanced technology to ensure effective, safe, reliable performance.

That means an innovative solid-state design with a choice of continuous or pulsed treatment modes. A seven-pound compact unit that delivers as much power as most large consoles. And digital readouts to precisely display both treatment time and power output.

The 10cm² Sonicator 706 provides the largest effective radiating area available, while the 5cm² Sonicator 705 permits solid surface contact in hard-to-reach places.

Membrane switching allows simple fingertip control of each function. And our watertight, lightweight transducer is anatomically designed to comfortably fit your hand. Direct crystal-to-patient contact enables more efficient energy transmission, while a no-load sensor automatically assures adequate coupling to the patient.

As a bonus, all the benefits of the Sonicator 706 now are available in the new small-transducer Sonicator 705.

If you're considering an ultrasound purchase, don't wait to find out more about the Sonicators. After all, first things first.

METTLER ELECTRONICS®

Mettler Electronics Corporation
1333 S. Claudina St., Anaheim, CA 92805 USA
(714) 533-2221, Cable: SONICATOR
Telex: 3718749 SONICATOR

use of Beta-blocking agents to decrease stress placed on the heart and if necessary, aggressive surgical intervention to repair the aorta and aortic valve.

The athlete's level of competitive participation will vary depending on the complete overview of the clinical findings. However, in cases involving progressive cardiovascular changes, participation on any level is not recommended.

This case serves to indicate the importance of a complete physical examination prior to competition in any athletic endeavor, regardless of level of participation. Failure to perform a complete evaluation in this case might have been disastrous.

References

1. Anderson RE, Pratt-Thomas HR: Marfan's Syndrome. *American Heart Journal* 46: 911, 1953.
2. Allen, Straatsma, Hall: Ocular Manifestations of Marfan's Syndrome. *Trans. Amer. Acad. Opthamology/Otolaryngology* 71: 18, 1967.
3. Ballenger M: Dissecting Aneurysms. *Emergency Magazine* 17(11): 25-26, Nov. 1985.
4. Cheitlin MD, Bonow PO, Parmley WW, Roberts WC, Swan HJ, Williams JF: Aquired Valvular Heart Disease. *Journal American College of Cardiology* 6(6): 1209-14, Dec. 1985.
5. Coffey, Barker, Friedland: Dissecting Aneurysm with Marfan's Syndrome. *Texas Journal Medicine* 51: 79, 1955.
6. Demak R: Marfan Syndrome: A Silent Killer. *Sports Illustrated* 64(7): 30-35, Feb. 17, 1986.
7. Duke-Elder WS: *Textbook of Opthamology*. St. Louis, C.V. Mosby Co. 1949 p. 4265.
8. Harrison: *Principles of Internal Medicine: The Inherited Disorders of Connective Tissue.* 7th edition. New York, McGraw-Hill Book Co. 7th edition 1974; pp. 1182-1184, 1247-1249, 2017-2019.
9. Hurst JW: Clinical Features and Prognosis in Dissecting Aneurysm of the Aorta. *Circulation* 35: 880, 1967.
10. Kirk JA, Ansell BM, Bywaters EG: "The Hypermobile Syndrome"; musculoskeletal complaints associated with generalized hypermobility. *Ann. Rheum. Dis.* 26: 419, 1967.
11. Maron, BJ, Epstein SE, Mitchell JH: Cardiovascular Abnormalities in the Athlete: Recommendations regarding eligibility for competition. 16th Bethesda Conference. *Journal American College Cardiology* 6(6): 1189-90, Dec. 1985.
12. Maron BJ, Epstein SE, Roberts WC: Causes of Sudden Death in Competitive Athletics. *Journal American College Cardiology* 7(1): 204-14, Jan. 1986.
13. Maron BJ, Gaffney FA, Jeresaty RM, McKenna WJ, Miller WW: Hypertrophic Cardiomyopathy, Other Myopericardial Diseases and Mitral Valve Prolapse. *Journal American College Cardiology* 6(6): 1215-1217, Dec. 1985.
14. McFarland J et al.: Medical Treatment of Dissecting Aortic Aneurysms. *New England Journal Medicine* 286: 115 1972.
15. McKusick V: *Heritable Disorders of Connective Tissue.* 4th edition. St. Louis, C.V. Mosby Co. 1972 p. 63-95, 101-189, 194-194-223.
16. McNamara DG, Bricker JT, Galioto FM, Graham TP, James FW, Rosenthal A: Congenital Heart Disease. *Journal American College Cardiology* 6(6): 1209-1214, Dec. 1985.
17. Pan CC, Chen CC, Wang SD, Hsu TL, Chiang BW: Echiocardiographic Study of Cardiac Abnormalities in Families of Patients with Marfan's Syndrome. *Journal American College Cardiology* 6(6): 1016-20. Dec. 1985.
18. Pyeritz RE: Marfan's Syndrome. *Hospital Medicine* Sept. 1985 p. 154-167.
19. Pyeritz RE, Conant J: *The Marfan Syndrome.* New York, National Marfan Foundation, 1984 p. 3-20.
20. Ross J, O'Rourke RA: *Understanding the Heart and its Diseases.* New York, McGraw-Hill Book Co. 1976 p. 66-69.
21. Stedman's' Medical Dictionary Illustrated, 23rd edition. Baltimore, Williams and Wilkins Co. 1976 p. 74.
22. Taber's Cyclopedic Medical Dictionary, 12th edition. Philadelphia, FA Davis Co. 1973 p. A-79. ⊕

Brochure Requests

Requests for the brochure entitled "Careers in Athletic Training" should be sent to the National Office at 1001 East 4th Street, Greenville, N.C. 27858. 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.

Attend the 38th Annual Meeting and Clinical Symposium

June 14-17, 1987

Columbus, Ohio

Suit 'em up...


No Glare
Special Protective Padding Systems
Energy Drinks and Bottles
Wound Dressings
Mouth Guards
Rib Pads
Tubular Compression Bandages
Tubular Pads
Special Protective Padding Systems
Analgesics
Mueller
Sports Balm
Mue
Prip Pt

.with Mueller.

They're ready for anything with Mueller.
And so are you. Because Mueller supplies over 200 different products to help keep your athletes safe, healthy and in the game.

A comprehensive system.
Mueller has led the way with a systematic approach to sports medicine. From pre-game preparation to immediate on-the-spot injury procedures to post-game treatment to long term therapy, our complete interactive family of supplies offers the best possible care.

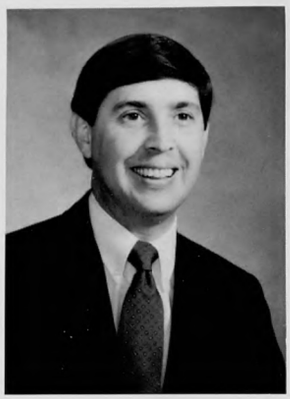
Leading sports medicine with new, innovative products.
While other companies offer only the old first aid supplies, Mueller has expanded the horizons of sports medicine by continually introducing new state-of-the-art medical products.

Demand Mueller.
Compare Mueller to your present supplier. We think you'll demand Mueller products from then on. You and your athletes deserve nothing less.

Mueller® Sports Medicine

One Quench Drive, Prairie du Sac, WI 53578
1-800-356-9522
608/643-8530 in Wisconsin

Editor-in-Chief Comments



Steve Yates, ATC, M.Ed
Wake Forest University
Winston-Salem, NC 27109

Welcome

It is with pleasure that the NATA welcomes Johnson and Johnson as a corporate sponsor. This fine company will provide significant support to our Association.

Progress

John LeGear of Timothy Communications reports progress with the number and quality of the media stories and Public Service Announcements being reported in our Public Relations Program.

Protective Cover

I trust the latest protective envelope will ensure safe and undamaged delivery of your Journal for the future.

Student Trainers

Please consider writing for the Student Trainer Corner and submit your articles to Dr. Deloss Brubaker following the guidelines found in the Guide to the Contributors.

New Editor

I would like to announce Dr. Ken Knight has agreed to be the new Editor in charge of manuscripts and technical material.

Closing

I wish to thank all those members who helped make the Fall 1986 30th Anniversary Edition Journal a success. I feel very proud to be the Editor-in-Chief of the Journal of the National Athletic Trainers Association.

Have a wonderful holiday season.

SY (SSSA)

MOVING?

Please notify the National Office of your new address as well as your old address (at least 30 days in advance of publication).

Letters to the Editor-in-Chief

(This letter was passed along to me and affects all Athletic Trainers. Editor-in-Chief)

August 15, 1986

Mr. Warren Morris
Head Trainer
Department of Athletics
The University of Georgia
Athens, GA 30613-2199

Dear Warren:

The NCAA Football Playing Rules Committee strongly supports employment of National Athletic Trainers Association, Inc. certified athletic trainers at the high school level.

The need for proper medical care for athletes is of utmost importance. We can not overlook our responsibility to the parents of young boys and girls participating in athletic activites.

We believe the employment of NATA certified athletic trainers is a must at the high school level.

Sincerely,

Homer C. Rice
Chairman
Football Rules Committee
The National Collegiate Athletic Association

October 8, 1986

Dear Mr. Yates:

I have just read the Public Relations article in the Committee Forum of the Fall issue on page 271 & 272 titled *Better Health Care "Imperative" for High School Athletes,* by John LeGear.

While thinking about this article I felt that a serious effort concerning secondary schools employing a Certified Athletic Trainer is again starting (perhaps as a result of a letter to Dr. Bobby Barton last year).

I would like to respectfully present the following thoughts to you in the sincere hope that we can increase our impact upon the secondary schools and the hiring of Certified Athletic Trainers.

1. Have school insurance companies lower their premium rate for any school district that employs a full time athletic trainer (certified by the NATA).
2. Receive and publish position or opinion stands from national professional organizations (American Medical Association, American Academy of Family Physicians*, American College of Health Associations*, American College of Sports Medicine*, American Corrective Therapy Association*, American Running and Fitness Association*, National Association of College Directors of Athletics*, National Association of Intercollegiate Athletics*, National Federation of State High School Associations*, National Football League Alumni*, President's Council of Physical Fitness and Sports*, WBA Athletic Federation*, National Association for Girls and Women in Sports*, National Athletic Head and Neck Injury Registry*, National Collegiate Athletic Association for Football Rules Committee*, NCAA*, Canadian Athletic Trainers Association*, Easter Seal Campaign, United States Olympic Committee*, American Physical Therapy Association*, National

continued on page 350

Comprehensive

MERAC

MERAC is the most comprehensive, biomechanical, Musculoskeletal, Evaluation, Rehabilitation, and Conditioning system available anywhere. MERAC offers:

- Isokinetic, Isokinetic Fatigue, Isotonic, Isotonic Fatigue, Isometric and IDVR Testing and Conditioning Modes
- Speeds to 500°/second, torque to 500 lb./feet
- Automatic calculations for work, power, fatigue, exertion and much, much more
- Protocol setup and storage
- Single bench system with attachments for all planes and testing protocols

Call **1-800-553-7901** for a free brochure or demonstration.

UNIVERSAL
Subsidiary of Kidde, Inc.
KIDDE
P.O. Box 1270
Cedar Rapids, Iowa U.S.A. 52406

AT-W86

Editor-in-Chief *from page 348*

Academy of Sports Vision*, Sports Medicine Congress*, National High School Athletic Coaches Association*, Joint Commission on Competitive Safeguards and Medical Aspects of Sports*, American Academy of Pediatrics*, National School Board Association*, American Association of School Administrators*, etc. *NATA aligned). These organizations were listed in the Fall 1986 *Athletic Training*.

3. Receive and publish endorsements made by health care advertisers, example: Johnson & Johnson "Certified Athletic Trainers . . . for the very best in Athletic Care. For more information, call the National Athletic Trainers Association 1-800-334-NATA".
4. Work with the organization Booster Clubs of America (national newsletter) to encourage (pressure) school boards into employing certified athletic trainers.
5. Encourage and report (publish) stats involved in athletic trainer costs. Example: The Chino Unified School District spends about .053 of the total operations budget of about 3 million dollars for the maintenance of two certified athletic trainers and their supply budgets (including facilities). If the Chino Unified School District was to become involved in a legal action the costs to that district may run as high as 6 million dollars or more. However, having Certified Athletic Trainers at each high school site doing their jobs (preventing, caring for, providing restorative care for, and recording of injuries both to Physical Education and Athletic Students, not to mention the public relations involvement) may be preventing a large award at the expense of the District Board.
6. A very large number of certified athletic trainers are now in the marketplace without a job. Perhaps they can be motivated to work toward establishing a larger marketplace for our services, in a organized manner, with national guidelines, based upon national goals and objectives.
7. About 10 years ago a bill was brought before the Congress of the United States with the intent of placing a Certified Athletic Trainer in each High School in the country. Perhaps you may wish to check this out and see if those who were urging this bill are still active and see if it can be reintroduced.

I hope that you will understand the ravings of a trainer who is sincerely interested in the future of Athletic Training, and was prompted by an article in the Journal to offer these rather poor solutions to a concern we all share.

Sincerely,

George V. Mrvichin, ATC
Chino High School
Chino, Calif. 91710

Support Our Advertisers — They Support You . . .

National Office Notes

WELCOME, NEW EDITOR

An ancient wise man (Buddha, I think) once said that whenever mankind had a great need for knowledge, a teacher would come forth. An analogy for the Journal would be that whenever we have had a great need for an editor, an outstanding one has been found. Our disappointment at losing Editor Don Kaverman has been assuaged beyond our expectations by the "coming forth" of Dr. Ken Knight of Indiana State University. Ken has worked with The Journal, as well as many other publications, for several years. Now we can proudly call him our very own Editor.

RECAPPING

Since this has been the year of reflection for the Journal (30th Anniversary!) the last issue of 1986 seems to be a good time to recap some of the material that has been published in this department since its first appearance in the Winter issue of 1982. I.E.:

The National Office Notes page made it possible for us to appeal to the entire membership and ultimately collect a complete library of all back issues of our Journal. This project spanned six issues, representing a year and a half of work, canvassing and correspondence, following up on every lead where a missing issue might be found. Now we have the complete up-to-date collection of back issues and can supply xerox copies of any article from any issue that has ever been printed.

Beginning with the Winter '82 issue the National Office Notes has covered the address change problem in almost every Journal. For four years we have continued to publish the same information over and over in an effort to inform and direct the membership on how to make sure an issue of the Journal is not missed. Would you believe 500 mailing labels from every issue are returned to the National Office due to incorrect address? The best way to avoid the "missing Journal syndrome" is simply to advise your post office to forward your second class mail when you change addresses — that is, if you're not going to give us "30 days notice" as requested. (see MAKING IT EASY below)

Until the Fall '85 issue when the *Committee Forum* section first appeared, the National Office page was used to make announcements and give current information from our various committees. Now our committee chairmen have their own department and members can turn to the *Committee Forum* and find all committee updates consolidated into one easily located section of the Journal. Of course, we continue to give you supplementary information from committees with offices here in Greenville.

Subjects covered in this department other than committee information have included: Listing of available back issues and how to obtain them; Information on upcoming annual meetings; "Newsy" items of interest; Updates on various topics of general interest, such as NATA insurance benefits; Important reminders and announcements; Referral to another section of the Journal that should have your attention; Requests from the National Office staff to help us serve you better; Tips on how to obtain various free items: Corrections on previous errors, to set the record straight; Introductions to new staff members; Reports on visitors to the National Office, plus invitations for more.

Over the years we have called your attention to important issues and not so important issues, but our initial goal was, and still is, "To inform and update the membership on various subjects of interest and answer the most frequently asked questions." And we still solicit and welcome your comments.

MAKING IT EASY

If you haven't thrown away the envelope this Journal arrived in, see the little box off to the side of your mailing label. This is as easy as we can make it for you to keep us updated on information concerning your address and telephone number. If you need to make changes in any of the areas specified, simply fill in the appropriate space, cut out the box along with the label, and return this to the National Office. We'll take it from there and will absolutely, unequivocally guarantee that you will miss no Association mail or your Journal if you follow the "30 days" specification. (Incidentally, most other publications require six weeks!)

COUPON RESPONSE

Our advertisers who have coupons in their ads want to hear from you. Just recently one of our advertisers stated that since very few of the coupons in his last ad had been returned, he assumed that the ad was not being read. Do let our supporters — our advertisers — know that you have noticed their announcements by returning their coupons. The free sample offers are a good way to try a new product, and at the same time give the advertiser an indication of the Journal's sales potential.

"FOR THE STUDENTS"

Encourage your students to submit articles for publication in the *Student Trainer Corner* section. This department was instituted to be "From the student, for the student, about the student" and with over 3000 student members in the Association, we should be getting more articles than we actually are. Tell your students to send their papers to Deloss Brubaker for consideration.

THE MEMBERSHIP OFFICE SAYS

Remember to pay your dues promptly, preferrably before February 1, 1987. After your name is deleted from the membership roster for non-payment on February 16, 1987, no check will be accepted without the $20.00 reinstatement fee. So if your check arrives on February 17th, it will have to be returned for the $20.00 additional payment. (This is **not** a National Office ruling as has been erroneously reported in some recent newsletters, but is in accordance with Board of Directors' Policy 7 published in the Summer National Office Notes, page 133.)

FROM THE CEU OFFICE

The current CE report period will end December 31, 1987. As we no longer have a probationary period, those who fail to meet the CEU requirement will have his/her name turned over to the Membership and Certification Offices for appropriate action at that time.

If you are an Associate or Certified member, do yourself a favor and review the Continuing Education Requirements and Activities. This information is published in every Winter issue of ATHLETIC TRAINING for *your* benefit.

FREE FOOT FACTS

The "TIPS" series of the American Podiatric Medical Association are available on request. Write to "TIPS", APMA, 20 Chevy Chase Circle, NW, Washington, DC 20015, and specify which of the following you would like to have.

* Americans Walk 115,000 Miles in a Lifetime
* Diabetic Feet Need Special Attention
* Don't Ignore Real Pain, Podiatrist Warns
* Extra Foot Protection Needed for Older Feet
* Faulty Feet Won't Stand Up to Aerobic Demands
* "Floating Foot Syndrome" Leads to Foot Ills
* Foot Care Essential for Expectant Mothers
* Healthy Feet Key to Skateboarding Fun
* Healthy Feet Key to Winter Sports Success
* High Heels OK for Play, But Not for All Day
* If You Can Move It, It's Not Broken, Just a Myth
* Is Barefoot Beautiful?
* Most Foot Problems Due to Heredity
* Prompt Treatment Needed for Hammertoes
* Proper Foot Care Can Dramatically Reduce Amputation Rate Among Diabetics
* Tennis Skills Useless If Your Feet Won't Hold Up
* Tips on Running Shoes
* Toenail Infections Increasing, Warn Podiatrists
* Trenchfoot Making Comeback Among School Children
* Walking a Sure Way to Fitness
* Winter Running — Do It With Care

continued on page 356

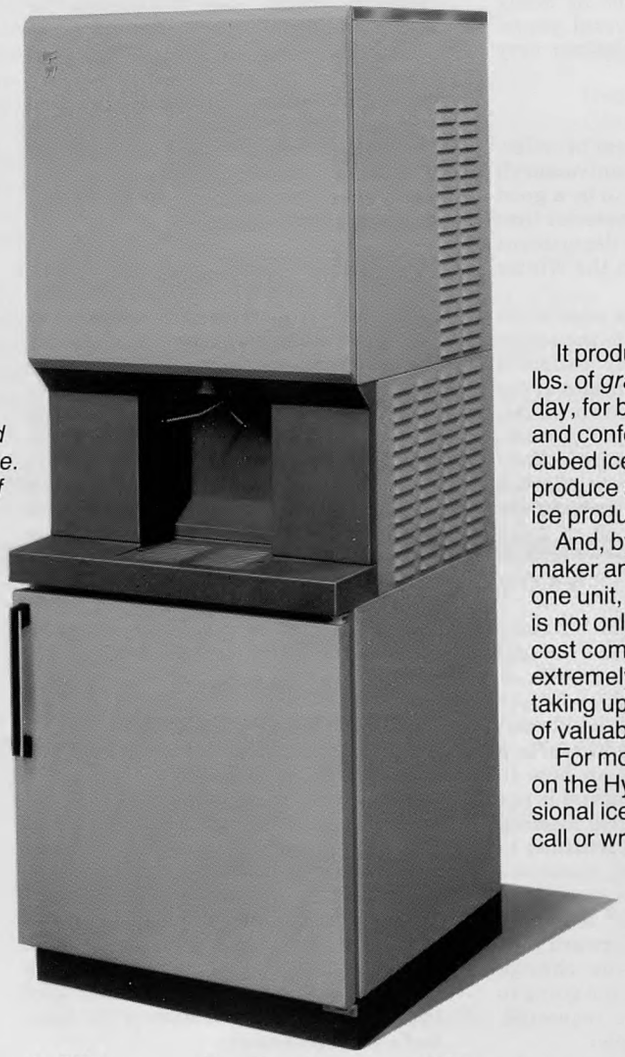
Introducing the only new ice machine for therapy that has 50 years experience.

Dave Tomasi
Program Director
Athletic Training
Lock Haven
University

"This unit was clearly designed for professional sports medicine. It finally takes ice therapy out of motel hallways and puts it in training rooms."

Ferno Ille brings over 50 years of knowledge and experience in hydrotherapy to this new and innovative Hydronix ice maker/freezer.

It's the first reliable, sanitary, efficient delivery system *specifically* designed for the ice modalities used by sports medicine professionals.



It produces up to 700 lbs. of *granular* ice per day, for better cooling and conformity than cubed ice; plus can produce and store solid ice products as needed.

And, by combining ice maker and freezer, into one unit, the Hydronix is not only extremely cost competitive, but extremely compact, taking up only 30″ x 26″ of valuable floorspace.

For more information on the Hydronix professional ice maker/freezer, call or write today.

Hydronix™ Ice Maker/Freezer

FERNO FORGE

A Division of
FERNO-WASHINGTON, INC.
70 Weil Way
Wilmington, Ohio 45177-9371
Phone: 513/382-1451
Telex: 214282 FERNOWASH WIMI

FL-037

Potpourri

Dennis Aten, ATC, RPT, MS

When Fire Scorches the Skin

Good Health Digest

As long as there has been fire, people have managed to burn themselves. Every year, more than 2.4 million Americans suffer burns. Fortunately, most burns are minor and can be treated at home, in a doctor's office, or a hospital emergency room. But about five percent of burn injuries (120,000 annually) are severe enough to require hospitalization. Deaths from burns total some 12,000 each year.

How a burn is treated depends on how severe it is. One measurement of a burn's severity is the depth of the injury. This is described by the degree of burn, characterized as follows:

*First degree — injures the epidermis or top skin layer. Redness, pain, no blistering;

*Second degree — injures the epidermis and some of the underlying layer. Red, mottled, blistered; weeping, wet surface; sensitive to air, severe pain;

*Third degree — injures full skin thickness. No blisters; leathery, white appearance; pain often absent because nerves in the skin have been destroyed;

*Fourth degree — injures full skin thickness, as well as underlying tissues, including muscle, tendon, joint and bone. Blackened appearance, dryness, severe pain.

Treatment

For first degree burns, nothing more than cool water may be needed. (Forget about what Aunt Amy said about using butter. Its salt content can be harmful if the skin is broken.) Also forget about ice; it may cause frostbite in the burned area. Studies show that ordinary, cool water slows inflammation, blistering and tissue damage. Other remedies if necessary: cocoa butter or petroleum jelly can be used to protect the burn from air, topical antibiotics to help prevent infection, and a number of nonprescription mediations to relieve pain. A burn that doesn't heal after seven days should be examined by a doctor.

More severe burns require professional attention. Moderate burns can often be treated without hospitalization. After the damaged skin is cleaned, fluid is usually drained from open blisters and the skin left in place to provide a natural cover. Some burns are covered with sterile gauze. Burns on the hands, legs, face, neck and thigh, however, are often left uncovered.

Hospitalization is a must for major burns, including second degree burns on more than 25 percent of the body (20 percent in children), third degree burns on more than 10 percent of the body, and on the hands, face or thigh area. Very old and very young patients should be hospitalized even with less severe burns. The risk of death for any burn victim increases in proportion to total skin loss. That risk is even greater for patients at both ends of the age scale.

Moped Accidents Are Never "Minor"

News Release

Though mopeds create excitement for many young adolescents, moped injuries have become a serious cause of traffic-related morbidity in children. And many of these accident victims haven't even reached the minimum driving age for any vehicle.

According to a study published in the November issue of *Pediatrics*, the journal of the American Academy of Pediatrics (AAP), moped injuries occur less frequently than bicycle injuries but are far more serious. Judity Westman, MD, and Grant Morrow, MD, report that of the 88 moped-related accidents they reviewed during a four-month period, 50 percent of these patients suffered orthopedic injuries and 46 had neurologic injuries.

The physicians, from Children's Hospital of Columbus, Ohio, and Ohio State University College of Medicine pediatrics department, noted that these injuries resulted in average hospital stays of 8.5 days; 14.6 days for intensive care admissions.

In addition, it was found that the patients with moped injuries were younger than expected — the average age was 12.8 years in an area where the minimum legal driving age was 14 years of age.

"The belief that a moped is a deluxe bicycle rather than a motorized vehicle may result in a lack of driver preparation and instruction," Drs. Westman and Morrow said. "The fact that, in Ohio, 80 to 90 percent of moped accidents occur during daylight hours, in good weather, on dry, straight roads lends credence to this idea."

The doctors continued that 43.2 percent of the patients were using the vehicles illegally — either as an illegal passenger on a single-rider vehicle or as an underage driver.

In Ohio alone, deaths and injuries related to mopeds increased from 2 killed and 158 injured in 1978 to 12 killed and 1,076 injured in 1982.

Drs. Westman and Morrow concluded that pediatricians can help solve this increasingly serious problem by finding out which of their older patients is using mopeds and then expressing the following information:

* Helmets should always be worn when using a moped;
* Legal minimum driving ages should be observed for safety's sake;
* Enough instruction should be given by a parent to ensure the adolescent is a "safe" driver.

The American Academy of Pediatrics is an organization of 27,000 pediatricians dedicated to the health, safety and well-being of infants, children and adolescents in North, Central and South America.

The Child Athlete A Unique Problem

Food and Nutrition

Child athletes need calories and nutrients for their normal growth and development. They need additional calories when their physical activity increases - generally a daily intake of 60 kcal per kg of ideal body weight should be allowed. Three major areas of concern for child athletes include: (1) the prevalence of irregular eating habits; (2) how the family's economic situation affects the availability of a nutritious diet (especially for young athletes from large families in lower socioeconomic groups); (3) haphazard weight gain, often to meet standard sports weight classifications, as for football. In growing children, weight gains or losses should be pursued slowly with special care not to compromise normal growth.

continued on page 359

NOTHING HINGES ON KNEE-SAVER®

Protective Knee Brace

(Loop cover removed)

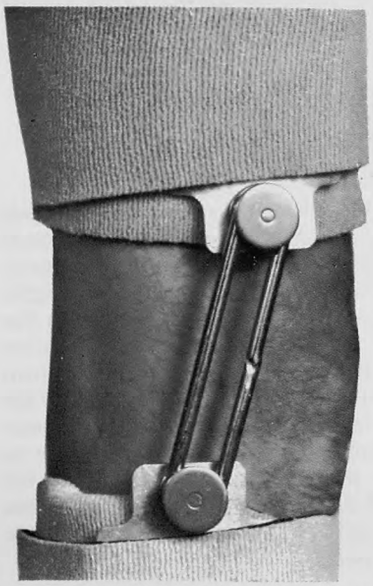
Unique action loop floats on spools, moves with player; doesn't pre-load ligaments.

No hinges to restrict mobility – wear out

Introduced at the 1985 NATA Show, this patented design works for any position player in contact sports and is now protecting high school, college, and professional athletes.

On impact, becomes lateral protective brace that shields the knee and diffuses impact

Spools are fixed pulleys on contoured thigh and calf plates that maintain position, wrapped or taped.



Patented in U.S.; foreign patents pending

$34.95

Standard ***Knee-Saver®*** with neoprene wrap; converts to tape-on

For distribution inquiries and sales information, contact Brooks at ***(916) 823-8865.***

Sports Appliance Products, Inc.
9160 Shanley Lane • Auburn, CA 95603

Association Activities

David G. Yeo, ATC, DPE

EDITOR'S NOTE:

"Toot Your Horn"

The intent of ASSOCIATION ACTIVITIES is to report on individual achievements on a local, state, regional, and national level. The column is to summarize such accomplishments as special honors, awards, press releases, and retirements, as well as special scholarships, inductions into local Hall of Fames, and major addresses presented to professional organizations.

For the column to succeed, input is needed. Information regarding individual accomplishments and awards can be submitted by anyone in the membership.

In addition to individual achievements, ASSOCIATION ACTIVITIES also summarizes noteworthy District news, such as proposed legislation, special projects, special awards, and state association news. District Directors, Secretaries, and Publicity Chairmen should insure that I receive a copy of their respective District newsletters, press releases, and other noteworthy items.

Let's pat ourselves on the back more frequently. Spread the name of your institution. For the good of the Association, let's be less humble, and take a moment to submit information by mail or phone (215: 456-2231 Ext. 431).

Hope to hear from many of you soon.

DY

The Southwest Athletic Trainers Association's annual meeting was held July 24-26 in Waco, Texas. The meeting was highlighted by the awards presentations. Cash Birdwell, Head Trainer at Southern Methodist University and Wayne Rudy, the former Head Trainer for the Kansas City Chiefs, were inducted to the S.W.A.T.A. Hall of Fame. Mike "Spanky" Stephens, Head Trainer at the University of Texas, received the Frank Medina Award and Ken Murray, Head Trainer at Texas Tech University, received the Eddie Wojecki Award. Both of these awards are for outstanding service to the Southwest Athletic Trainers Association.

There were also twenty honorary charter memberships awarded. They included Dr. James M. Beckley, Dr. Tom P. Coker, Mr. Jack Cramer, Mr. George Haynie, Dr. Wallace Ness, Dr. Elbert Lovelass, Dr. Charles Rockwood, Mr. James Cody, Dr. R.W. "Red" Covington, Dr. Thurston Dean, Dr. Jack Henry, Dr. Jerry Julian, Dr. Sam Morgan, Dr. Robert Rowntree, Dr. Emmett Shannon, Dr. Edward T. Smith, Dr. Robert Vandermeer, Dr. James Shuffield, Dr. Paul Trickett, and Mr. Elmer Tarbox. Honorary memberships are given to those who have given a great deal of time and service to the Southwest Athletic Trainers Association or have made significant contributions to sports medicine, the health care of athletes in the area, or to the athletic training profession.

* * *

Louis M. DiNitto of Sports Medicine Resource, P.C., Stony Brook, NY has written a Sports Injury Prevention Guide. Distribution of the fitness and safety publication has involved several major businesses and industries, including DuPont.

* * *

Jim Roslevich State College High School, PA, was the Medical Director of the Keystone Games held last August at Penn State. His duties included the presentation of a one-day pre-Games clinic for the volunteer athletic trainers. ⊕

The topic of the

Schering Symposium

at the 1987 annual meeting in

Columbus, Ohio

will be

"Internal Injuries."

The Symposium will be in the

Regency Room

of the

Ohio Center

of the

Hyatt Regency Columbus,

June 14, 1987.

Current Literature

Brian Barry, ATC, MA

The Treatment of Soft Tissue After Spinal Injury. Sawyer, M. et al. *Clinical Sports Medicine* 1986 April; 5(2): 387-405 (57 Ref.).

Effectiveness of Transcutaneous Electrical Nerve Stimulation in the Treatment of Pain. Recommendations for Use in the Treatment of Sports Injuries. Jensen, J.E., et al. *Sports Medicine* 1986 March-April, 3(2): 79-88 (38 Ref.).

Triathlons and Medicine: The Race to Catch Up. Cohen, L., *Journal of the Canadian Medical Association* 1986 April 15; 134 (8): 938-41.

Neck and Low Back Injuries in Wrestling. Wroble, R.R., et al. *Clinical Sports Medicine* 1986 April; 5(2): 295-325.

Metabolic Factors From Exercising Muscle and the Proliferation of Endothelial Cells. Burton, H. W., et al. *Medicine and Science in Sports and Exercise* 1986 August; 18(4): 390-96.

Maxillofacial Fractures Sustained in Bicycle Accidents. Lindquist, C., et al. *International Journal of Oral and Maxiollofacial Surgery* 1986 February; 15(1): 12-18.

Plasma Lactate and Ventilation Thresholds in Trained and Untrained Cyclists. Simon, J., et al. *Journal of Applies Physiology* 1986 March; 60(3): 777-81.

Strength Training for Children. Sewall, L., et al, *Journal of Pediatric Orthopedics* 1986 March-April; 6(2): 143-6.

Effects of Selected Softball Bat Loading Strategies on Impact Reaction Impulse. Noble, L., et al. *Medicine and Science in Sports and Exercise* 1986 February; 18(1): 50-9.

The Reproductivity of VO_2 max, Ventilatory, and Lactate Thresholds in Elderly Women. Foster, V. L., et al. *Medicine and Science in Sports and Exercise* 1986 August; 18(4): 425-31.

Injuries to the Spine. *Clinical Sports Medicine* 1986 April; 5(2): 213-410.

1986 American College of Sports Medicine Annual Meeting Abstracts. May 28-31, Indianapolis, Indiana. *Medicine and Science in Sports and Exercise* 1986 April; 18(2 Supplemental): 51-98.

Achilles Tendon Lesions in Sport. William, J. G., *Sports Medicine* 1986 March-April; 3(2): 114-35 (128 Ref.).

Spontaneous Rupture of the Extensor Pollicus Longus Tendon After Anabolic Steroids. Kramhoft, M., et al. *Journal of Hand Surgery* [Br] 1986 February; 11(1): 87.

Acetabular Epiphysis-Labrum Entrapment Following Traumatic Anterior Dislocation of the Hip in Children. Shea, K.P., et al. *Journal of Pediatric Orthopedics* 1986 March-April; 6(2): 215-9.

Biomechanics of the Squat Exercise Using a Modified Center of Mass Bar. Lander, J.E., et al. *Medicine and Science in Sports and Exercise* 1986 August; 18(4): 469-79.

'Bony Sciatica' — The Valve of Thermography, Electromyography, and Water-soluble Myelography. Getty, C.J., *Clinical Sports Medicine* 1986 April; 5(2): 327-42.

Sonographic Diagnosis of Partial Achilles Tendon Rupture and Healing. Leekam, R.N., et al. *Journal of Ultrasound Medicine* 1986 February; 5(2): 115-6.

The School Nurse as an Athletic Trainer. Alt, P.M., *Journal of School Health* 1986 April; 56(4): 155-7.

Case Report of a Rare Mallet Finger Injury. Cohn, B.T., et al. *Orthopedics* 1986 April; 9(4): 529-31.

Case Report 355: Delayed Closure of the Right Olecranon Epiphysis in a Right-handed, Tournament-Class Tennis Player (post-traumatic). Retrum, R.K., et al. *Skeletal Radiology* 1986; 15(2): 185-7. ⊕

MOVING?

Please notify the National Office of your new address as well as your old address (at least 30 days in advance of publication).

National Notes *from page 251*

VISITORS

Alex Brown, East Central Oklahoma University; Bruce E. Fischbach, Kinston Eagles and University of Nebraska; Jeff D. Clay, Texas Rangers, Salem Club; John McGonagle, ECU; Bob Barber, New York Yankees; and Gregg Ott, John Spiker, Andy Altman, John Daniels, Brian E. Hill, Candace Barker, Kathleen Myers, David Walls, Joseph Erdeljac, Stanley Ambrosia, Mike Matthews and Hank Ralston, all of West Virginia University.

GRAFFITTI

*The National Office, and especially the Journal Office, has been greatly enriched by the addition to our staff of Debi Hilton. Debi is handling circulation and subscriptions for the Journal, as well as assisting in other departments.

*DON'T FORGET THOSE DUES! No later than the second week of February if you want a Spring Journal.

*Computer files are being updated to include NATA members' telephone numbers. Please supply your phone numbers to complete your file. A notation on your returned dues statement would be very helpful.

*Four free posters from the "Substance Abuse Program" series are yours for the asking. Contact Ron DeSalvatore at Clement Communications, Concord Industrial Park, Concordville, PA 19331, or call Ron's toll free number: 800/345-8101.

*For information on a booth at the Columbus exhibits contact George Budig, 1100 Gest St., Cincinnati, OH 45203.

Our wish for you at the close
of our anniversary year
Is a safe yuletide season,
Filled with good cheer!

HAPPY HOLIDAYS

b ⊕

Student Trainer Corner

Deloss A. Brubaker, ATC, EdD

Brachial Plexus Stretch Injuries:

The Need for Accurate Evaluation and Management Techniques

Anthony Glodava, ATC

Contact sports such as football, wrestling, hockey, lacrosse and rugby place extreme stresses on many body parts, especially the cervical spine, as stability is sacrificed for functional mobility. Serious spinal injuries, namely fractures and dislocations, are well documented (1). Another injury that commonly occurs, but is frequently shrugged off by athletes and coaches, is the brachial plexus or cervical nerve root stretch injury. The signs and symptoms are often transient, and frequently mask the underlying strength and endurance deficits that may predispose the athlete to further, more serious injury. It is the responsibility of the athletic trainer and team physician to ensure proper evaluation and management of this injury.

Anatomy of the Brachial Plexus

The brachial plexus is a collection of nerve roots arising from the spinal cord at the vertebral levels of C5-T1. The nerves provide the innervation for the dermatomes and myotomes of the upper extremities. Exiting at the intervertebral foramina between each of the lower cervical vertebrae, just off the transverse processes, the brachial plexus passes between the scalenus anticus and medius muscles (4), and is formed by the fusing of the nerve roots into trunks which combine and divide in various combinations into divisions, cords, and terminal branches as shown in Figure 1 (4).

Mechanism of Injury

In a cervical stretch injury, the head is laterally flexed and rotated, and the opposite shoulder is depressed, stretching the brachial plexus and the scalenus muscles, and causing a traction injury to these structures (2,5,6,7). The C5-C6 nerve roots are the structures most commonly injured, and the site of injury is usually at the root (2,5). If the shoulder is depressed, and the head is laterally flexed and hyperextended, tension is exerted on all the nerve roots down to C8-T1. This requires a much greater force than a C5-C6 stretch, and these injuries have the poorest prognosis for full recovery (5). Because of the architectural arrangement of the lateral cervical spine, namely the absence of protective features such as the spinous processes, and the anterior and posterior longitudinal ligaments, the cervical spine is less effective in preventing excessive lateral flexion and rotation than straight flexion and extension, increasing the probabiity of the brachial plexus stretch mechanism. Therefore, the athletic trainer needs to develop and emphasize a well planned neck strengthening program for his athletes, to enable the neck musculature to absorb some of the impact in lateral flexion/rotation situations.

Evaluation of Injury

Upon collision, and the ensuing traction of the brachial plexus, the athlete encounters immediate and complete paralysis, burning and stinging, which radiates down the entire arm, hand and fingers of the involved side, and a persistent heaviness and generalized weakness of the upper extremity. This usually subsides after one minute, but may last for two or three minutes.

Any manifestations of a cervical spine injury such as a stiff neck, a fixed deformity or tenderness of the spinous or transverse processes, in conjunction with paresthesia in one or both limbs, should preclude further contact until x-ray evaluation is obtained. The athlete should be stabilized and transported as per standard protocol for neck injuries.

The team physician or athletic trainer, having ruled out a cervical spine injury, should then proceed to examine the brachial plexus on the sidelines via neurological levels, testing reflex, sensation, and motor responses (See Figure 2). Differentiation between nerve root lesions and brachial plexus stretch injuries is made by the history of pain. If pain is localized to one dermatome and does not travel down the arm, a nerve root injury rather than a brachial plexus stretch is suspected.

Sideline or clinical detection of muscle weakness may be difficult due to the athlete's strength level, and may not be sufficient to determine whether the athlete may return to competition. Establishment of sensory or reflex loss may be a more reliable method of determining the advisability of returning the athlete to competition.

Mr. Glodava graduated from Northeastern University and became a certified athletic trainer August 1986.

GET THE EDGE, REDUCE CRAMPS, SORE MUSCLES AND FATIGUE!

Maintain and replace 15 VITAL ELECTROLYTES with field tested and performance proven SPORTS-LYTES, The CHOICE OF CHAMPIONS.

NO DRUGS • NO PRESERVATIVES
NO SUGAR • NO SACCHARIN
NO NaCl (Table Salt)

Only SPORTS-LYTES tablets are formulated to:

- replace electrolytes lost through athletic activity and sweating (you lose them by stress, too).
- contribute in reducing and overcoming heat problems and loss of peak performance.
- help prevent muscle cramps and spasms, promote muscle elasticity.
- increase stamina and physical endurance and quicken energy recovery.
- impede muscle soreness and fight fatigue by retarding lactic acid buildup.
- provide high calcium intake that helps strengthen bones and reduce cavities.

Case of 12 jars 800's ...	$250.00	(plus 10.00 delivery)
½-Case of 6	125.00	(plus 6.00 delivery)
Jar of 800 tablets	21.00	(plus 4.00 delivery)
Bottle of 300 tabs	9.00	(plus 4.00 delivery)

24-HOUR HOT LINE PHONE
1-817-261-1139

Kaye Barrett Droke
Founder-President

John Wm. Perry, M.D.
Medical Director

SPORTS-PAK a bountiful combination of Electrolytes (Minerals), Vitamins with anti-oxidants and energy releasers, plus digestive Enzymes in each individually sealed daily packet. There is nothing as complete in total nutrients available anywhere.

Each sealed daily packet has:
All essential vitamins, and more
All vital minerals, and more
All electrolyte replacers, and more

30-daily Paks	90-daily Paks
$15.00	$35.00
(plus 4.00 delivery)	(plus 4.00 delivery)

33 YEARS OF EXPERIENCE

Champion Sports Nutrition

110 GAY ST., Box 1507, ARLINGTON, TX 76010

Management and Rehabilitation

If a sensory, reflex, muscle strength or endurance loss is noted, the player should be removed from competition to prevent a more serious injury due to a collision in conjunction with a loss of proprioception and muscle setting ability. Management is designed to reduce inflammation of the stretched nerves. Ice, rest in the form of a sling, anti-inflammatory medication, and a gradual range of motion and progressive resistance exercise program should be initiated. The athlete should be rechecked regularly for a minimum of two weeks to rule out any objective muscle weakness.

The criteria for return after a brachial plexus stretch injury is similar to a cervical strain or sprain: Full neck range of motion with minimal pain, full neck strength with no pain, normal reflexes of all muscles supplied by the brachial plexus, and normal sensation in all dermatomes (6, 7, 8). After a careful physical examination on the sidelines, the athlete may return to competition with little concern if no abnormalities exist (2). The team physician or athletic trainer may also request that a neck roll be used as an aid to prevent excessive neck motion (6, 7, 8).

Figure 1

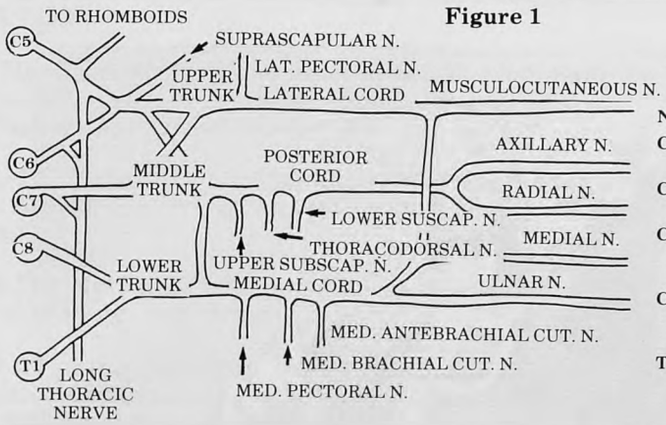


Figure 2

Neurological Level Evaluation Chart

Nerve	Muscles	Reflex	Dermatome	Movements
C5	Deltoid, Biceps	Biceps	Lateral Upper Arm	Elbow Flexion, Abduction
C6	Wrist Extensors	Brachio-radialis	Lateral Forearm	Wrist Extension
C7	Triceps, Wrist Flexors, Finger Extensors	Triceps	Middle Finger	Forearm Extension, Wrist Flexion, Finger Extension
C8	Finger Flexors Interossei Muscles	None	Medial Forearm	Finger Flexion, Finger Abduction, Finger Adduction
T1	Interossei Muscles	None	Medial Elbow	Finder Abduction, Finger Adduction

Conclusion

Due to the anatomical location and biomechanics of the cervical spine and the nerves that pass through it, the athlete engaged in contact sports is vulnerable to a nerve stretch injury that appears minor because of its transiency, but actually has potentially permanent implications. Repetitive brachial plexus stretch injuries will lead to chronic weaknesses of the upper extremity musculature instead of isolated transient episodes (2, 5). Thus, repeated incidents should be referred to appropriate medical personnel, and the decision of continued contact sport participation should then be made. The preferred method of management and rehabilitation is removal from contact until the athlete is asymptomatic, immobilization, ice, anti-inflammatory medication, and range of motion and resistance exercises as indicated.

References

1. Torg JS et al.: The national football head and neck injury registry. *JAMA* 1979; 241: 1477-1479.
2. Archambault JL: Brachial Plexus Stretch Injury. *Journal of American College Health* 1983; 31: 256-260.
3. Slagle GW: A tip from the field - Prevention of Neck Injuries - The Neck Roll. *NATA Journal* 1983; 1: 66.
4. Hoppenfeld S: *Physical Examination of the Spine and Extremities.* Norwalk, Appleton-Century-Crofts 1976.
5. Robertson WC et al.: Upper Trunk Brachial Plexopathy in Football Players. *JAMA* 1979; 241: 1480-1482.
6. Scott N et al.: *Principles of Sportsmedicine.* Baltimore, Williams and Wilkins 1984.
7. Roy S, Irvin R: *Sports Medicine: Prevention, Evaluation, Management, and Rehabilitation.* Englewood Cliffs, Prentice-Hall, 1983.
8. O'Donoghue DH: *Treatment of Injuries to Athletes.* Philadelphia, W.B. Saunders 1976.
9. Arnheim D: *Modern Principles of Athletic Training.* St. Louis, Times Mirror/Mosby College Publishers 1985.
10. Birch R: Traction Lesions of the Brachial Plexus. *British Journal of Hospital Medicine.* 1984; 9: 140-143.
11. Maroon JC: 'Burning Hands' in football spinal cord injuries. *JAMA* 1977; 238: 2049-2051.
12. Blyth CS, Arnold C, eds. *The Forty-Fourth Annual Survey of Football Fatalities 1931-1975.* The American Football Coaches Association 1970. ⊕

Potpourri *from page 353*

Four Letter Words Everyone Should Know

Press Release

Rays, Rads, Rems and Ergs.

These are four letter words that are appropriate to say in public, but which few people do. Yet virtually everyone on earth is affected by them daily — especially those administering X-rays and those receiving them.

Simplistically, X-rays are invisible "bundles of energy" produced from the impact of high speed electrons on a particular target metal, usually tungsten. The energy of X-rays varies with the amount of voltage used to accelerate the electron beam.

. . . Rads are the units to measure absorbed doses of X-radiation.

. . . Rems are the quantities of ionizing radiation whose biological effect is equal to that produced by one roentgen of X-Rays.

The measurable rad corrected by a factor for the biological effect yields the rem. Roentgens are named after a German research physicist.

. . . Ergs are centimeter-gram second units of work or energy. One rad is the absorbed dose of 100 ergs per grams of any matter and can be used for any type of radiation. ⊕

A case of performance above and beyond the call of duty.

PATIENT PROFILE:
Male, 41 years old, 6′4″, 218 lbs.– U.S. Army Major, assigned to a Special Forces Group, Airborne. Patient heard a "loud snap" during a night parachute jump. Orthopedic Clinic noted massive effusion of the left knee. The knee was aspirated of 150cc of blood and diagnosed as having significant ligament damage. Further examination revealed varus instability in 30 degrees of flexion and marked induration in the medial joint line.

COURSE OF TREATMENT:
The patient underwent a medial meniscectomy, a reefing of the posterior oblique ligament, and repair of the anterior cruciate ligament by passing it through the intercondylar notch and suturing it laterally to the iliotibial band. The patient's post-operative course was uncomplicated, returning for daily physical therapy for a short period of time after discharge.

DISPOSITION:
The patient returned to active duty with a Lenox Hill Brace to protect the surgery and help speed the rehabilitative process. Based on the stability afforded by the brace, it was decided to allow the patient to rejoin his "Green Beret" troops and to resume jumping with full combat equipment during both land and sea maneuvers. In the five years following surgery the patient has continued his paratrooping career, making over 200 open and rough terrain jumps in his Lenox Hill Brace, with great satisfaction.

CONCLUSION:
The Lenox Hill Brace can be depended on to protect the unstable knee against further injury, even under conditions of extreme and repeated impact. The treatment team in this case was the Orthopedic staff of Womack Army Community Hospital.

An Open Call For Case Studies
If you have a case you would like to share with your colleagues, please send it to us. Every case study we receive will be considered for publication based on its reference value to medical professionals.

Lenox Hill Brace, Inc. 11-20 43rd Road, Long Island City, NY 11101

For the Lenox Hill Knee Center nearest you call Toll Free: 1-800-222-8837 • In New York State, call 718-392-3320 • Telex 229161 UR

For inquiries in: England: **Lenox Hill U.K.;** Austria, Switzerland, West Germany: **Bort GmbH.;** Netherlands, Luxembourg, Belgium: **Orthopaedie Van Lieop BV.;** Sweden, Denmark, Norway, Finland, Iceland: **Camp Scandinavia;** Israel: **Gapim Ltd.;** Australia, New Zealand: **Orthopaedic Appliances;** Japan: **Lenox Hill Japan Inc.**

Calendar of Events

Jeff Fair, ATC, MS, CCT

January

4 Oklahoma Athletic Trainers Association Meeting, Stillwater, OK. Contact Alex Brown, Head Athletic Trainer, East Central University, E. 14th Street, Ada, OK 74820.

9-10 Sport Med '87 Toronto. Contact Stephen Sullivan, MD, Victoria Hospital, South Street, London, Ontario, Canada N6A 4G5.

11-12 National Operating Committee on Standards for Athletic Equipment Annual Meeting, New Orleans, LA.

13-15 National Collegiate Athletic Association Annual Meeting, New Orleans, LA.

22-27 First American College of Sports Medicine Clinical Conference, Keystone, CO. Contact ACSM, 401 W. Michigan Street, Indianapolis, IN 46202-3233.

24-31 16th Annual Temple University School of Medicine Diving and Sports Medicine Program, Bonaire, Netherlands Antilles. Contact Temple University School of Medicine, Office of CME, 3400 N. Broad Street, Philadelphia, PA 19140.

29-31 Southwest Region Annual Meeting of the American College of Sports Medicine, Charleston, SC. Contact Ronald Bos, 113 Memorial Gymnasium, Virginia Tech, Blacksburg, VA 24061.

February

6-9 American Physical Therapy Association Combined Meeting, Anaheim, CA.

7-14 4th Annual Office Based Sports Medicine, Park City, VT. Contact Extended Programs in Medical Education, University of California, San Francisco, CA 94143.

12-15 The Fifth International Advanced Arthroscopic Update and Sports Medicine Symposium, Orlando, FL. Contact Arthrotechnics Inc., 2000 Nebraska Avenue, Fort Pierce, FL 33450.

20-25 American Academy of Orthopaedic Surgeons Annual Meeting, New Orleans, LA.

27-28 Southeastern Athletic Trainers' Association Student Athletic Trainer Meeting, Birmingham, AL. Contact Alabama Sports Medicine, c/o SEATA Student Athletic Trainer Meeting, 1222 14th Avenue South, Suite 109, P.O. Box 55907, Birmingham, AL 35255-5907.

March

12-14 20th Annual Winter Clinical Symposium of the Great Lakes Athletic Trainers Association with the Mayo Clinic, Rochester, MN. Contact Mr. Bill Neitz, Director of Programs, Mayo Clinic, Rochester, MN 55902.

continued on page 394

Announcements

Corporate Sponsorship Position Statement

The NATA believes that we, as a society, have a moral obligation to provide a common defense against sports injuries for 5.6 million U.S. interscholastic athletes. In assessing the situation since 1976, the NATA — as national governing body for allied health care professionals in the field of athletic training — has determined that effective injury management and prevention programs are absent in the vast majority of secondary schools.

It is the opinion of the NATA that lack of a basic understanding about the need and value of a verifiable health care plan in high school athletic programs is responsible for thousands of preventable sports injuries and re-injuries. As such, the NATA has set out to enhance public understanding of injury management and prevention methods currently available.

In the opinion of the NATA Board of Directors, consistent, quality health care can and must be part of the package that student-athletes receive when they participate in high school sports. To convey that message, the NATA welcomes counsel and assistance from select organizations who share its view. Sponsors or corporate sponsors of the public education program are recognized for the support they provide to fuel the NATA's nationwide public education effort. However, sponsorship support should be understood to be "a sponsor of the NATA public education program," and not NATA endorsement of sponsors' products or services.

TO: NATA Membership

FROM: American Orthopaedic Society for Sports Medicine

SUBJECT: Distinguished Service Award for Athletic Training

Criteria for Selection: NATA Hall of Fame
Outstanding contributions to NATA & sports medicine/athletic training

Selection Process: Send application to your district director for submission to AOSSM selection committee
(Must be submitted by 1 January, 1987)

AMERICAN ORTHOPAEDIC SOCIETY FOR SPORTS MEDICINE DISTINGUISHED SERVICE TRAINER AWARD

Application form for Annual Award for Recognition of Distinguished Service

The information furnished on this form, together with any attachments provided by the nominator, will be the principle items considered by the Special Selection Committee. Nominators are asked to provide information as complete as practicable. Additional information may be solicited by the Committee.

NAME OF NOMINEE: _____

ADDRESS: _____

NAME OF NOMINATOR: _____ DATE _____

ADDRESS: _____

Career Achievments:

1. Professional Accomplishments:

2. Evidence of impact on athletic training and professional growth:

3. Provide a detailed resume of nominee's contribution to Sports Medicine and to the athletic training profession.

State of North Carolina

Department of the Secretary of State

To all to whom these presents shall come, Greeting:

I, **Thad Eure,** *Secretary of State of the State of North Carolina, do hereby certify the following and hereto attached (* 3 *sheets) to be a true copy of*

ARTICLES OF INCORPORATION

OF

THE NATIONAL ATHLETIC TRAINERS ASSOCIATION HALL OF FAME, INC.

and the probates thereon, the original of which was filed in this office on the 22nd *day of* July *19* 86 *, after having been found to conform to law.*

In Witness Whereof, *I have hereunto set my hand and affixed my official seal.*

Done in Office, *at Raleigh, this* 22nd *day of* July *in the year of our Lord 19* 86.

Secretary of State

By *Deputy Secretary of State*

Ninth Annual N.A.T.A. Student Writing Contest

In an effort to promote scholarship among young athletic trainers, the National Athletic Trainers Association, Inc. 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 March 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 March 1, 1986.

NATA Student Writing Contest
Deloss Brubaker, ATC
U.S. Sports Academy
One Academy Drive
Daphne, AL 36526

Book Reviews

Phil Callicutt, ATC, EdD

Therapeutic Exercise: Foundations and Techniques
Carolyn Kisner, M.S., P.T.
and Lynn Allen Colby, M.S., P.T.
F.A. Davis Company Publishers
1915 Arch Street, Philadelphia, PA 19103
1986
648 pages: illustrations 289
$30.00

During my recent search for a book to review which would be of great interest and value to all NATA members, I discovered an excellent work by Carolyn Kisner and Lynn Allen Colby, both Assistant Professors at Ohio State University, School of Allied Medical Professions, Physical Therapy Division, located in Columbus, Ohio. Therapeutic exercise is one of the primary tools that Athletic Trainers and Physical Therapists utilized to restore full function to an injured athlete prior to his/her return to safe full participation in the activity or sport chosen. Therapeutic exercise or rehabilitation, whatever you are inclined to call the process, is of utmost importance. Most of us are forever looking for a new program or process. For the very few of us who profess to have all the answers in this area, a good review is always in order.

I found this text to be filled with good sound information on the entire therapeutic exercise function. It is divided into twenty-one (21) chapters ranging from a detailed survey of the Range of Motion to specific therapeutic exercise programs for Treating Soft-Tissue, Bony, and Post-surgical Problems. Each region of the anatomy is fully covered concerning a wide range of programs for such areas as the shoulder and shoulder girdle, the elbow and forearm complex, the wrist and hand, the knee, and the spine. Chapter 16 on The Spine: Traction Procedures is well written and answers many questions which we all ask from time to time when applying traction to this region. The final chapter is devoted to Critical Analysis of Exercise Programs, dealing with designing a program, establishing a baseline and the establishment of realistic goals.

This text is well written and illustrated. It should be a ready reference in everyone's training room or sports medicine clinic.

Encyclopedic Dictionary Of Sports Medicine
David F. Tver and Howard F. Hunt, Ph.D.
Chapman and Hall Publishing
29 West 35th Street, New York, NY 10001
1986
232 pages: illustrated
$32.50

There has been a need for a "state of the art" reference book on Sports Medicine. Many other publications have devoted small portions on the defining of injuries and medical conditions resulting from participation in sport and physical fitness related activities, but most of them have not met the needs and expectations of those dealing with the dynamic and ever changing field of

continued on page 368

Hydrostatic Weighing *from page 330*

2. Behnke AR, Wilmore JH: *Evaluation and Regulation of Body Build and Composition.* Englewood Cliffs, New Jersey, Prentice-Hall 1974 pp. 30-38.
3. Bogert JL, Briggs GM, Calloway DH: *Nutrition and Physical Fitness.* Philadelphia, W.B. Saunders Company 1973 pp. 486-489.
4. Boren H, Kory R, Syner J: The lung volume and its subdivisions in normal men. *Am J Med* 41: 96-114. 1966.
5. Brozek J, Grande F, Anderson J, Keys A: Densitometric analysis of body composition: revision of some quantitative assumptions. *Ann NY Acad Sci* 10: 113-140, 1963.
6. Goldman H, Becklake M: Respiratory function tests. *Am Rev Respir Dis* 79: 457-467, 1959.
7. Guyton AC: *Textbook of Medical Physiology.* Philadelphia, W.B. Saunders Company 1981 pp. 866-867.
8. Katch F, Michael E, Horvath S: Estimation of total body volume by underwater weighing: Description of a simple method. *J Appl Physiol* 23: 811-813, 1967.
9. Siri WE: Gross composition of the body. In J.H. Lawrence and C.A. Tobias (Eds.), *Adv Biol Med Phys IV* New York, Academic Press, 1956.
10. Wilmore J: Body composition in sport and exercise: directions for future research. *Med Sci Sports Exerc* 15: 21-31, 1983. ⊕

Return your 1987 membership renewal by February 15, 1987, or miss the Spring issue of The Journal

Book Reviews *from page 367*

Sports Medicine. Mr. Tver and Dr. Hunt have authored a clear and straight forward volume of medical information on the symptomatic ill effects of various sports on particular body parts.

The volume is designed for everyone concerned about exercise and sport. I found the Encyclopedic Dictionary of Sports Medicine to be easy to use and to be extremely accurate. The definitions are presented in alphabetical order with sufficient detail provided for complete comprehension. Each definition examines the nature of the injury and its related symptoms, however no attempt is made to suggest or prescribe any type of treatment. There is an excellent glossary explaining many short, but very important terms.

The conditions and injuries defined are too numerous for a complete listing, so I will only attempt to list a few: Achillobursitis, Barr Bodies, cardiac dyspnea, diuretics, environmental stress, hives, and many, many more outstanding descriptions of common and uncommon conditions which confront the sports medicien professional on a daily basis.

There are instances when we need concise definitions which can be understood by all parties concerned: the athlete, the parent, or sports writer, The Encyclopedic Dictionary Of Sport Medicine provides us with a ready reference to help us provide information of this type in language that everyone understands.

This is a very informative and useful volume for Athletic Trainers, Team Physicians, Primary Care Physicians, Physical Educators, and average weekend athletes. It is a good value and will prove to be a welcome addition to every sports medicine library. ⊕

Committee Forum

Certification

Schedule of Sites and Dates — **NATA Certification Examination**

All regional sites are subject to a minimum of six candidates per site and limited to a *maximum* of *thirty-six* candidates. Completed applications must be received by the Certification Office within the prescribed deadline for the examination date chosen.

January 18, 1987 — Deadline for the receipt of applications is December 2, 1986.

New Britain, CT
Pittsburgh, PA
Montclair, NJ
Richmond, KY
Anderson, IN
Minneapolis, MN
Greensboro, NC
Fort Worth, TX
Albuquerque, NM
Santa Clara, CA
Eugene, OR

March 15, 1987 — Deadline for receipt of applications is February 2, 1987.

Boston, MA
Mechanicsburgh, PA
Morgantown, WV
Granville, OH
Holland, MI
Fort Worth, TX
Lincoln, NE
Costa Mesa, CA
Logan, UT
Cheney, WA
Richmond, KY

May 17, 1987 — Deadline for receipt of applications is April 6, 1987.

New Britain, CT
Montclair, NJ
Anderson, IN
Chicago, IL
Omaha, NE
Houston, TX
Albuquerque, NM
Santa Clara, CA
Nashville, TN
Seattle, WA

July 12, 1987 — Deadline for receipt of applications is June 1, 1987.

Boston, MA
Claymont, DE
Pittsburgh, PA
Columbia, SC
Costa Mesa, CA
Dayton, OH
Madison, WI
Maryville, MO
Denver, CO

(NOTE: The Clinical Hours Report Form may be xeroxed from page 160 of the Summer '86 issue of *The Journal.)*

Continuing Education

CONTINUING EDUCATION REQUIREMENTS AND APPEAL PROCESS FOR THE CERTIFIED ATHLETIC TRAINER

Units of Continuing Education shall be approved by the Continuing Education Committee of the National Athletic Trainers' Association, Inc. Where it is applicable, the Continuing Education Unit (CEU) will be adopted as the unit of measurement to meet the Continuing Education requirements of the Certified Athletic Trainer of the NATA. The Continuing Education Unit (CEU) is defined as "ten contact hours of participation in an organized Continuing Education experience under responsible sponsorship, capable direction, and qualified instruction" (10 contact hours = one CEU).

To maintain Certification the minimum number of units to be accumulated each three (3) year Continuing Education period shall be 6 CEUs. The CE report periods are January 1, 1985 through December 31, 1987; January 1, 1988 through December 31, 1990; etc.

THE CERTIFIED ATHLETIC TRAINER is responsible for sending to the Continuing Education Office proof of completion of any Continuing Education Units (CEUs) and activities to be used in updating his/her record in a required period of THIRTY DAYS after completing the activity.

THE CERTIFIED ATHLETIC TRAINER who does not accumulate a recorded number of 6 CEUs during the designated 3-year period shall have his/her name turned over to Membership and Certification for appropriate action. Those Certified within the 3-year period shall have their CEU requirement prorated for that period only. Any action taken affecting the status of a Certified Athletic Trainer relating to Continuing Education may be appealed to the Continuing Education Committee (Please refer to the Appeal Process section).

Certified Athletic Trainers serving as members of the Armed Forces **may** request (in writing) a waiver of CEUs during their tour of active duty. The request will be granted at the discretion of the Continuing Education Committee. This waiver would apply only to time spent stationed overseas.

Certified Athletic Trainers who are not members of the NATA, Inc. should consult the Board of Certification Office for the recording of their CEUs and appropriate fees.

The Continuing Education Committee has

developed the following definitions of acceptable Continuing Education for Certified Athletic Trainers:

A. **NATA ANNUAL MEETING AND CLINICAL SYMPOSIUM:** 2 CEUs for registration and attendance of each annual meeting.*

B. **SCIENTIFIC WORKSHOPS OFFERED AT NATA ANNUAL MEETING AND CLINICAL SYMPOSIUM:** 1 CEU for every 10 contact hours of workshop. (1 contact hour = .1 CEU.)*

C. **NATA DISTRICT MEETINGS:** 1 CEU for every 10 contact hours will be awarded for the scientific program content offered at the District Meeting. (1 contact hour = .1 CEU.)

D. **NATA APPROVED SHORT TERM COURSES AND SCIENTIFIC MEETINGS:** Clinics, workshops, seminars, or NATA approved courses, etc., endorsed by the Continuing Education Committee. One CEU will be awarded for every 10 contact hours. **Maximum of 2.0 CEUs per meeting.** (1 contact hour = .1 CEU.)

E. **PUBLICATION OF ORIGINAL WORK:** Publication of an original paper in the NATA's quarterly publication *ATHLETIC TRAINING* will be awarded 1.5 CEUs per original paper. One CEU will be awarded per original publication in a state or national scientific journal or publication of a related professional organization.

F. **PROGRAM PARTICIPATION AT STATE, DISTRICT OR NATIONAL MEETINGS:** Credit units will be awarded for the presentation of an original paper or program participation at State, District or National level NATA meetings. One CEU will be awarded per meeting.

G. **PROMOTION OF ATHLETIC TRAINING TO OTHER GROUPS:** The presentation of athletic training to nonrelated organizations and civic groups will be awarded .5 CEU per meeting. This also includes participation in workshops/seminars/symposiums as a speaker.

H. **TEACHING OF ATHLETIC TRAINING COURSES:** .5 CEU will be awarded for each credit hour of actual teaching that is not a part of your job description, not to exceed 2 per year.

I. **STUDENT TRAINER SUPERVISION:** (inclusive of high school trainers). .5 CEU per year will be awarded for supervision of a student trainer program for a full calendar year. If more than one Certified Athletic Trainer is supervising the student trainer, each receives equal credit.

J. **POSTGRADUATE STUDY:** Any study completed after receiving a Bachelors degree may be submitted for consideration by the Continuing Education Committee. The study must be related to improving one's Athletic Training skills and/or knowledge. There will be .5 CEU awarded for each credit hour accepted, with a limit of 2.0 CEUs per year to be accompanied by a copy of the transcript and course description.

K. **CORRESPONDENCE COURSES:** Correspondence courses in *ATHLETIC TRAINING, The Journal of the National Athletic Trainers Association, Inc.* will be awarded .3 CEU per course. Correspondence courses offered by other publications related to Athletic Training will need to be approved in advance by the Continuing Education Committee. All courses approved by the Continuing Education Committee will require an examination that certifies the satisfactory completion of the course.*

L. **OTHER NATA ACTIVITIES:**
1. Serving as a National or District Officer in the NATA will be awarded one CEU per year.*
2. Committee membership in the NATA at the National level and/or District level will be awarded one CEU per year. An additional .5 CEU each year will be awarded for the chairmanship of the committee.*
3. Certification testing. Those members participating in the certification examination will be awarded .5 CEU per testing date.*
4. Examiner Development Workshop. Completion of an NATA Certification Examiner Development Workshop will be awarded .3 CEU.*
5. Official liaison activity. Those members participating in the capacity of a liaison for the NATA will be awarded .5 CEU each year.
6. State Organizations. Those members serving as elected officers or committee chairpersons in a formally organized State Athletic Trainers organization recognized by the NATA shall receive .5 CEU for each full calendar year served in that capacity. This would include those committee persons officially designated as working toward state licensure.
7. Visitation team members doing curriculum evaluations shall be awarded .5 CEU per visit not to exceed 1.0 CEU per year.

M. **TAPES AND CASSETTES OF PROCEEDINGS:** Purchase of audio cassette tapes from NATA will earn .1 CEU per tape acquired. Proof of purchase is necessary to receive credit.*

N. **SPECIAL PROJECTS AND CONSIDERATIONS:** All projects and educational activities must be submitted to the Continuing Education Committee District Representative for consideration. Projects such as development of, or participation in films, radio conferences, television programs or other audio-visual aids that may be used as a teaching aid or for public relations in the field of athletic training will be

awarded .5 CEU per project. Preparation and presentation of scientific athletic training exhibits at the local, District or National level: Limit .5 CEU per exhibit. Current CPR and First Aid is creditable for .5 CEU per year. Teaching CPR and First Aid is also creditable for .5 CEU per session taught. EMT is creditable for up to 1.0 CEU per Continuing Education period.

***CEUs for catagories A, B, K, L-1, L-2, L-3, L-4 and M are automatically recorded and do not require individual reporting.**

PLEASE REFER ALL QUESTIONS CONCERNING APPROVAL OF CEU PROGRAMS TO YOUR DISTRICT CONTINUING EDUCATION REPRESENTATIVE, ALONG WITH A SELF-ADDRESSED STAMPED ENVELOPE.

APPEAL PROCESS

The certified Athletic Trainer will receive an annual statement showing the number of CEUs accumulated. CEUs earned in excess of requirements for the current period cannot be credited to the next recording period.

If a Certified Athletic Trainer has not earned, reported, and had recorded the appropriate number of CEUs for the current period, his/her name will be turned over to Membership and Certification for appropriate action.

A Certified Athletic Trainer who fails to accumulate sufficient CEUs will receive notice that his/her name has been turned over to Membership and Certification. The Certified Athletic Trainer may appeal this action.

An appeal may be filed by notifying the Committee on Continuing Education IN WRITING WITHIN THIRTY DAYS of the receipt of such notice . The appeal should be sent to the following address:

Committee on Continuing Education/Appeal
1001 East Fourth Street
Greenville, NC 27858

National Athletic Trainers Association, Inc.
Continuing Education Committee

James B. Gallaspy - Chairperson
University of Southern Mississippi
P.O. Box 5105
Southern Station
Hattiesburg, MS 39406-5105
(601) 266-5577

DISTRICT REPRESENTATIVES

DISTRICT 1
Connie Bauman
Wellesley College
Mary Hemenway
Wellesley, MA 02181
(617) 235-0320, Ext. 2023

DISTRICT 2
Don Kessler
Princeton University
P.O. Box 71 Athletic Department
Princeton, NJ 08544
(609) 452-3518

DISTRICT 3
Carla Stoddard
North Carolina State University
Athletic Department Box 8501
Raleigh, NC 27695-8501
(919) 737-2111

DISTRICT 4
Fred Turner
1816 W. 170th
Hazelcrest, Il 60429
(312) 335-1415

DISTRICT 5
Reginald Speak
Bettendorf Senior High
3333 18th St.
Bettendorf, IA 52722
(319) 332-7001, Ext. 265

DISTRICT 6
Ron Carroll
Arkansas State University
P.O. Box 1225
State University, AR 72467
(501) 972-3342

DISTRICT 7
George Goodridge
Northern Arizona University
Box 15400
Flagstaff, AZ 86011
(602) 523-4151

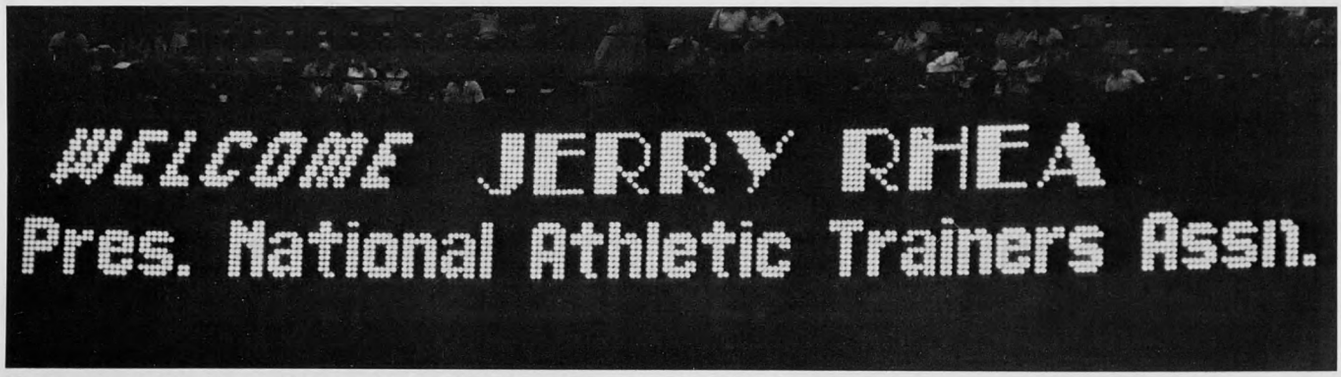
DISTRICT 8
Dan W. Bailey
Cal State University
Athletic Department
Long Beach, CA 90840
(213) 430-5791

DISTRICT 9
Linda Arnold
Memphis State University
Athletic Office Building
Memphis, TN 38152
(901) 454-2340

DISTRICT 10
Jackie Smaha
P.O. Box 8645
Moscow, ID 83843
(509) 332-1919

NOTE: All CEU requests should be sent directly to the National Office. Workshop/seminar and/or course evaluations should be sent to the Representative in whose district the event is taking place.

Attend the 38th Annual Meeting and Clinical Symposium
June 14-17, 1987
Columbus, Ohio



Scoreboard in Superdome, New Orleans, Falcons vs. Saints game

CEU REPORT FORM
National Athletic Trainers' Association, Inc.
Continuing Education
1001 East 4th Street
Greenville, NC 27858

Certified and Associate members of the NATA are responsible for submitting to the National Office proof of completion of any Continuing Education Units (CEUs) and activities to be used in updating his/her record within **THIRTY (30) DAYS** of the activity. Failure to do so will mean no credit will be given for that activity.

Enclose a copy of the program if advance NATA approval has not been given.

I request CEUs for _____

_____ Conference, Meeting, workshop, etc.

_____ _____ _____
(Total contact hours attended) (category) (Date of activity)

_____ _ _ _ _ _ _ _____
(Name as printed in NATA record) (Membership number) (Classification)

_____

_____

_____
(Address)

I certify that the above information is correct _____
(Signature of member)

PHOTOCOPY THIS FORM FOR FUTURE USE

Licensure

The Function of the National Licensure Committee

Edward Crowley

The purpose of the National Licensure Committee is to disseminate information to the membership pertinent to establishing guidelines and a standard format for requesting Athletic Training regulation within each state.

The Committee is organized to improve communications between the NATA and each state association. Each district has a National Licensure Committee member who represents those states within the district on licensure matters. The district representative is appointed by the chair of the Licensure Committee and approved by the Board of Directors.

The Licensure Committee district representative determines or selects a state delegate who represents their state on matters pertinent to state regulation. Communication between the states and the NATA is primarily between these people. As the state delegates communicate to their district representative, important issues are reported to the national chair prior to November 1st and March 1st. The national chair consolidates the material and forwards the district reports to the Board of Directors prior to December 1st and April 1st of each year. The Board reviews these materials and provides guidance to the Licensure Committee on any decisions necessary in carrying out the responsibilities of the Licensure Committee.

The National Licensure Committee Communication Chain

DISTRICT 1

DISTRICT REPRESENTATIVE

Elwood "Ike" Isley
Athletic Trainer/Physical Therapist
University of Vermont Sports Therapy
Patrick Gymnasium
Burlington, VT 05405
802/656-3070

STATE DELEGATES

CONNECTICUT
Margret Hogan, ATC
Trinity College
Ferris Athletic Complex
Hartford, CT 06106
203/572-3151 Ext. 285

MAINE
Richard Labonte
Beddeford High School
Maplewood Avenue
Beddeford, ME 04005
207/282-1596

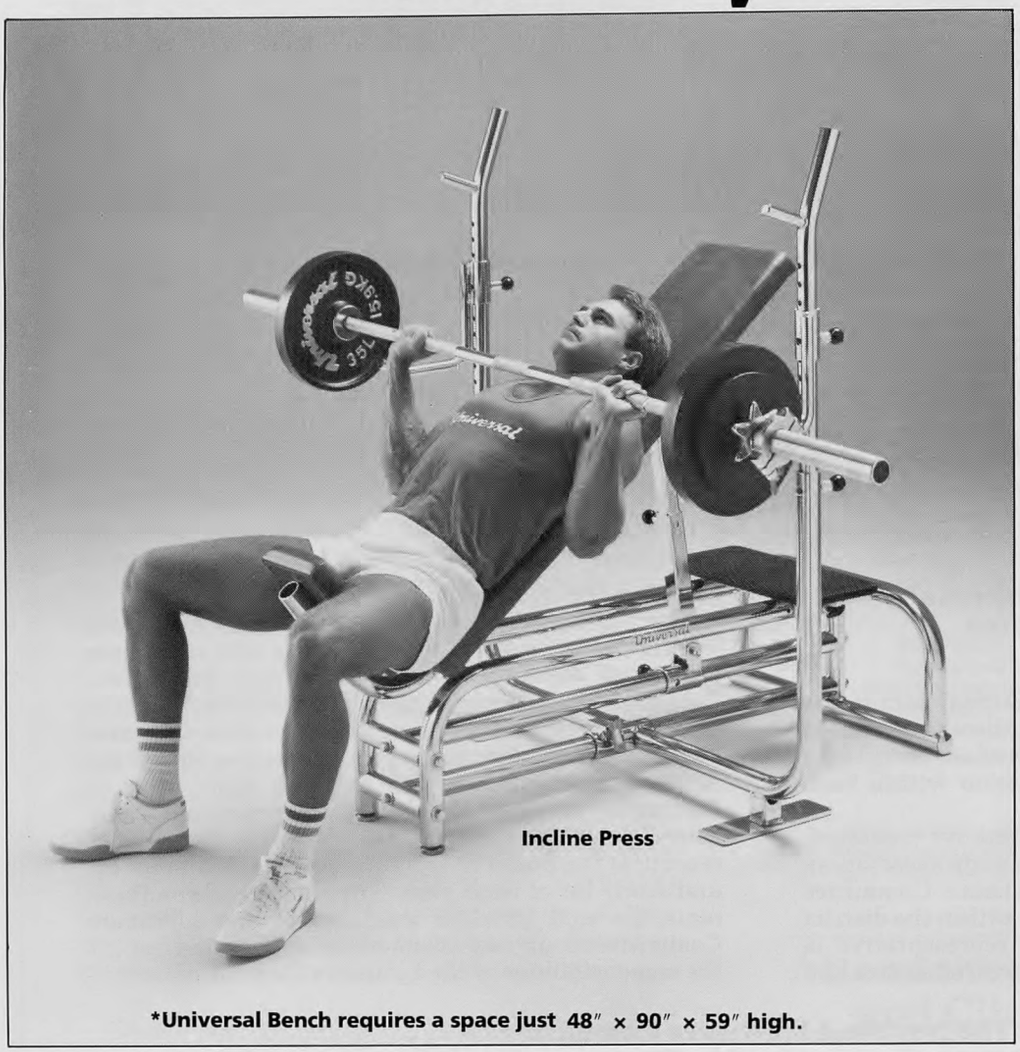
MASSACHUSETTS
Kerkor Kassabian, ATC
Sports Medicine/Athletic Training
Northwestern University
360 Huntington Avenue-Room 100CB
Boston, MA 02115
617/437-2477

NEW HAMPSHIRE
Dennis McManus
Head Athletic Trainer

shaping your future

Universal®

The imagination continues

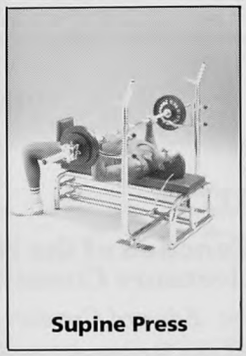


Incline Press

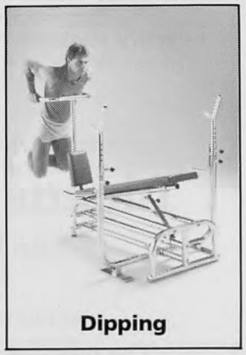
*Universal Bench requires a space just 48″ × 90″ × 59″ high.

Leg Extension

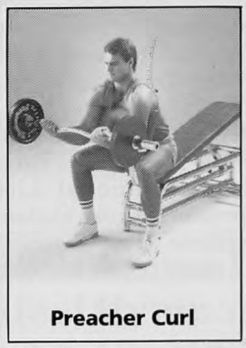
Leg Curl



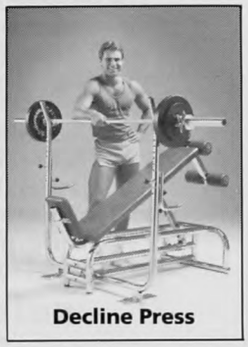
Supine Press



Dipping



Preacher Curl



Decline Press

New Universal Bench™ builds better bodies 7 ways.

The new Universal Bench is an imaginative, space-saving* free weight system that lets your athletes perform 7 major exercises. Thus it can instantly expand your free weight training program, without greatly expanding your training area or budget.

Build better bodies 7 ways. Quick adjustments let your athletes benefit from Incline Press, Supine Press, Decline Press, Leg Extension, Leg Curl, Preacher Curl and Dipping.

Yes, the imagination continues with the new Universal Bench...helping build better bodies 7 ways.

FREE CATALOG. Write, or call toll free 800-553-7901 or 319-365-7561

AT126

UNIVERSAL
Subsidiary of Kidde, Inc.
KIDDE
P.O. Box 1270 • Cedar Rapids, Iowa USA 52406
Telex: 4979634 UNI GYM CDR

Imagine your opportunities

Please send me:
- ☐ Universal Conditioning Equipment Catalog.
- ☐ Please have a representative call.

Name _____
School _____
Address _____
City _____ State _____
Zip _____ Phone _____

Plymouth State College
Plymouth, NH 03264
603/536-1550 Ext. 293

RHODE ISLAND
Mike Rule
University of Rhode Island
Kingston, RI 02881
401/792-2051

VERMONT
Elwood "Ike" Isley
(same as above)

QUEBEC
no delegates designated

DISTRICT 2

DISTRICT REPRESENTATIVE

Don Lowe
Head Athletic Trainer
Syracuse University
Dept. of Intercollegiate Athletics
Syracuse, NY 13210
315/423-2384

STATE DELEGATES

DELAWARE
Joan Molaison
University of Delaware
Newark, DE 19716
302/451-8857

NEW JERSEY
Don Kessler
Princeton University
P.O. Box 71
Princeton, NJ 98544
609/452-3518

NEW YORK
Ronald Linfonte
St. Johns University
Jamaica, NY 11439
718/990-6055

PENNSYLVANIA
Mark Keppler
Carnegie-Mellon University
Athletic Dept.
Pittsburgh, PA 15213
412/578-2211 Ext. 2222

DISTRICT 3

DISTRICT REPRESENTATIVE

John Bush
Head Athletic Trainer
University of Maryland
College Park, MD 20740-0295
301/423-2384

STATE DELEGATES

MARYLAND
John Bush
(District Representative)

NORTH CAROLINA
D. Rod Compton
110A Maplewood Court
Greenville, NC 27834

SOUTH CAROLINA
Fred Hoover
Clemson University
P.O. Box 31
Clemson, SC 29633
803/656-2101

VIRGINIA
Ronald J. Stefancin
James Madison University
South Main
Harrisonburg, VA 22807
703/568-6562

WEST VIRGINIA
John Spiker
West Virginia University
Box 877
Morgantown, WV 26507

DISTRICT OF COLUMBIA
Thomas Sulkowski
George Washington University
600 22nd Street NW
Washington DC 20116

Dennis Rivenburgh
Sidwell Friends School
3825 Wisconsin Avenue NW
Washington, DC 20016
202/537-8190

DISTRICT 4

DISTRICT REPRESENTATIVE

Bill Kauth
Illinois State University
Department of HPERD
Normal, IL 61761

STATE DELEGATES

ILLINOIS
Gerald Bell
University of Illinois
216 Freer Hall
Urbana, IL 61801
217/333-7699

INDIANA
Dave Craig
c/o Indiana Pacers

MICHIGAN
Kenneth Kopke
Central Michigan University
Broomfield Road
Mt. Pleasant, MI 48859
517/774-6594

MINNESOTA
Gordon L. Graham
Mankato State University
Highland Arena
Mankato, MN 56001
507/389-6112

OHIO
Bob Livengood
Hospital Support Building, Rm 260
MCO, C.S. 10008
Toledo, OH 43699
419/381-3518

WISCONSIN
Dennis Helwig
University of Wisconsin
1440 Monroe St.
Madison, WI 53706
608/262-3630

MANITOBA
(no information)

ONTARIO
(no information)

DISTRICT 5

DISTRICT REPRESENTATIVE

Barb Moran

South Dakota State University
Dept. of HPER - Box 2820
Brookings, SD 57007
605/688-5022

STATE DELEGATES

IOWA
Lonnie Clark
731 46th Street
W. Des Moines, IA 50265
515/283-6212

KANSAS
Lynn Bott
University of Kansas
Allen Field House
Lawrence, KS 66045
913/864-3812

MISSOURI
John Omahundro
St. Louis Football Cardinals
200 Stadium Plaza
St. Louis, MO 63102
314/421-0777

NEBRASKA
Guy Shelton
University of Nebraska Medical Center
Dept. of Physical Therapy
42nd and Dewey Avenue
Omaha, NE 68105
402/559-4465

NORTH DAKOTA
Joe Kroeber
Jamestown High School
Jamestown, ND 58401
701/252-0559

OKLAHOMA
Dan E. Pickett
180 W. Brooks, Rm E-8
Norman, OK 73019
405/325-8332

SOUTH DAKOTA
Barb Moran
(District Representative)

DISTRICT 6

DISTRICT REPRESENTATIVE

Spanky Stevens
Head Athletic Trainer
University of Texas
Austin, TX 78712
512/471-5513

STATE DELEGATES

ARKANSAS
Dean Weber
University of Arkansas
Dept. of Athletics
Broyles Athletic Complex
Fayetteville, AR 72701
501/575-3756

TEXAS
Spanky Stevens
(District Representative)

DISTRICT 7

DISTRICT REPRESENTATIVE

Thomas E. Abdenour
Head Athletic Trainer
Weber State College
3750 Harrison Boulevard
Ogden, UT 84408
801/626-6500

STATE DELEGATES

ARIZONA
Mike Nesbitt
Box 15400 N.A.U.
Flagstaff, AZ 86011
602/523-4151

COLORADO
Ed Seiler
Denver Broncos/St. Luke's Hospital
Sports Medicine Center
70 Executive Center #1
4891 Independence Street - Suite 220
Wheat Ridge, CO 80033
303/425-8838

NEW MEXICO
L.F. Diehm
University of New Mexico
Athletic Department
Albuquerque, NM 87131
505/277-5114

UTAH
Thomas Abdenour
(District Representative)

WYOMING
Bill Lyons (temporary)
University of Wyoming
University of Station - Box 3414
Laramie, WY 82071
307/766-2305

DISTRICT 8

DISTRICT REPRESENTATIVE

Gary Lang
Athletic Trainer
Sacramento City College
3835 Freeport Blvd.
Sacramento, CA 95822
916/449-7273

STATE DELEGATES

CALIFORNIA
Gary Lang
(District Representative)

NEVADA
Dennis Ryan
Sports Therapy and Arthritis Rehabilitation
2055 E. Sahara
Las Vegas, NV 89104
702/796-0945

HAWAII
Eric Okasaki
Head Athletic Trainer
University of Hawaii
1337 Lower Campus Road
Honolulu, HI 96822
808/948-7144

DISTRICT 9

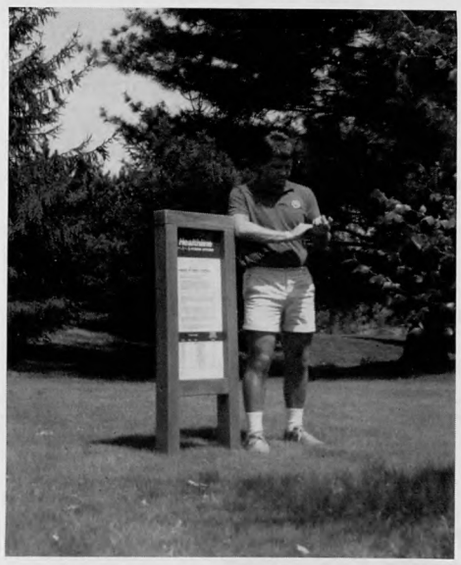
DISTRICT REPRESENTATIVE

Jim Murphy
McNeese State University
Department of Athletics
Lake Charles, LA 70609
318/478-4961

STATE DELEGATES

ALABAMA
Sang Lyda
University of Alabama/Tuscaloosa

HEALTH



Physical fitness is its own reward. We look better, feel better and perform better when we are physically fit.

The Healthline Fitness system is an aggressive approach to improved physical fitness by conditioning the musculo-skeletal and cardio-respiratory system. Healthline combines three groups of major exercise activities in their Fitness system: muscle flexion & stretch, muscle strength & tone, and cardiovascular conditioning. These activities are accomplished at exercise stations located along an outdoor trail. Up to 22 different Healthline exercise stations may be employed in the fitness trail. Each station includes the appropriate exercise equipment and illustrated sign that explains the activity. The Healthline Heart Check Station explains use of the system with regard to vigor of exercise, age and heart rate.

The Healthline Fitness System requires no supervision and little maintenance. Athletic trainers incorporating the system into their programs may develop different regimens to fit specific needs.

Please send me the free Healthline Fitness System brochure.

Name_____

Address_____

City_____ State_____ Zip_____

Agency or Dept._____ Telephone No._____

Quality Industries, Inc.

P.O. Box 765
Hillsdale, MI 49242-0765

Box K
Tuscaloosa, AL 35486
205/348-3663

FLORIDA
Jim Mackie
University of Florida
Div. of Intercollegiate Athletics
P.O. Box 14485
Gainsville, FL 32604
904/392-5840

GEORGIA
Warren Morris
University of Georgia
Box 1472
Athens, GA 30603

KENTUCKY
Keith Webster
Morehead State University
UPO Box 742
Morehead, KY 40351
606/783-2392

LOUISIANA
Jim Murray
(District Representative)

MISSISSIPPI
Jim Gallaspy
University of Southern Mississippi
Box 5105 Southern Station
Hattiesburg, MS 39406
601/266-5577

TENNESSEE
Tim Kerin
P.O. Box 47
Knoxville, TN 37901
615/974-1229

DISTRICT 10

DISTRICT REPRESENTATIVE
Jim Whitesel
Head Athletic Trainer
The Seattle Seahawks
5305 Lake Washington Blvd.
Kirkland, WA 98033
206/827-9777

STATE DELEGATES

ALASKA
Merle B. Young, Jr.
University of Alaska
Athletic Department
Fairbanks, AK 99701
907/474-7205

IDAHO
Gary Kraner/Tom Koto
1910 University Drive
Boise, ID 83725
208/385-1696

OREGON
Gerald Krummel
Lewis & Clark College
Department of Athletics
Portland, OR 97219
503/293-2709

MONTANA
Leo Dougherty
1937 Florida
Butte, MT 59701

WASHINGTON
Jim Whitesel
(District Representative)

ALBERTA
(no information available)

BRITISH COLUMBIA
(no information available)

SASKATCHEWAN
(no information available)

Professional Education

Professional Education Committee

GARY DELFORGE, CHAIRMAN
Department of Exercise & Sport Sciences
University of Arizona
Tucson, Arizona 85721
(602) 621-4947

GERALD W. BELL - Chairman, Sub-Committee on Internship Programs
Freer Hall, 906 S. Goodwin
University of Illinois
Urbana, Illinois 61801-3895
(217) 333-7699

SUSAN BRYANT - Project Director, Athletic Training Educators Workshop
Athletic Department
Cumberland College
Williamsburg, Kentucky 40769
(606) 549-2200

L.F. "TOW" DIEHM - Project Director, Education Ethics
Department of Athletics
University of New Mexico
Albuquerque, New Mexico 87131
(505) 277-5307

DAN FOSTER - Chairman Sub-Committee on Undergraduate Education
Carver - Hawkeye Arena
University of Iowa
Iowa City, Iowa 52242
(319) 353-4030

JANET GUILFOYLE - Project Director, Program Graduates Certification
Department of Physical Education
Northeastern University
Boston, Massachusetts 02115
(617) 776-6432

PETE KOEHNEKE - Project Director, Education Program Evaluation
Department of Physical Education
Canisius College
Buffalo, New York 14208
(716) 883-7000

DAVID LEIGH - Project Director, Program Graduates Placement
1532 W. Clybourn Street
Marquette University
Milwaukee, Wisconsin 53233
(414) 224-7136

KEN MURRAY - Project Director, Honors and Awards
P.O. Box 4199
Texas Tech University
Lubbock, Texas 79409
(806) 742-3355

LOU OSTERNIG - Project Director, Educational Research
Department of Physical Education
University of Oregon
Eugene, Oregon 97403
(503) 686-3384

DAVID H. PERRIN - Chairman, Sub-Committee on Graduate Education
Department of Health & Physical Education
University of Virginia
Charlottesville, Virginia 22903
(804) 924-6187

JACK REDGREN - Project Director, Annual Reports
Sports Medicine Rehabilitation Center
4230 Harding Road, Suite #101
Nashville, Tennessee 37205
(615) 383-0845

Approved Athletic Training Education Programs

1986-87

Programs listed here are approved by the National Athletic Trainers Association. For detailed information, write to the program director whose name is given in parentheses in the listing. Two basic plans of education for athletic training are listed according to the following key:

(1) Undergraduate Athletic Training Education Programs
(2) Graduate Athletic Training Education Programs

ARIZONA

UNIVERSITY OF ARIZONA (2)
Department of Exercise & Sport Sciences
Tucson, Arizona 85721 (Gary Delforge)

CALIFORNIA

CALIFORNIA STATE UNIVERSITY, FRESNO (1)
Department of Athletics
Fresno, California 93740-0001 (Ed Ferreira)

CALIFORNIA STATE UNIVERSITY, FULLERTON (1)
Department of Health, Physical Education & Recreation
Fullerton, California 92634 (Jerry Lloyd)

CALIFORNIA STATE UNIVERSITY, LONG BEACH (1)
Department of Physical Education
Long Beach, California 90840 (Keith Freesemann)

CALIFORNIA STATE UNIVERSITY, NORTHRIDGE (1)
Department of Physical Education
Northridge, California 91330 (Thomas Weidner)

CALIFORNIA STATE UNIVERSITY, SACRAMENTO (1)
Department of Health & Physical Education
Sacramento, California 95819 (Doris E. Flores)

DELAWARE

UNIVERSITY OF DELAWARE (1)
College of Physical Education, Athletics & Recreation
Newark, Delaware 19716 (Roy Rylander)

IDAHO

BOISE STATE UNIVERSITY (1)
Department of Physical Education
Boise, Idaho 83725 (Ron Pfeiffer)

ILLINOIS

EASTERN ILLINOIS UNIVERSITY (1)
Department of Physical Education & Athletics
Charleston, Illinois 61920 (Dennis Aten)

ILLINOIS STATE UNIVERSITY (2)
Department of Health, Physical Education, Recreation & Dance
Normal, Illinois 61761 (William Kauth)

SOUTHERN ILLINOIS UNIVERSITY (1)
Department of Physical Education
Carbondale, Illinois 62901 (Sally Rouse Perkins)

UNIVERSITY OF ILLINOIS (1)
Department of Physical Education
Urbana, Illinois 61801 (Gerald W. Bell)

WESTERN ILLINOIS UNIVERSITY (1)
College of Health, Physical Education & Recreation
Macomb, Illinois 61455 (Don Zylks)

INDIANA

BALL STATE UNIVERSITY (1)
Department of Men's Physical Education
Muncie, Indiana 47306 (Michael Ferrara)

INDIANA UNIVERISTY (1,2)
Department of Physical Education
Bloomington, Indiana 47405 (John W. Shrader)

INDIANA STATE UNIVERSITY (1,2)
Department of Physical Education
Terre Haute, Indiana 47809 (Bob Behnke, undergraduate) (Ken Knight, graduate)

PURDUE UNIVERSITY (1)
Department of Physical Education, Health & Recreational Studies
West Lafayette, Indiana 47907 (Dale Rudd)

IOWA

UNIVERSITY OF IOWA (1)
Department of Exercise Science & Physical Education
Iowa City, Iowa 52242 (Dan Foster)

KENTUCKY

EASTERN KENTUCKY UNIVERSITY (1)
Department of Physical Education
Richmond, Kentucky 40475-0933 (Robert M. Barton)

MASSACHUSETTS

BRIDGEWATER STATE COLLEGE (1)
Department of Health, Physical Education & Recreation
Bridgewater, Massachusetts 02324 (Marcia Anderson/Matthew Gerken)

NORTHEASTERN UNIVERSITY (1)
Department of Health, Sport & Leisure Studies
Boston, Massachusetts 02115 (Kerkor Kassabian)

SPRINGFIELD COLLEGE (1)
Department of Health, Physical Education, Recreation & Physical Therapy
Springfield, Massachusetts 01109 (Charles Redmond)

MICHIGAN

CENTRAL MICHIGAN UNIVERSITY (1)
Department of Physical Education
Mount Pleasant, Michigan 48859 (Gordon Martel)

GRAND VALLEY STATE COLLEGE (1)
Department of Physical Education & Athletics
Allendale, Michigan 49401 (Douglas P. Woods)

WESTERN MICHIGAN UNIVERSITY (2)
Department of Health, Physical Education & Recreation
Kalamazoo, Michigan 49008 (Bob Moss)

MINNESOTA

GUSTAVUS ADOLPHUS COLLEGE (1)
Department of Physical Education
St. Peter, Minnesota 56082 (Gary D. Reinholtz)

MANKATO STATE UNIVERSITY (1)
Department of Physical Education
Mankato, Minnesota 56001 (Gordon Graham)

MISSISSIPPI

UNIVERSITY OF SOUTHERN MISSISSIPPI (1)
Department of Athletic Administration & Coaching
Hattiesburg, Mississippi 39406-5105 (James B. Gallaspy)

MISSOURI

SOUTHWEST MISSOURI STATE UNIVERSITY (1)
Department of Health, Physical Education & Recreation
Springfield, Missouri 65804-0094 (Gary Ward/Ivan Milton)

MONTANA

UNIVERSITY OF MONTANA (1)
Department of Health & Physical Education
Missoula, Montana 59801 (Scott Richter)

NEBRASKA
UNIVERSITY OF NEBRASKA (1)
Department of Health, Physical Education & Recreation
Lincoln, Nebraska 68588-0618 (Roland E. LaRue)

NEVADA
UNIVERSITY OF NEVADA - LAS VEGAS (1)
School of Health, Physical Education, Recreation & Dance
Las Vegas, Nevada 89154 (A.G. Edwards)

NEW JERSEY
KEAN COLLEGE OF NEW JERSEY (1)
Department of Physical Education
Union, New Jersey 07083 (Gary Ball)
WILLIAM PATERSON COLLEGE OF NEW JERSEY (1)
Department of Movement Science
Wayne, New Jersey 07470 (Jim Manning)

NEW MEXICO
NEW MEXICO STATE UNIVERSITY (1)
Department of Physical Education, Recreation & Dance
Las Cruces, New Mexico 88003 (George Westbrook)
UNIVERSITY OF NEW MEXICO (1)
Department of Health, Physical Education & Recreation
Albuquerque, New Mexico 87131 (L.F. "Tow" Diehm)

NEW YORK
CANISIUS COLLEGE (1)
Department of Physical Education
Buffalo, New York 14208 (Pete Koehneke)
ITHACA COLLEGE (1)
Department of Health, Physical Education & Recreation
Ithaca, New York 14850 (Ken Scriber)
STATE UNIVERSITY OF NEW YORK AT BUFFALO (2)
Department of Physical Therapy & Exercise Science
Buffalo, New York 14214 (Terry Whieldon)
STATE UNIVERSITY OF NEW YORK AT CORTLAND (1)
Department of Physical Education & Recreation
Cortland, New York 13045 (John Cottone)

NORTH CAROLINA
APPALACHIAN STATE UNIVERSITY (1)
Department of Health Education, Physical Education & Leisure Studies
Boone, North Carolina 28608 (Craig Denegar)
EAST CAROLINA UNIVERSITY (1)
Department of Health, Physical Education, Recreation & Safety
Greenville, North Carolina 27834-4353 (Rod Compton)
UNIVERSITY OF NORTH CAROLINA (2)
Department of Physical Education
Chapel Hill, North Carolina 27514 (William E. Prentice)

NORTH DAKOTA
NORTH DAKOTA STATE UNIVERSITY (1)
Department of Health, Physical Education & Recreation
Fargo, North Dakota 58105-5600 (John Schueneman)
UNIVERSITY OF NORTH DAKOTA (1)
Department of Health, Physical Education & Recreation
Grand Forks, North Dakota 58202 (Mark Healy)

OHIO
BOWLING GREEN STATE UNIVERSITY (1)
Department of Health, Physical Education & Recreation
Bowling Green, Ohio 43403 (Crayton Moss)
MARIETTA COLLEGE (1)
Department of Sports Medicine
Marietta, Ohio 45750-3058 (Paul Spear)
MIAMI UNIVERSITY OF OHIO (1)
Department of Health, Physical Education
Oxford, Ohio 45056 (Patricia Troesch)
OHIO UNIVERSITY (1)
Department of Health & Sports Sciences
Athens, Ohio 45701 (Charles "Skip" Vosler)
UNIVERSITY OF TOLEDO (1)
Department of Health Promotion & Human Performance
Toledo, Ohio 43606 (Jim Rankin)

OREGON
OREGON STATE UNIVERSITY (1)
Department of Physical Education
Corvallis, Oregon 97331 (Richard F. Irvin)
UNIVERSITY OF OREGON (2)
Department of Physical Education
Eugene, Oregon 97403 (Rick Troxel)

PENNSYLVANIA
CALIFORNIA UNIVERSITY OF PENNSYLVANIA (1)
College of Education
California, Pennsylvania 15419 (William B. Biddington)
EAST STROUDSBURG UNIVERSITY (1)
Department of Professional Physical Education
East Stroudsburg, Pennsylvania 18301 (John Thatcher)
LOCK HAVEN UNIVERSITY (1)
Department of Health & Science
Lock Haven, Pennsylvania 17745 (David J. Tomasi)
PENNSYLVANIA STATE UNIVERSITY (1)
Department of Athletics/Health Education
University Park, Pennsylvania 16802 (Angela Carlson)
UNIVERSITY OF PITTSBURGH (1)
Department of Physical Education
Pittsburgh, Pennsylvania 15261 (Frank Walters)
SLIPPERY ROCK UNIVERSITY (1)
Department of Health Sciences
Slippery Rock, Pennsylvania 16057 (Rick McCandless)
WEST CHESTER UNIVERSITY (1)
Department of Physical Education
West Chester, Pennsylvania 19383 (Phillip B. Donley)

SOUTH DAKOTA
SOUTH DAKOTA STATE UNIVERSITY (1)
Department of Health, Physical Education & Recreation
Brookings, South Dakota 57007 (Jim Booher)

TENNESSEE
EAST TENNESSEE STATE UNIVERSITY (1)
Department of Physical Education & Athletics
Johnson City, Tennessee 37614-0002 (Jerry Robertson)

TEXAS
SOUTHWEST TEXAS STATE UNIVERSITY (1)
Department of Health, Physical Education & Recreation
San Marcos, Texas 78666 (Bobby Patton)

TEXAS CHRISTIAN UNIVERSITY (1)
Box 32924 - TCU
Fort Worth, Texas 76129 (T. Ross Bailey)

UTAH

BRIGHAM YOUNG UNIVERSITY (1)
College of Physical Education Sports
Provo, Utah 84601 (Earlene Durrant)

VERMONT

UNIVERSITY OF VERMONT (1)
Department of Human Development Studies
Burlington, Vermont 05405 (Roger T. Bryant)

VIRGINIA

JAMES MADISON UNIVERSITY (1)
Department of Physical Education & Health Sciences
Harrisonburg, Virginia 22807 (Ronald Stefancin)

OLD DOMINION UNIVERSITY (2)
Department of Physical Education
Norfolk, Virginia 23508 (Martyn Bradley)

UNIVERSITY OF VIRGINIA (2)
Department of Health & Physical Education
Charlottesville, Virginia 22903 (David H. Perrin)

WASHINGTON

WASHINGTON STATE UNIVERSITY (1)
Department of Physical Education, Sport & Leisure Studies
Pullman, Washington 99164 (Douglas Sebold)

WEST VIRGINIA

MARSHALL UNIVERSITY (1)
Department of Health, Physical Education & Recreation
Huntington, West Virginia 25701 (Dan Martin)

WEST VIRGINIA UNIVERSITY (1)
Department of Professional Physical Education
Morgantown, West Virginia 26506-6116 (John Leard)

WISCONSIN

UNIVERSITY OF WISCONSIN - LA CROSSE (1)
Department of Health, Physical Education & Recreation
La Crosse, Wisconsin 54601 (Karen R. Toburen)

10 Graduate Programs
64 Undergraduate Programs

Order Forms *begin on page 386*

Research & Injury

OUTSTANDING RESEARCH AWARD

CALL FOR PAPERS

The Research and Injury Committee of the National Athletic Trainers Association has as its overall mission to encourage members of the NATA to conduct, document and report research in the athletic training profession. In order for our profession to grow we must continually search for new methods of prevention, care and rehabilitation of athletic related trauma. We also have a responsibility to monitor the effectiveness and strive for excellence in our current clinical procedures. To this end, the Research and Injury Committee established the Outstanding Research Award.

The Outstanding Research Award is designed to provide recognition for the research efforts of the members of our profession. The Research and Injury Committee and a panel of noted researchers in the area of Sports Medicine will review all papers submitted for consideration. The entire review process will be conducted so that no reviewer is able to identify the authors or the institutions associated with any paper being considered. The Research and Injury Committee will determine the appropriateness of the papers and the amount of the cash awards to be presented to the Outstanding Research Project as well as the award for the first runner-up. In general, the runner-up award will be half of that established for the Outstanding Research Award.

The Research and Injury Committee reserves the right not to provide an award, either first or second, or both, if in its opinion the submitted manuscripts have not met the established criteria. *Athletic Training, The Journal of the National Athletic Trainers Association* has the first right of publication of papers submitted for the Outstanding Research Award. Papers that have been submitted for publication in other professional journals are ineligible for this program. Should the Journal elect not to publish the recipient's paper, consideration will be provided at 75% of the original award amounts.

It should be noted that this program is not to be confused with the Call for Abstracts for the 1987 Free Communications Session in Columbus. The Outstanding Research Award is offered based on fully completed projects and requires written documentation of background, method, data collection, findings, discussion, bibliography and auxiliary funding sources.

To be eligible for the Outstanding Research Award the following criteria are established. These criteria must be followed and submission deadlines met in order for papers to be considered.

1. The Principal Investigator must be an NATA Certified Athletic Trainer.

2. The project must be of original design and not have been published at the time of application.

3.The project must represent a completed research effort at the time of application.

4.Entries must be written in journal manuscript format according to the Guide to Contributors established by the NATA Journal.

5. *ATHLETIC TRAINING, The Journal of the NATA* has first choice to publish any paper receiving a cash award. Winners will be notified by August 1st whether or not *Athletic Training* intends to publish their papers.

Entrants should take great care to see that their papers are suitable for publication.

6. Completed papers must be received at the following address prior to January 30, 1987:

Mr. Russ Cagle
Head Athletic Trainer
Williamette University
Salem, OR 97301

The basic criteria for final selection will be as follows:

1. ORIGINALITY

A. Background for nature of the project.
B. Creativity and utility of the research design.
C. Need based on existing review of literature.

2. DEPTH OF ANALYSIS

A. Use of appropriate statistical designs and methodologies.

B. Application of theoretical and practical design.
C. Interpretations based on the project design.

3. APPLICATION FOR THE PROFESSION

A. Effectiveness and relationship of research to the clinical setting.
B. Application for growth of the athletic training profession.
C. Contributions to the theoretical and practical knowledge in Athletic Training.

4. PRESENTATION

A. Clarity of organization.
B. Internal Consistency.
C. Bibliography.

FREE COMMUNICATIONS CALL FOR ABSTRACTS June 1987

Each year during our National Convention, members are continually sharing ideas, procedures, techniques, innovations in and for the profession of athletic training. Most of these conversations are among small groups of members and much of the information exchanged would be highly meaningful for the larger group. Many of these ideas have been developed through systematic data collection and observations made by the athletic trainers in the performance of their responsibilities. The accumulation of this information represents an important form of applied research.

With this in mind, the NATA Research and Injury Committee will offer a Free Communications Section at our National Meeting in Columbus, June 1987. In order to provide organization to this session, the Committee is issuing a CALL FOR ABSTRACTS from the NATA membership. The titles of the projects to be presented will be available to members prior to the convention so that they will know which topics will be discussed and at what time during the session.

The response to this session has been excellent. We encourage each member to participate in these information exchanges. So please submit your abstract soon and we look forward to seeing you in Columbus.

INSTRUCTIONS FOR COMPLETION OF FREE COMMUNICATION ABSTRACT

Please read all instructions before preparing abstract. Carefully develop your abstract so that it is within the boundaries of the space provided on the following page. Mail a clearly typed original and one copy prior to January 30, 1987.

1. Type title of paper or project in all caps.
2. Type the name of all authors with the author that will make the presentation listed first.
3. Indent three spaces on a new line and type the text of your paper.
4. Indicate any funding or grants information on one line at the bottom.
5. Indicate if presenting author is "member of the NATA."
6. Indicate any audio-visual aids required.
7. Sign the completed abstract.

REMEMBER: Your abstract should be of the informative type and should contain:
A. Sentence stating the specific objective of the project.
B. Brief statement of methods.
C. Summary of results.
D. Statement of conclusion.

All submitted abstracts are sent to a sub-committee consisting of members of the NATA Research and Injury Committee. Each member of this group will independently review and rank each abstract submitted without benefit of the author's name or affiliation. Final selection of the abstracts for presentation are determined by the review committee's order of merit. The number of selection's are dependent upon the amount of time allotted for the Free Communication Sessions at the National Convention. Each presenter will have fifteen minutes in which to deliver his/her topic. Notification will be made in plenty of time for final paper preparation.

1987 INTERNATIONAL ISOKINETIC CONGRESS

April 16-17-18, 1987
Lake Tahoe, Nevada

CYBEX

Lido

BIODEX CORPORATION

KIN-COM®

Come and participate in the First Scientific Congress on Isokinetic Exercise and its Clinical Use in the Field of Orthopaedics and Sports Medicine.

Learn About, Observe and Use the Leading Isokinetic Peripheral Joint Testing Machines from Biodex, Cybex, Kin-Com and Lido in Clinical Situations.

These Outstanding Speakers Highlight the Congress:

Jim Montgomery, M.D.
Mark Rowinski, Ph.D.
Richard Romeyn, M.D.
Greg Bennet, P.T.
Doug Ross, P.T.
Mark Gibson, A.T.C.
Jeff Metheny, M.D.
Sue Aikens, Ph.D.
Bob Tank, P.T., A.T.C.
Rich Elsner, P.T., A.T.C.
Tony Dilitto, P.T.
Brett Smith, P.T.

REGISTER NOW!

Please Check Appropriate Box

Rate before 2-9-87 ☐ $299

Rate after 2-9-87 ☐ $349

Please send information on the 1987 International Isokinetic Congress ☐

Name _____

Address _____

City _____ *State* _____

Zip _____ *Phone* _____

Return this form and a check to:

Ms. Lynn DePaolo
Orthopaedic and Sports Education and Research (OSER)
505 King Street/Suite 001
La Crosse, WI 54601
(608) 784-1560

Hotel Reservations can be made at Hyatt Lake Tahoe, P.O. Box 3239, Country Club Drive and Lakeshore Blvd., Incline Village, Nevada 89450 (702) 831-1111.

Your travel arrangements can be made by the Travel Center (608) 782-8445, 505 King Street, La Crosse, WI 54601. Attention Carl

CALL FOR ABSTRACTS
NATA FREE COMMUNICATION
NATIONAL CONVENTION
COLUMBUS, OHIO
JUNE, 1987

Presenting Author(s): _____

Address: _____

_____

Representing: _____

Telephone: ( ) _____ Audio Visual Needs: _____

Is presenting author a member of NATA? _____

Completed abstracts must be received at the following address prior to January 30, 1987:

Russ Cagle
Head Athletic Trainer
Williamette University
Salem, OR 97301

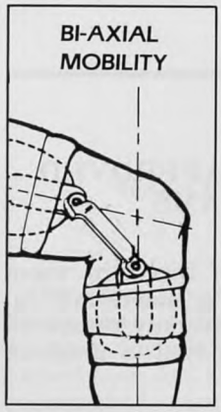
ANDERSON KNEE STABLER®

PROTECTIVE KNEE BRACE

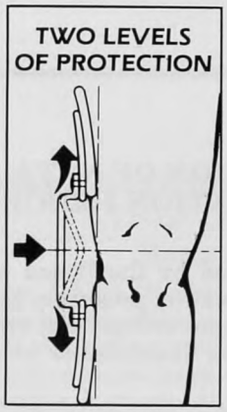
"The Name of the Game is Protection"

The unique design of the **ANDERSON KNEE STABLER®** *offers lateral protection and support while allowing action mobility. The ANDERSON is widely used for football, hockey and other sports by hundreds of colleges and high schools as well as professional teams. It is endorsed by the NFL Players Association.*

If you are going to pay for protection make sure you get it.



Bi-Axial Double-Hinged design gives action mobility.



1. *Bridges and spreads the load away from the knee.*
2. *Absorbs energy: Center bar yields to high impact loads.*

Features:

1. Contoured wide angle flanges
2. Exclusive plush nylon/ neoprene wrap for maximum adjustment
3. Hyperextension stop to assist anterior/posterior control
4. Convertible from wrap-on to tape-on

Endorsed by the NATIONAL FOOTBALL LEAGUE PLAYERS ASSOCIATION

TAPE-ON MODEL 101

WRAP-ON MODEL 101W

omni SCIENTIFIC, INC.

for more information write or call:

1-800-448-OMNI (6664)
or (415) 228-5330 (in Cal.)

827 Arnold Drive #100 • Martinez, California 94553

U.S. Patent No. 4249524. Other U.S. and foreign patents pending.

GUIDELINES FOR DEVELOPMENT AND IMPLEMENTATION OF NATA APPROVED GRADUATE ATHLETIC TRAINING EDUCATION PROGRAMS
1984 Edition

Developed by the NATA Professional Education Committee and approved by the Board of Directors, these **Guidelines** govern NATA evaluation of graduate athletic training education programs. Directors of current NATA approved athletic training education programs and college and university personnel contemplating development of new graduate programs will find these **Guidelines** essential to program development according to NATA standards.

Order Form

GUIDELINES FOR DEVELOPMENT AND IMPLEMENTATION OF NATA APPROVED GRADUATE ATHLETIC TRAINING EDUCATION PROGRAMS
1984 Edition

Please send me _____ copy(ies) of the **Guidelines** ($10.00 each). Total amount enclosed $ _____.

NAME _____

ADDRESS _____

SCHOOL _____

CITY _____ **STATE** _____ **ZIP CODE** _____

PAYMENT MUST BE SUBMITTED WITH ORDER! Make checks payable to NATA **Professional Education Committee** and mail to:

Dr. Gary Delforge
NATA Professional Education Committee
Department of Physical Education
University of Arizona
Tucson, Arizona 85721

GUIDELINES FOR DEVELOPMENT AND IMPLEMENTATION OF NATA APPROVED UNDERGRADUATE ATHLETIC TRAINING EDUCATION PROGRAMS
1983 Edition

Developed by the NATA Profesional Education Committee and approved by the Board of Directors, these **Guidelines** govern NATA evaluation of undergraduate athletic training education programs as academic majors. Directors of current NATA approved athletic training education programs and college and university personnel contemplating development of new undergraduate programs will find these **Guidelines** essential to program development according to NATA standards.

Order Form

GUIDELINES FOR DEVELOPMENT AND IMPLEMENTATION OF NATA APPROVED UNDERGRADUATE ATHLETIC TRAINING EDUCATION PROGRAMS
1983 Edition

Please send me _____ copies of the **Guidelines** ($10.00 each).

Total amount enclosed $ _____.

NAME _____

ADDRESS _____

SCHOOL _____

CITY _____ STATE _____ ZIP CODE _____

Payment must be submitted with order. Make checks payable to NATA PROFESSIONAL EDUCATION COMMITTEE and mail to:

Dr. Gary Delforge
NATA Professional Education Committee
Department of Physical Education
University of Arizona
Tucson, Arizona 85721

COMPETENCIES IN ATHLETIC TRAINING

Developed by the NATA Professional Education Committee and approved by the Board of Directors, the competencies included in this nineteen page manual clearly identify the body of knowledge and technical skills to be developed by the entry-level athletic trainer. Specific competencies are identified for each of seven "major tasks" comprising the role of the athletic trainer and are categorized according to knowledge and intellectual skills (cognitive domain), manipulative and motor skills (psychomotor domain), and attitudes and values (affective domain.)

The manual is intended to assist both instructional personnel and students in identifying knowledges and skills to be mastered. Individual students preparing for careers in athletic training will find the list of competencies helpful as a guide to self-evaluation of their strengths and weaknesses.

Order Form
COMPETENCIES IN ATHLETIC TRAINING

Please send me _____ copies of the **Competencies in Athletic Training.**

Total amount enclosed $ _____.

Individual Copies $6.00 Member
$11.00 Non-members

Bulk Orders: Subtract 10% from total purchase price for orders of 15 copies or more.

NAME _____
ADDRESS _____
SCHOOL _____
CITY _____ STATE _____ **ZIP CODE** _____

Payment must be submitted with order. Make checks payable to **NATA PROFESSIONAL EDUCATION COMMITTEE** and mail to:

Competencies in Athletic Training
1001 East Fourth Street
Greenville, North Carolina 27858

RECOMMENDATIONS FOR DEVELOPMENT AND IMPLEMENTATION OF ATHLETIC TRAINING INTERNSHIP PROGRAMS

Manual for Internship Program Supervisors

Developed by the NATA Professional Education Committee, this manual includes recommendations for development of learning experiences for students pursuing NATA certification through the 1800 hour internship program. Included in the manual are the **Competencies in Athletic Training,** guidelines for development of clinical experiences, and elective course work recommendations. Certified athletic trainers supervising internship students in colleges and universities, high schools, and professional sports, as well as NATA approved allied clinical settings will find the manual helpful.

Order Form
RECOMMENDATIONS FOR DEVELOPMENT AND IMPLEMENTATION OF ATHLETIC TRAINING INTERNSHIP PROGRAMS

Please send me _____ copy(ies) of the **Recommendations** ($10.00)

Total amount enclosed $ _____.

NAME _____

ADDRESS _____

SCHOOL _____

CITY _____ STATE _____ **ZIP CODE** _____

PAYMENT MUST BE SUBMITTED WITH ORDER! Make checks payable to NATA PROFESSIONAL EDUCATION COMMITTEE and mail to:

RECOMMENDATIONS
NATIONAL ATHLETIC TRAINERS ASSOCIATION, INC.
1001 East Fourth Street
Greenville, North Carolina 27858

GET THE COMPETITIVE EDGE

Healthy players are winners.

Coaches, Trainers and Student Trainers:

To keep your athletes in top-notch shape you need the most comprehensive, up-to-date information available on the prevention, care and rehabilitation of athletic injuries.

Whether you are a coach, trainer or team physician, you'll find **Athletic Training and Sports Medicine** can add an edge: an accessible easy-to-understand guide to better health for your athletes.

The American Academy of Orthopaedic Surgeons teamed up with the National Athletic Trainers Association to develop this in-depth 600-page volume that deals with every aspect of the medical care and training of the career, amateur, and recreational athlete.

The book's 51 chapters detail the latest advances in conditioning, prevention, musculoskeletal injuries, emergency care, special medical considerations, rehabilitation, and much, much more. An extensive glossary helps clarify terms and more than 450 drawings, x-rays, charts, diagrams, and photos illustrate and amplify the text. This book is an invaluable tool on how to keep your players at the peak of their performance. . . and in the game!

We wanted to find out if **Athletic Training and Sports Medicine** was as good as we thought it was, so we asked the user: coaches, trainers, physicians, educators and "hands-on" people like you.

To order by Visa or Master Card call:

1-800-626-6726

(Illinois residents call 312-823-6630) Or send your check or purchase order for $39.00 for each book (includes shipping) to: American Academy of Orthopaedic Surgeons P.O. Box 7195 Chicago, Illinois 60680
Be sure to include your name and shipping address!
Allow 3-6 weeks for delivery

Here's What They Said!

Athletic Training and Sports Medicine is the best text ever written on the subject. I cannot tell you how many times this NBA season I have referred to it. I recommend it to every trainer and coach who calls me looking for a reference. What makes it so outstanding is that it's understandable to coaches and trainers. You don't have to be in the medical profession to interpret it.

Ron Culp, RPT; AT,C
Trainer, The Portland Trailblazers, Portland, Oregon

This is a great book with outstanding diagrams and photographs. It should be required reading for any athletic trainer.

Jerry Lloyd, MS; AT,C
California State University, Fullerton, California

Without question this is one of the finest, most complete publications available for athletic trainers.

Lewis W. Flagg, Jr., RPT; AT,C; RT
Exeter Academy, Exeter, New Hampshire

I keep a copy on my desk for fast easy reference and it is also widely used by all of my student trainers.

Patrick Baril, AT,C
Head Athletic Trainer, University of Denver, Denver, Colorado
Selected Volunteer for U.S. Olympic Sports Medicine Staff

I find the book to be very well organized, making it easy to find desired information quickly. I believe it is of interest to a broad audience. In addition to my own use as a high school basketball coach and physiology instructor, my young team trainers have found it valuable.

Jerry Leggett
Head Basketball Coach, Quincy High School, Quincy, Illinois

Athletic Training and Sports Medicine: Winner of a 1985 First Place Award in the 1985 American Medical Writers Association book awards competition.

Sayers "Bud" Miller Distinguished Athletic Training Educator Award

Nominations are being received for the annual **Distinguished Athletic Training Educator Award** to be presented by the NATA Professional Education Committee in recognition of excellence in athletic training education:

I. Qualifications

To be nominated for the award, educators must have the following qualifications:

1. Current member of the National Athletic Trainers Association, Inc.
2. Member of a teaching faculty in the area of athletic training/sports medicine for at least ten (10) years.
3. Minimum of ten years of outstanding service in the area of athletic training education and research.
4. Recognized excellence in the field of athletic training education.
5. Outstanding service in district, state or national professional organizations concerned primarily with the field of athletic training.
6. Evidence of quality in publications and public speaking on topics in athletic training/sports medicine.

II. Nomination Procedures

1. the candidate's current personal resume which includes:
   a. academic background
   b. employment background
   c. published research and other publications (journal articles, books, etc.)
   d. course work taught (during past five years)
   e. classroom teaching innovations
   f. course work/curriculums developed
   g. professional memberships
   h. positions on state, district, or national level of the National Athletic Trainers Association, Inc.
   i. positions on state, district, or national level of related sports medicine professional organizations
   j. consultant work
   k. speaking engagements on community, state, regional, and national levels
   l. community service
   m. college or university service (i.e. committee involvement, thesis advertising, etc.)
   n. any other pertinent materials
2. A minimum of three letters (additional letters may be submitted) from professional colleagues, administrators, or students providing detailed rationale in support of the candidate's nomination.

Nominations including the above materials should be sent to the Professional Education Committee Project Director, Honors and Awards, and must be received by **March 1, 1987.** Presentation of the award will be made to the recipient at the 1986 NATA Annual Meeting and Clinical Symposium in Las Vegas, Nevada. Send nominations to:

Ken Murray
Athletic Department
Texas Tech University
P.O. Box 4199
Lubbock, Texas 79409

A Comparison of Two *from page 318*

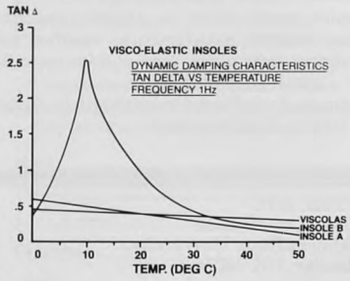
10. Mathewes DK: *Measurements in Physical Education.* 4th edition. Philadelphia, PA: WB Saunders Co. 1973.
11. McArdle WD, Katch FI, Katch VL: *Exercise Physiology: Energy, Nutrition, and Human Performance.* Philadelphia, PA: Lea and Febiger. 1981.
12. McCloy CH: *Test and Measurements in Health and Physical Education.* New York: FS Crofts and Co. 1944.
13. Murray MP, Gardner GM, Mollinger LA, et al.: Strength of Isometric and Isotonic Contractions: Knee Muscles of Men Aged 20 to 86. *Physical Therapy* 60:4, 1980.
14. Norkin CC, Levangie PK: *Joint Structure and Function: A Comprehensive Analysis.* Philadelphia, PA: FA Davis Company. 1983.
15. Pipes TV, Wilmore JH: Isokinetic Versus Isotonic Strength Training in Adult Men. *Medicine and Science in Sports* 7:262-274, 1975.
16. Polhemus R: The Effects of Plyometric Training with Ankle and Vest Weights on Conventional Weight Training Programs for Men and Women. *National Strength Coaches Association Journal* 2(2):13, 1980.
17. Pollock ML, Wilmore JH, Fox SM III: *Health and Fitness Through Physical Activity.* New York: John Wiley and Sons. 1978.
18. Rasch PJ, Burke RK: *Kinesiology and Applied Anatomy.* 6th edition. Philadelphia, PA: Lea and Febiger. 1978.
19. Rasch PJ, Pierson WR: Some Relationships of Isometric Strength, Isotonic Strength, and Anthropometric Measurements. *Journal of Ergonomics* 6:211-215, 1963.
20. Rasch PJ: *Weight Training.* 2nd edition. Dubuque, Iowa: Wm C Brown. 1975.
21. Riley DP: *Strength Training by the Experts.* 2nd edition. West Point, NY: Leisure Press. 1982.
22. Riley DP: *Conditioning for Football: The Penn State Way.* West Point, NY: Leisure Press. 1978.
23. Walters EC: Scientific Foundations of the Overload Principle. *Scholastic Coach* 27(8): 34-35, 1958.
24. White J, Mathew JL, Piper CC: Prediction of Body Composition in College Football Players. *Journal of Sports Medicine* 20: 317-334, 1980.
25. Wilmore JH: *Training for Sport and Activity: The Physiological Basis of the Conditioning Process.* 2nd edition. Boston, MA: Allyn and Bacon, Inc. 1982.
26. Wilmore JH, Parr RB, Girandola RN, Ward P, Vodka P, Barstow TJ, Pipes T, Romero GT, Leslie P: Physiological Alterations Consequent to Circuit Weight Training. *Medicine and Science in Sport* 10: 79-84, 1978. ⊕

IF YOU THINK YOU'RE USING THE BEST CUSHIONING INSOLE, YOU'RE IN FOR A SHOCK!

When a better product is needed in the physical therapy field, you can bet Chattanooga will develop it! An improved cushioning material was needed so Chattanooga developed Viscolas®...a significant advance in insoles, heel cushions and heel spur cushions.

A Shock-Attenuating Cushion That Moderates the Damaging Effects of Heel Strike

Viscolas attenuates the shock produced by heel strike and dissipates it on three axes—compression, torsion and shear. Additionally, the material has a time delay factor which means the product provides the four-dimensional action that is so important to patients who suffer from musculoskeletal disorders and lower limb injuries common to sports and occupational activities.



Clinically Tested and Biomechanically Designed

Independent clinical testing has shown that Viscolas is far superior in cushioning heel strike to anything else on the market today.

As the first visco elastic material *specifically* developed for use as a cushioning material in footwear, Viscolas has overcome the problems associated with comparable visco elastic products. The material contains no heavy metals that could cause skin irritation and is fully resistant to bacterial and fungal growth.

To provide the best support for your patients, Viscolas products are orthopedically designed to give optimum load distribution under the foot. The isobaric action of the material adjusts its own structure continuously to equalize underfoot pressure.

Cambrelle™, a fabric with outstanding characteristics, is used to cover the top of the product. This material has an exceptional resistance to abrasion, sweat and bacterial growth. The inherent tackiness of the visco elastic compound adheres the cushion to the inside of the shoe to prevent slippage.

Chattanooga Reduces Your Inventory With a Unique Sizing System

Storage space is usually a problem in a clinic or institution, so Chattanooga has reduced the number of sizes to just four, which cover the entire range of standard shoe sizes. The patient trims the insole to fit his or her own shoe. The heel cushions and heel spur cushions, which do not have to be trimmed, follow the same sizing pattern. Viscolas sheets are also available for custom design applications.

SHOE SIZE CHART

CODE	BOYS'/MEN'S			WOMEN'S		
A	2	3	4	4	5	6
B	5	6	7	7	8	9
C	8	9	10	10	11	12
D	11	12	13	–	–	–

There's a great deal more about Viscolas insoles, heel cushions and heel spur cushions we'd like to tell you, and we have clinical studies we're sure you would find interesting. Just call us TOLL FREE at 1-800-592-7329 and we'll be glad to send more information.

CHATTANOOGA
CORPORATION

Wellness by Design™

Guide to Contributors

Athletic Training, The Journal of the National Athletic Trainers' Association, Inc. 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. Four copies of the manuscript should be forwarded to the editor and each page typewritten on one side of 8½ x 11 inch plain paper, double spaced with one inch margins.
2. Good quality color photography is acceptable for accompanying graphics but glossy black and white prints are preferred. Color illustrations will be used only if color separations are furnished. 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; however photographs cannot be returned if the manuscript is published.
   All artwork 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.
   All artwork to be reproduced in black plus a second (or more colors) should be submitted as black and white line art (see above paragraph), with an Amberlith® or similar-type overlay employed for each area of additional color(s). Also, all areas of tonal value, shading, "washes", etc. should be supplied on a separate clear or frosted acetate or Amberlith® overlay. In addition, all areas to be screened (a percent or tint of black or color) should be supplied on an Amberlith® overlay. Artwork cannot be returned if the manuscript is published.
3. The list of references and citations should be in the following form: a) books: author, title, publisher with city and state of publication, year; b) articles: family names, initials and titles of all authors, title of article, journal title, with abbreviations accepted as per Index Medicus, volume, page, year. Citations in the text of the manuscript will take the form of a number in parentheses, (7), directly after the reference or name of author being cited, indicating the number assigned to the citation. Example of references to a journal, book, chapter in an edited book, and presentation at a meeting are illustrated below. Reference page accompanying manuscript should list authors in alphabetical order numerically.
   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*, 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.
5. Manuscripts are accepted for review for possible publication with the understanding that they are original, have been submitted solely to *Athletic Training*, and are not under simultaneous review by any other publication. 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 *National Athletic Trainers Association*. For permission to reproduce an article published in *Athletic Training*, send request to the Editor-in-Chief.
6. 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.
7. It is required that submitting authors include a comprehensive abstract and a brief biographical sketch.
8. Published manuscripts and accompanying artwork cannot be returned. Unused manuscripts will be returned when submitted with a stamped, self-addressed envelope.

The following recommendations are offered to those submitting CASE REPORTS:

1. The above recommendations for submitting manuscripts apply to case studies as well but only two copies of the report need be submitted.
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* receive, 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 for TIPS FROM THE FIELD:

1. The above recommendations for submitting CASE REPORTS apply to Tips From the Field.
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.

The following guidelines must be met for submission of papers or material to the STUDENT TRAINER CORNER.

1. Author must be a student member of NATA.
2. Topics must relate to athletic training. (case reports, experimental reports, suggestions, new ideas, tips and/or specifics for a given problem)
3. Articles should be no more than 2 to 3 pages in length, double spaced.

Journal Deadlines

The Editorial Board will review papers submitted on an individual basis, work with the authors and prepare the papers for publication.

In order to avoid confusion and delays on contributions to the Journal the deadlines are provided below.

The deadlines are:

Journal	Deadline
Spring Issue	December 15
Summer Issue	March 1
Fall Issue	June 15
Winter Issue	September 15

Send material for "Announcements", "Letters to the Editor" and miscellaneous items to:

Steve Yates, Editor-in-Chief
P.O. Box 7265-Sports Medicine Unit
Wake Forest University
Winston-Salem, NC 27109

Send manuscripts and "Case Reports" to:

Ken Knight
Physical Education Department
Indiana State University
Terre Haute, IN 47809

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

"Tips From the Field" and "New Products" should be sent to:

Barrie Steele
Head Athletic Trainer
University of Idaho
Moscow, Idaho 83843

Items for the "Student Trainer Corner" should be sent to:

Deloss Brubaker
U.S. Sports Academy
One Academy Drive
Daphne, AL 36526

Reliability of Isokinetic Measures *from page 321*

3. Cambell DE, Glenn W: Foot-pounds of torque of the normal knee and the rehabilitated postmeniscectomy knee. *Physical Therapy* 59(4): 418-421, 1979.
4. Gleim GW, Nicholas JA, Webb JN: Isokinetic evaluation following leg injuries. *The Physician and Sportsmedicine* 6(8): 75-82, 1978.
5. Hislop HJ, Perrine JJ: The isokinetic concept of exercise. *Physical Therapy* 47(2): 114-117, 1967.
6. Johnson J, Siegel D: Reliability of an isokinetic movement of the knee extensors. *The Research Quarterly* 49(1): 88-90, 1978.
7. Kelly JM, Gorney BA, Kalm KK: The effects of a collegiate wrestling season on body composition, cardiovascular fitness and muscular strength and endurance. *Medicine and Science in Sports* 10(2): 119-124, 1979.
8. Mawdsley RH, Croft BJ: The effects of submaximal contractions on an isokinetic test session. *The Journal of Orthopaedic and Sports Physical Therapy* 4(2): 74-77, 1982.
9. Miyashita M, Kanehisa H: Dynamic peak torque related to age, sex, and performance. *Research Quarterly* 50(2): 249-255, 1979.
10. Moffroid M, Whipple R, Hofkosh J, Lowman E, Thistle H: A study of isokinetic exercise. *Physical Therapy* 49(7): 735-744, 1969.
11. Murray MP, Gardner GM, Mollinger LA, Sepic SB: Strength of isometric and isokinetic contractions. *Physical Therapy* 60(4): 412-419, 1980.
12. Osternig LR, Sawhill JA, Bates BT, Hamhill J: Function of limb speed on torque ratios of antagonistic muscles and peak torque joint position. *Medicine and Science in Sports and Exercise* 13: 107,1981.
13. Rankin JM, Thompson CB: Isokinetic evaluation of quadriceps and hamstring function: normative data concerning body weight and sport. *Athletic Training* 18:110-114, 1983.
14. Schlinkman B: Norms for high school football players derived from Cybex data reduction computer. *The Journal of Orthopaedic and Sports Physical Therapy* 5(5): 243-245, 1984.
15. Thistle HG, Hislop HJ, Moffroid M, Lowman EW: Isokinetic contractions: a new concept of resistive exercise. *Archives of Physical Medicine and Rehabilitation* 6: 279-282, 1967.
16. Thorstensson A: Muscle strength, fibre types, and enzyme activities in man. *Acta Physiologica Scandinavica, Supplement* 449: 7-38, 1976.
17. Winter DA, Wells RP, Orr GW: Errors in the use of isokinetic dynamometers. *European Journal of Applied Physiology* 46: 397-408, 1981. ⊕

Calendar *from page 361*

26-27 3rd National Traumatic Brain Injury Symposium, Baltimore, MD. Contact Roberta Schwartz, MEd, CCC-SLP, MIEMSS, 22 S. Greene Street Baltimore, MD 21201.

ATHLETIC TRAINING will list events of interest to persons involved in sports medicine, providing items are received well in advance of publication. Please include the name and address of the person to contact for further information. Send items for the CALENDAR to Jeff Fair, Head Athletic Trainer, Athletic Department, Oklahoma State University, Stillwater, OK 74074. Refer to the following dates to ensure your event will appear in the desired issue. ⊕

ISSUE	COPY DUE DATE
Spring	December 15
Summer	March 1
Fall	June 15
Winter	September 15

STATEMENT OF OWNERSHIP MANAGEMENT AND CIRCULATION
(Required by 39 U.S.C. 3685)

Date of Filing: September 23, 1986
Title of Publication: ATHLETIC TRAINING, The Journal of the National Athletic Trainers Association, Inc. (NATA Inc.)
Frequency of Issues: Quarterly
Location of Known Offices: 1001 East Fourth St. Greenville, NC 27858.
Editor: Steve Yates, Wake Forest University, PO Box 7265, Winston Salem, NC 27109
Managing Editor: Barbara Manning, 1001 East Fourth St., Greenville NC 27858.
Owner: National Athletic Trainers Association Inc., 1001 East Fourth St., Greenville, NC 27858.

Known bondholders, mortgages, and other security holders owning or holding one (1) or more of total amounts of bonds, mortgages or other securities. None.

Extent and Nature Circulation	
Total No. copies printed (Net press run)	10,303
Paid Circulation	
Dealers, carriers, vendors, counters	0
Mail subscription	9,847
Free Distribution	
Samples, comps, etc.	95
Total Distribution	9942
Office use, left-over spoiled, unaccounted	361
Returns from news agents	0
Total	10,303

I Certify that the statements made by me above are correct and complete.
Barbara Manning, Managing Editor

Advertisers

EAGLE® AEROBIC ERGOMETERS

THE SMART ALTERNATIVE TO SHIN SPLINTS, MUSCLE PULLS AND TENDON TEARS

Running, jogging, aerobic dancing. All can lead to muscle and joint injury. Put UBE® and FITRON® Aerobic Ergometers by Eagle into your fitness program and get all the benefits of total body conditioning without the risks.

UBE and FITRON are the world's only clinically proven Isokinetic ergometers. They feature fully accommodating resistance throughout the range of motion safely matching force output. Joints and muscles are never undertaxed or overstressed. That's why both units are safe and effective for athletic rehabilitation, sports-specific performance training, personal fitness, cardiovascular conditioning, warm-ups, cool-downs and weight loss programs.

You benefit too! There's little or no routine maintenance. No electronic gimmicks to malfunction. Just set the speed and pedal. No supervision is required once exercise goals are established.

UBE and FITRON. The safe aerobics alternative for users *and* owners.

FITRON® CYCLE-ERGOMETER — For 15 years the choice of physical therapists, athletic trainers, pro teams and top fitness centers. FITRON stands up to the demands of continuous high speed workouts.

UBE® AEROBIC ERGOMETER — For the muscles and joints of the upper body. The torso, shoulders, arms, wrists and back benefit from safe aerobic workouts.

EAGLE FITNESS SYSTEMS BY CYBEX — PIONEERING THE FUTURE OF SPORTS MEDICINE AND EXERCISE.

For more information call Cybex toll-free today at 1-800-645-5392.

EAGLE®
FITNESS SYSTEMS by CYBEX

CYBEX, Division of Lumex, Inc., 2100 Smithtown Avenue, Ronkonkoma, NY 11779, (516)585-9000